Naval Facilities Engineering Command

ENGINEERING AND EXPEDITIONARY WARFARE CENTER

Site Specific Report
CR-NAVFAC EXWC-CIOFP-1310

TANK INSPECTIONS AND ASSESSMENTS AT NAVAL AIR STATION SIGONELLA, ITALY

By

TANK INDUSTRY CONSULTANTS

November 2012

WATER TANK
INSPECTIONS AND ASSESSMENTS AT

NAVAL AIR STATION
SIGONELLA, ITALY

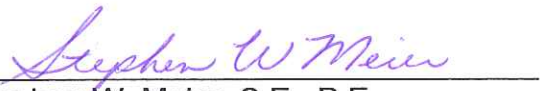
REPORT # CR-NAVFAC EXWC-CIOFP-1310

November 2012

by:
Tank Industry Consultants
7740 West New York Street
Indianapolis, Indiana 46214

Under:
Contract No. N62583-10-D-0340
Delivery Order No. 0018

Prepared for:
NAVFAC EXWC
720 Kennon St. SE, Bldg. 36, Suite 333
Washington Navy Yard, DC 20374



Stephen W. Meier, S.E., P.E.
Managing Principal

WATER TANKS AT
NAVAL AIR STATION
SIGONELLA, ITALY

EXECUTIVE SUMMARY

This report was prepared as part of the Water Tank Inspection Program administered by the Ocean Construction Division of the Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC).

This program provides inspection, assessment, repair recommendations, and estimates of repair costs for water tank facilities. All of these services, including this report, were provided by Tank Industry Consultants, under the responsible charge of Gregory R. "Chip" Stein, P.E., in accordance with Contract No. N62583-10-D-0340.

Twelve tanks were evaluated at the Naval Air Station in Sigonella, Italy. Tank 307 was undergoing work operations at the time of the field evaluation. The remaining tanks were in operation and the interiors were evaluated by a remotely operated vehicle (ROV). Nine were partially or completely buried concrete tanks (Tanks 238, 823, 535, 492, 612, 214, 2105, 2106, and 425), and one was a welded steel ground level tank (1011). One was an elevated legged tank constructed of welded steel (Tank 307), and another was an elevated concrete tank (Tank 707).

The purpose of this report is to present the findings of the comprehensive inspections and to make recommendations for the repair, recoating, and maintenance of the tanks. Budgetary estimates to perform repair work are also included.

Tank 238

Tank 238 is a three-chamber concrete tank which is partially located below grade and has a capacity of 900,000 gallons of nonpotable water.

Exterior Concrete: The exterior concrete surfaces were in generally good overall condition as no significant cracking and spalling were noted. The exterior surfaces should be re-evaluated in 4 to 5 years to determine if repairs are required at that time.

Interior Concrete: The interior concrete surfaces appeared to be in adequate condition as no significant cracking and chipping were observed. The interior surfaces should be re-evaluated in 3 to 4 years to determine if repairs are required at that time.

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

- an uncovered cabinet on the shell exposed wiring (recommended practice),
- the interior ladder width was less than required by OSHA (29 CFR 1910.27(b)(1)(iii)),

- the interior ladder toe room was less than required by OSHA (29 CFR 1910.27(c)(4)), and
- safety railing was not located at the roof's edge adjacent to the roof manholes as required by OSHA (29 CFR 1910.23(a)(2)).

To be in full compliance with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA and Operational Deficiencies: There were no AWWA or operational deficiencies noted on this tank at the time of the field evaluation.

Tank 823

Tank 823 is a concrete tank located partially below grade with a capacity of 680,000 gallons of nonpotable water.

Exterior Concrete: The concrete exterior was uncoated and was in generally good condition as no significant deterioration was noted.

Interior Concrete: The interior of the tank was coated and was in good condition as no deterioration was observed at the time of the field evaluation. The interior surfaces should be re-evaluated in 3 to 4 years to determine if deterioration is noted which requires repair.

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

- the height of the handrail on the stairs to the valve vault exceeded the OSHA maximum allowed height (29 CFR 1910.23(e)(2)),
- the roof safety railing access opening did not have closure chains to deter personnel from inadvertently falling (29 CFR 1910.23(a)(2)),
- the gaps between the roof and toe bar exceeded the OSHA maximum allowed gap width (29 CFR 1910.23(e)(4)),
- the interior ladder width was less than required by OSHA (29 CFR 1910.27(b)(1)(iii)),
- the interior ladder toe room was less than required by OSHA (29 CFR 1910.27(c)(4)), and
- the interior ladder head clearance was less than required by OSHA (29 CFR 1910.27(c)(1)).

To be in full compliance with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA and Operational Deficiencies: There were no AWWA or operational deficiencies noted at the time of the field evaluation.

Tank 535

Tank 535 is a two-chamber concrete tank located partially below grade with a capacity of 317,000 gallons of potable water.

Exterior Concrete: The exterior concrete surfaces were in poor condition and a leak was observed; it is recommended the exterior surfaces be repaired within the next year. The cracks in the underside of the roof overhang should be prepared according to the specifications of the concrete crack repair material manufacturer. These areas to be repaired should be prepared by wet blast cleaning to remove dust, laitance, grease, or other bond inhibiting materials and blown off with high-pressure air. The cracks in the concrete should then be repaired by routing out the crack to a minimum depth of 1 inch (25 mm, with a minimum 90° angle from the surface) and repairing with a cement-based patching compound. The sequence and performance of these concrete repairs shall be such that the structural integrity of the tank area is not compromised. In order to repair the leak, epoxy injection may be required.

Interior Concrete: The coating on the concrete interior of the tank appeared to be in generally good overall condition as no significant cracking and chipping were observed. The interior surfaces should be re-evaluated in 3 to 4 years to determine if repairs are required at that time.

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

- the roof safety railing access opening did not have closure chains to deter personnel from inadvertently falling (29 CFR 1910.23(a)(2)),
- the gaps between the roof and toe bar exceeded the OSHA maximum allowed gap width (29 CFR 1910.23(e)(4)),
- some of the toe bar sections had broken (29 CFR 1910.23(e)(4)),
- the valve vault ladder side rails were dimensionally too small (ANSI A14.3),
- the valve vault ladder rung size was dimensionally less than required by OSHA (29 CFR 1910.27(b)(1)(i)),
- the valve vault ladder head clearance was less than required by OSHA (29 CFR 1910.27(c)(1)),
- wiring was exposed in the south vault (recommended practice),
- the exterior ladder side rails were dimensionally too small (ANSI A14.3),
- the size of the exterior ladder rungs was less than allowed by OSHA (29 CFR 1910.27(b)(1)(i)),
- the interior ladder side rails were dimensionally too small (ANSI A14.3), and
- the interior ladder rung size was dimensionally less than required by OSHA (29 CFR 1910.27(b)(1)(i)).

To be in full compliance with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA, Sanitary, and Operational Deficiencies: There were AWWA, sanitary, and operational deficiencies noted on this tank as well which include:

- a leak was located in the shell,
- the overflow pipe screening could allow the ingress of insects into the tank, and
- the roof vent screening could allow the ingress of insects into the tank.

These deficiencies should be corrected.

Tank 492

Tank 492 is a two-chamber concrete tank which is located partially below grade with a capacity of 400,000 gallons of potable water.

Exterior Concrete: The concrete exterior surfaces were in generally good condition except for the corrosion observed on some exposed rebar near the top of the shell. The exterior concrete should be re-evaluated in 3 to 4 years to determine if repairs are necessary at that time, especially at the area of exposed rebar previously mentioned.

Interior Concrete: The concrete interior of the tank appeared to be in good condition as no significant areas of cracking were noted. The interior surfaces should be re-evaluated in 3 to 4 years to determine if repairs are required at that time.

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

- the height of the handrail on the stairs exceeded the OSHA maximum allowed height (29 CFR 1910.23(e)(2)),
- the platforms did not have toe bars as required by OSHA (29 CFR 1910.23(e)(4)),
- the roof safety railing access opening did not have closure chains to deter personnel from inadvertently falling (29 CFR 1910.23(a)(2)),
- the gaps between the roof and toe bar exceeded the OSHA maximum allowed gap width (29 CFR 1910.23(e)(4)),
- some of the toe bar sections had broken (29 CFR 1910.23(e)(4)),
- the valve vault ladder width was less than required by OSHA (29 CFR 1910.27(b)(1)(iii)),
- the valve vault ladder head clearance was less than required by OSHA (29 CFR 1910.27(c)(1)),
- the rust tubercles on the ladder could injure the climber (recommended practice),
- the interior ladder width was less than required by OSHA (29 CFR 1910.27(b)(1)(iii)),
- the interior ladder head clearance is less than required by OSHA (29 CFR 1910.27(c)(1)), and
- the rust tubercles on the interior ladder could injure the climber (recommend practice).

To be in full compliance with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA, Sanitary, and Operational Deficiencies: There were AWWA, sanitary, and operational deficiencies noted on this tank as well which include:

- the overflow pipe screening could allow the ingress of insects into the tank, and
- the roof vent screening could allow the ingress of insects into the tank.

These deficiencies should be corrected.

Tank 612

Tank 612 is a three-chamber concrete tank which is located partially below grade and provides 976,720 gallons of nonpotable water storage tank.

Exterior Concrete: The exterior concrete surfaces were in generally good overall condition as no significant cracking and spalling were noted. The exterior surfaces should be re-evaluated in 4 to 5 years to determine if repairs are required at that time.

Interior Concrete: The interior concrete surfaces appeared to be in adequate condition as no significant cracking and chipping were observed. The interior surfaces should be re-evaluated in 3 to 4 years to determine if repairs are required at that time.

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

- the height of the handrail on the stairs exceeded the OSHA maximum allowed height (29 CFR 1910.23(e)(2)),
- the height of the roof safety railing handrail was less than required by OSHA (29 CFR 1910.23(e)(1)),
- the gaps between the roof and toe bar exceeded the OSHA maximum allowed gap width (29 CFR 1910.23(e)(4)),
- sections of the toe bar had broken (29 CFR 1910.23(e)(4),
- the interior ladder width was less than required by OSHA (29 CFR 1910.27(b)(1)(iii)), and
- the rust tubercles could injure the climber (recommended practice).

To be in full compliance with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA and Operational Deficiencies: There were no AWWA or operational deficiencies noted on this tank at the time of the field evaluation.

Tank 307

Tank 307 is a steel elevated water storage tank which stores 210,000 gallons of potable water. Work operations were being performed on the tank at the time of the field evaluation which reportedly included topcoating the exterior, replacing the top of the riser, and pressure washing the interior surfaces. Heavy metals, chrmoum and lead, were found in the exterior riser, exterior columns and target gage coatings.

Exterior Coating: The exterior coating system appeared to be good overall condition and providing adequate corrosion protection. The exterior surfaces should be re-evaluated in 4 to 5 years to determine if repainting is necessary at that time.

Interior Coating: The interior container coating was in very poor condition as widespread corrosion and metal loss were noted. It was reported that the top of the riser is to be repaired, and the interior surfaces are to be pressure washed. Care should be taken during pressure washing as the extensive metal loss located on the roof and support structure members, as well as that which may be located beneath the rust tubercles throughout the interior, may result in holes from the pressure applied during washing. It is recommended the interior surfaces be repaired and repainted as soon as feasible. If repairs and repainting are not performed, leaks could be observed at any time. However, it may be more economical to replace the tank than to repair it. The following recommendations are based on repairing and repainting the tank as opposed to replacing it.

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

- the tower ladder and shell ladder width was less than required by OSHA (29 CFR 1910.27(b)(1)(iii)),
- the tower ladder head clearance was less than required by OSHA (29 CFR 1910.27(c)(1)),
- the length of the tower ladder sections between the ladder platforms exceeded the OSHA allowed maximum width (29 CFR 1910.27(d)(1)(ii),
- the width of the tower and shell ladder safety cages was less than required by OSHA (29 CFR 1910.27(d)(1)(i)),
- the depth of the tower and shell ladder safety cages was less than required by OSHA (29 CFR 1910.27(d)(1)(i)),
- the tower ladder and shell ladder toe room was less than required by OSHA (29 CFR 1910.27(c)(4)),
- the tower ladder and shell ladder side rails were dimensionally too small (ANSI A14.3),
- the vandal deterrent was not adequate prevent unauthorized personnel from accessing the tower ladder (recommended practice),
- the height of the handrail on the tower ladder platforms, balcony, and roof ladder platforms was less than required by OSHA (29 CFR 1910.23(e)(1)),

- the handrail, uprights, and mid-rails on the tower ladder platforms, balcony, and roof platform were dimensionally too small (29 CFR 1910.23 (e)(3)(iii)),
- the tower ladder and roof platform toe bar height was less than required by OSHA (29 CFR 1910.23(e)(4)),
- the tower ladder and roof platform access openings did not have closure chains to deter personnel from inadvertently falling (29 CFR 1910.23(a)(2)),
- the balcony and roof platform toe bar height was less than required by OSHA (29 CFR 1910.23(e)(4)),
- the access opening through the balcony floor did not have a closable cover as required by OSHA (29 CFR 1910.23(a)(6)),
- the balcony access opening did not have a curb as required by OSHA (29 CFR 1910.23 (e)(3)), and
- the roof had only one manhole (AWWA D100).

To be in full compliance with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA, Sanitary, and Operational Deficiencies: There were AWWA, sanitary, and operational deficiencies noted on this tank as well which include:

- there were uncovered openings in the roof,
- the roof vent was not clog-resistant,
- the roof vent screening could allow the ingress of insects into the tank,
- the roof manhole cover did not have a gasket,
- the roof manhole cover was not locked, and
- the location of the overflow inlet was above the unwelded roof cap seam.

These deficiencies should be corrected.

Tank 214

Tank 214 is a four-chamber concrete tank located below grade with a capacity of 528,344 gallons of potable water.

Overflow: The operational system should be reviewed to determine the risks of overfilling the tank and the appropriate mitigation actions identified when overflowing occurs.

Interior Concrete: The concrete interior of the tank appeared to be in adequate condition as no significant cracking and chipping were observed. The interior surfaces should be re-evaluated in 3 to 4 years to determine if the cracks require repair.

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

- the interior ladder head clearance was less than required by OSHA (29 CFR 1910.27(c)(1)),
- the rust tubercles on the interior ladder could injure the climber's hands (recommended practice),
- the interior ladder side rails were not continuous at ladder section intersections (29 CFR 1910.23(b)(4)), and
- the interior ladders were not equipped with safe-climbing devices (29 CFR 1910. 27(d)(1)(ii)).

To be in full compliance with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA and Operational Deficiency: There was an AWWA and operational deficiency noted:

- the tank was not equipped with a dedicated overflow.

This deficiency should be addressed.

Tank 2105

Tank 2105 is a two-chamber concrete tank located partially below grade with a capacity of 47,500 gallons of nonpotable water.

Exterior Concrete: The exterior concrete surfaces were in good overall condition as no significant cracking and spalling were noted. The exterior surfaces should be re-evaluated in 4 to 5 years to determine if repairs are required at that time.

Interior Concrete: The concrete interior of the tank appeared to be in fair condition although corrosion and rust staining were visible on exposed steel in the roof and shell. The interior surfaces should be re-evaluated in 3 to 4 years to determine if these areas require repair at that time.

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

- the exterior ladder rungs were dimensionally less than required by OSHA (29 CFR 1910.27(b)(1)(i)),
- the exterior ladder width was less than required by OSHA (29 CFR 1910.27(b)(1)(iii)),
- the exterior ladder toe room was less than required by OSHA (29 CFR 1910.27(c)(4)),
- the exterior ladder side rails were dimensionally too small (ANSI A14.3),
- the roof access opening did not have closure chains to deter personnel from inadvertently falling from the roof (29 CFR 1910.23(a)(2)),

- the height of the handrail on the roof safety railing was less than required by OSHA (29 CFR 1910.23(e)(1)),
- the gaps between the roof and toe bar exceeded the OSHA maximum allowed gap width (29 CFR 1910.23(e)(4)),
- the interior ladder width was less than required by OSHA (29 CFR 1910.27(b)(1)(iii)),
- the interior ladder toe room was less than required by OSHA (29 CFR 1910.27(c)(4)),
- the interior ladder side rails were dimensionally too small (ANSI A14.3), and
- the spacing between interior ladder rungs did not comply with OSHA requirements (29 CFR 1910.27(b)(1)(i)).

To be in full compliance with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA and Operational Deficiencies: There were AWWA and operational deficiencies noted on this tank as well which include:

- ponding water may lead to infiltration through the roof, and
- the screening on the interior piping cover was clogged.

These deficiencies should be addressed.

Tank 2106

Tank 2106 is a two-chamber concrete tank located partially below grade with a capacity of 47,500 gallons of nonpotable water.

Exterior Concrete: It is recommended the exterior surfaces be repaired within the next year. The shell beneath the roof overhang has deteriorated and the deterioration in the south side of the shell has started to leak. The cracks in the underside of the roof overhang should be prepared according to the specifications of the concrete crack repair material manufacturer.

Interior Concrete: The concrete interior of the tank appeared to be in fair condition although corrosion and rust staining were visible on exposed steel in the shell. The interior surfaces should be re-evaluated in 3 to 4 years to determine if these areas require repair at that time.

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

- the exterior ladder rungs were dimensionally less than required by OSHA (29 CFR 1910.27(b)(1)(i)),
- the exterior ladder width was less than required by OSHA (29 CFR 1910.27(b)(1)(iii)),

- the exterior ladder toe room was less than required by OSHA (29 CFR 1910.27(c)(4)),
- the exterior ladder side rails were dimensionally too small (ANSI A14.3),
- the roof access opening did not have closure chains to deter personnel from inadvertently falling from the roof (29 CFR 1910.23(a)(2)),
- the height of the handrail on the roof safety railing was less than required by OSHA (29 CFR 1910.23(e)(1)),
- the gaps between the roof and toe bar exceeded the OSHA maximum allowed gap width (29 CFR 1910.23(e)(4)),
- the interior ladder width was less than required by OSHA (29 CFR 1910.27(b)(1)(iii)),
- the interior ladder toe room was less than required by OSHA (29 CFR 1910.27(c)(4)),
- the interior ladder side rails were dimensionally too small (ANSI A14.3), and
- the spacing between interior ladder rungs did not comply with OSHA requirements (29 CFR 1910.27(b)(1)(i)).

To be in full compliance with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA and Operational Deficiencies: There were AWWA and operational deficiencies noted on this tank as well which include:

- there was a leak in the shell,
- ponding water may lead to infiltration through the roof, and
- the screening on the interior piping cover was clogged.

These deficiencies should be addressed.

Tank 425

Tank 425 is a two-chamber concrete tank which is partially located below grade and stores 200,000 gallons of nonpotable water.

Exterior Concrete: The exterior concrete surfaces were in generally good overall condition as no significant cracking and spalling were noted. The exterior surfaces should be re-evaluated in 4 to 5 years to determine if repairs are required at that time.

Interior Concrete: The interior concrete surfaces appeared to be in adequate condition as no significant cracking and chipping were observed. The interior surfaces should be re-evaluated in 3 to 4 years to determine if repairs are required at that time.

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

- the valve vault rung width was less than required by OSHA (29 CFR 1910.27(b)(1)(iii)),
- the valve vault toe room was less than required by OSHA (29 CFR 1910.27(c)(4)),
- wiring in the east vault was exposed (recommended practice),
- there was no safety railing located at the roof access and adjacent to the roof manholes (29 CFR 1910.23(c)(1)),
- the interior ladder side rails were dimensionally too small (ANSI A14.3), and
- the rust tubercles on the interior ladders could injure the climber (recommended practice).

To be in full compliance with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA and Operational Deficiencies: There were AWWA and operational deficiencies noted on this tank as well which include:

- ponding water may lead to infiltration through the roof, and
- the tank was not equipped with a dedicated means of ventilation

These deficiencies should be addressed.

Tank 707

Tank 707 is an elevated single-pedestal tank constructed of concrete with a capacity of 288,000 gallons of potable water.

Exterior Concrete: The exterior concrete surfaces were in generally good overall condition as no significant cracking and spalling were noted. However, due to the thickness of the roof coating, it could not be determined if the cracks observed at the roof extended to the concrete. The exterior surfaces should be re-evaluated in 4 to 5 years to determine if repairs are required at that time.

Interior Dry Concrete: The interior dry concrete surfaces appeared to be in adequate condition as no significant deterioration was observed. The interior surfaces should be re-evaluated in 3 to 4 years to determine if repairs are required at that time.

Interior Wet Concrete: The interior wet concrete surfaces appeared to be in adequate condition as no significant deterioration was observed. The interior surfaces should be re-evaluated in 3 to 4 years to determine if repairs are required at that time.

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

- the height of the handrail on the roof safety railing, interior dry platforms, and interior container platform was less than required by OSHA (29 CFR 1910.23(e)(1)),

- the size of the members of the roof safety railing, interior dry platforms, and interior container platforms were dimensionally less than required by OSHA (29 CFR 1910.23(e)(3)),
- the gaps between the toe bar and top of the access tube exceeded the OSHA maximum allowed width (29 CFR 1910.23(e)(4)),
- the roof was equipped with only one manhole (AWWA D100),
- the access tube side rails were dimensionally too small (ANSI A14.3),
- the access tube head clearances was less than required by OSHA (29 CFR 1910.27(c)(1)),
- the depth of the access tube ladder safety cage was less than required by OSHA (29 CFR 1910.27(d)(1)(i)),
- the width of the access tube ladder safety cage was less than required by OSHA (29 CFR 1910.27(d)(1)(i)),
- the spacing between vertical bars on the access tube safety cage exceeded the maximum allowed by OSHA (29 CFR 1910.27(d)(1)(vi)),
- the gaps between the toe bars and two of the interior dry platforms exceeded the OSHA maximum allowed width (29 CFR 1910.23(e)(4)),
- the top interior dry platform did not have a toe bar as required by OSHA, (29 CFR 1910.23(e)(4)),
- the access openings through the interior dry platforms did not have closure chains as required by OSHA (29 CFR 1910.23(a)(2)),
- the access opening through the lower platform in the wet container did not have a closable cover, (29 CFR 1910.23(a)(6)),
- the curbs around the access openings through both interior wet container platforms were less than required by OSHA (29 CFR 1910.23(a)(3)),
- the gap between the toe bar and the lower platform in the wet container platform exceeded the OSHA maximum allowed gap width (29 CFR 1910.23(e)(4)),
- the wet container ladder width was less than required by OSHA (29 CFR 1910.27(b)(1)(iii)),
- the wet container ladder side rails were dimensionally too small (ANSI A14.3),
- the wet container ladder toe room was less than required by OSHA (29 CFR 1910.27(d)(1)(i)),
- the depth of the wet container ladder safety cage was less than required by OSHA (29 CFR 1910.27(d)(1)(i)), and
- the width of the wet container ladder safety cage was less than required by OSHA (29 CFR 1910.27(d)(1)(i)).

To be in full compliance with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA, Sanitary, and Operational Deficiencies: There were AWWA, sanitary, and operational deficiencies noted on this tank as well which include:

- the overflow pipe did not have an above grade air break,
- the roof manhole cover had cracked, and
- the roof manhole was not locked.

These deficiencies should be corrected.

Tank 1011

Tank 1011 is a 200,000 gallon welded steel tank with a dome roof which stores nonpotable water.

Exterior Coating: The coating on the exterior surfaces appeared to be in good condition as there were not significant areas of corrosion noted. The exterior should not need to be repainted within the next 7 to 8 years from a corrosion standpoint. However, the exterior should be re-evaluated in 3 to 4 years to determine if repainting and repairs are necessary at that time.

Interior Coating: The interior coating system appeared to be in good condition and providing adequate corrosion protection. A cathodic protection system should be installed within the next 2 years in order to extend the life of the coating.

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

- the tank had only one shell manhole (AWWA D100),
- the exterior ladder toe room was less than require by OSHA (29 CFR 1910.27(c)(4)),
- the spacing between vertical bars on the exterior ladder safety cage exceeded the maximum allowed (29 CFR 1910.27(d)(1)(vi)),
- the spacing between horizontal bars on the exterior ladder safety cage exceeded the maximum allowed (29 CFR 1910.27(d)(1)(i)),
- the base of the exterior ladder safety cage was not flared (29 CFR 1910.27(d)(1)(iv)),
- the roof safety railing toe bar was bent in areas (29 CFR 1910.23(e)(4)),
- the roof safety railing access opening did not have closure chains to deter personnel from inadvertently falling (29 CFR 1910.23(a)(2)),
- the gaps between the roof and toe bar exceeded the OSHA maximum allowed gap width (29 CFR 1910.23(e)(4)),
- the interior ladder side rails were dimensionally too small (ANSI A14.3), and
- the rust tubercles on the interior ladder could injure the climber (recommended practice).

To be in full compliance with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA and Operational Deficiencies: There were AWWA and operational deficiencies noted on this tank as well which include:

- the roof vent was not clog-resistant, and
- there was debris on the roof vent screening which could prevent the tank from venting.

These deficiencies should be corrected.

The aforementioned safety and operating deficiencies are not intended to be a complete list of the deficiencies found on the tanks. Refer to the report text and accompanying photographs for a complete account of all observed deficiencies.

In the event that repairs are performed, it may be more economical to schedule the rehabilitations of the tanks consecutively to allow for a single mobilization by a contractor. If the work is not performed within the next 2 years, the structures should be reevaluated prior to the preparation of specifications and the solicitation of bids. Proper maintenance after completing the recommendations listed in this report would include periodic washouts and evaluations approximately every 3 to 5 years.

EXECUTIVE SUMMARY TABLE
NAVAL AIR STATION
SIGONELLA, ITALY

Tank Name	Capacity (Gallons)	Purpose	Type	Structure Materials	Recommendations	Prioritization Ratings						Est. Cost	Est. Rating w/ Rec. Repairs
						Safety	Sanitary	Structural	Exterior PCM/PM	Interior PCM/PM	Overall		
238	900,000	Nonpotable	Partially Below Grade	Concrete	Clean and paint interior piping; install roof safety railing; remove interior ladders (4)	97	N/A	100	100	100	**99**	$56,000	**100**
823	680,000	Nonpotable	Partially Below Grade	Concrete	Modify roof safety railing and install closure chains; remove interior ladders (2)	87	N/A	100	100	100	**97**	$49,000	**100**
535	317,000	Potable	Partially Below Grade	Concrete	Repair exterior shell surfaces and leak; clean and paint interior piping; install overflow pipe elastomeric check valve and clog-resistant vents (2); replace exterior ladder; modify roof safety railing and install closure chains; remove interior ladders (2)	92	45	100	100	100	**87**	$94,000	**100**
492	400,000	Potable	Partially Below Grade	Concrete	Clean and paint interior piping; install overflow pipe elastomeric check valves (2) and clog-resistant vents (2); modify stair safety railing and install platform toe bars; remove interior ladders (2)	90	70	100	100	100	**92**	$77,000	**100**
612	976,270	Nonpotable	Partially Below Grade	Concrete	Clean and paint interior piping; modify roof and stair safety railing; remove interior ladders (3)	93	N/A	100	100	100	**98**	$58,000	**100**
307	210,000	Potable	Elevated	Welded Steel	Clean and paint interior; replace tower ladder, shell ladder, vandal deterrent, balcony safety railing, roof platform safety railing; remove tower ladder platforms; install clog-resistant vent; contingencies to replace roof and repair shell metal loss	80	50	68	95	13	**61**	$407,000	**100**
214	528,344	Potable	Buried	Concrete	Review operational system to determine the risk of overfilling the tank and identify appropriate mitigation; clean and paint interior piping; remove interior ladders (4)	77	75	100	100	100	**90**	$51,000	**100**
2105	47,500	Nonpotable	Partially Below Grade	Concrete	Clean and paint interior piping; install overflow pipe elastomeric check valve; replace exterior ladder; modify roof safety railing and install closure chains; remove interior ladders (2)	83	N/A	100	100	100	**96**	$60,000	**100**
2106	47,500	Nonpotable	Partially Below Grade	Concrete	Repair exterior shell surfaces and leak; clean and paint interior piping; install overflow pipe elastomeric check valve; replace exterior ladder; modify roof safety railing and install closure chains; remove interior ladders (2)	83	N/A	88	33	100	**76**	$76,000	**100**
425	200,000	Nonpotable	Partially Below Grade	Concrete	Clean and paint interior piping; replace exterior ladder; install roof safety railing and clog-resistant vent; remove interior ladders (2)	82	N/A	100	100	100	**95**	$67,000	**100**
707	288,000	Potable	Elevated	Concrete	Clean and paint interior wet piping; replace access tube ladder and install safe-climbing devices; remove access tube ladder safety cages and wet container ladders and platforms; install clog-resistant vent and overflow air break with elastomeric check valve; modify roof and interior dry platform safety railings; modify roof manhole and replace cover	83	35	100	95	100	**83**	$91,000	**99**
1011	200,000	Nonpotable	Ground Level	Welded Steel	Remove exterior ladder safety cage; modify exterior ladder and install safe-climbing device; install additional shell manhole and clog-resistant vent; modify roof safety railing and install closure chains; remove interior ladder	92	N/A	94	100	100	**96**	$72,000	**100**

Key:
Overall Rating is 0-50.
Overall Rating is 51-79.
Overall Rating is 80-100.
PCM – Painting, Corrosion, & Maintenance
PM – Painting & Maintenance
Sanitary Ratings are not applicable for tanks that store nonpotable water

WATER TANK
INSPECTIONS AND ASSESSMENTS AT
NAVAL AIR STATION
SIGONELLA, ITALY

TABLE OF CONTENTS

Page No.

EXECUTIVE SUMMARY i

LIST OF FIGURES xix

LIST OF PHOTOGRAPHS xx

LIST OF TABLES xlviii

1. INTRODUCTION 1-1
   1.1 BACKGROUND/OBJECTIVES 1-1
   1.2 INSPECTION BRIEFINGS 1-2

2. ACTIVITY DESCRIPTION 2-1
   2.1 TANKS INSPECTED 2-1

3. TANKS INSPECTED 3-1
   3.1 TANK 238 ..... 3.1-1
      3.1.1 Description of the Facility 3.1-1
      3.1.2 Observed Conditions 3.1-3
      3.1.3 Comparison of Previous Inspection Results 3.1-41
      3.1.4 Structural Condition Assessment 3.1-41
      3.1.5 Recommendations 3.1-42
   3.2 TANK 823 ..... 3.2-1
      3.2.1 Description of the Facility 3.2-1
      3.2.2 Observed Conditions 3.2-3
      3.2.3 Comparison of Previous Inspection Results 3.2-40
      3.2.4 Structural Condition Assessment 3.2-40
      3.2.5 Recommendations 3.2-41
   3.3 TANK 535 ..... 3.3-1
      3.3.1 Description of the Facility 3.3-1
      3.3.2 Observed Conditions 3.3-3

3.3.3 Comparison of Previous Inspection Results....3.3-46
3.3.4 Structural Condition Assessment....3.3-46
3.3.5 Recommendations....3.3-47
3.4 TANK 492....3.4-1
3.4.1 Description of the Facility....3.4-1
3.4.2 Observed Conditions....3.4-3
3.4.3 Comparison of Previous Inspection Results....3.4-36
3.4.4 Structural Condition Assessment....3.4-36
3.4.5 Recommendations....3.4-37
3.5 TANK 612....3.5-1
3.5.1 Description of the Facility....3.5-1
3.5.2 Observed Conditions....3.5-3
3.5.3 Comparison of Previous Inspection Results....3.5-35
3.5.4 Structural Condition Assessment....3.5-35
3.5.5 Recommendations....3.5-36
3.6 TANK 307....3.6-1
3.6.1 Description of the Facility....3.6-1
3.6.2 Observed Conditions....3.6-3
3.6.3 Comparison of Previous Inspection Results....3.6-49
3.6.4 Structural Condition Assessment....3.6-49
3.6.5 Recommendations....3.6-50
3.7 TANK 214....3.7-1
3.7.1 Description of the Facility....3.7-1
3.7.2 Observed Conditions....3.7-3
3.7.3 Comparison of Previous Inspection Results....3.7-27
3.7.4 Structural Condition Assessment....3.7-27
3.7.5 Recommendations....3.7-28
3.8 TANK 2105....3.8-1
3.8.1 Description of the Facility....3.8-1
3.8.2 Observed Conditions....3.8-3
3.8.3 Comparison of Previous Inspection Results....3.8-33
3.8.4 Structural Condition Assessment....3.8-33
3.8.5 Recommendations....3.8-34
3.9 TANK 2106....3.9-1

3.9.1 Description of the Facility 3.9-1
3.9.2 Observed Conditions 3.9-3
3.9.3 Comparison of Previous Inspection Results 3.9-36
3.9.4 Structural Condition Assessment 3.9-36
3.9.5 Recommendations 3.9-37
3.10 TANK 425 ..... 3.10-1
3.10.1 Description of the Facility 3.10-1
3.10.2 Observed Conditions 3.10-3
3.10.3 Comparison of Previous Inspection Results 3.10-39
3.10.4 Structural Condition Assessment 3.10-39
3.10.5 Recommendations 3.10-40
3.11 TANK 707 ..... 3.11-1
3.11.1 Description of the Facility 3.11-1
3.11.2 Observed Conditions 3.11-3
3.11.3 Comparison of Previous Inspection Results 3.11-62
3.11.4 Structural Condition Assessment 3.11-62
3.11.5 Recommendations 3.11-63
3.12 TANK 1011 ..... 3.12-1
3.12.1 Description of the Facility 3.12-1
3.12.2 Observed Conditions 3.12-3
3.12.3 Comparison of Previous Inspection Results 3.12-34
3.12.4 Structural Condition Assessment 3.12-34
3.12.5 Recommendations 3.12-35
3.13 CLOSURE 3.13-1
APPENDIX A – KEY PERSONNEL A-1
APPENDIX B – INSPECTION PROCEDURES B-1
APPENDIX C – STRUCTURAL DATA C-1
APPENDIX D – PERTINENT BACKGROUND INFORMATION D-1
APPENDIX E – SUBSTANTIATION OF COST ESTIMATES E-1
APPENDIX F – COST ESTIMATES SUMMARY F-1
APPENDIX G - REFERENCES G-1

LIST OF FIGURES

Figure No.	Title	Page No.
FIG 2-1	Location Map	2-2
FIG 3.1-1	Nomenclature, Tank 238	3.1-2
FIG 3.2-1	Nomenclature, Tank 823	3.2-2
FIG 3.3-1	Nomenclature, Tank 535	3.3-2
FIG 3.4-1	Nomenclature, Tank 492	3.4-2
FIG 3.5-1	Nomenclature, Tank 612	3.5-2
FIG 3.6-1	Nomenclature, Tank 307	3.6-2
FIG 3.7-1	Nomenclature, Tank 214	3.7-2
FIG 3.8-1	Nomenclature, Tank 2105	3.8-2
FIG 3.9-1	Nomenclature, Tank 2106	3.9-2
FIG 3.10-1	Nomenclature, Tank 425	3.10-2
FIG 3.11-1	Nomenclature, Tank 707	3.11-2
FIG 3.12-1	Nomenclature, Tank 1011	3.12-2

LIST OF PHOTOGRAPHS

Photo No.	Description	Page No.
Photo 3.1-1	Tank 238 and site	3.1-6
Photo 3.1-2	Tank 238	3.1-6
Photo 3.1-3	Tank 238	3.1-7
Photo 3.1-4	Tank 238	3.1-7
Photo 3.1-5	Tank 238	3.1-8
Photo 3.1-6	Concrete apron around tank	3.1-8
Photo 3.1-7	Debris and voids in sealant around apron-to-tank interface	3.1-9
Photo 3.1-8	Voids in sealant around apron-to-tank interface	3.1-9
Photo 3.1-9	Debris and voids in sealant around apron-to-tank interface	3.1-10
Photo 3.1-10	Shell exterior	3.1-10
Photo 3.1-11	Shell exterior	3.1-11
Photo 3.1-12	Elbowed pipe fitting	3.1-11
Photo 3.1-13	Elbowed pipe fitting	3.1-12
Photo 3.1-14	Screening on elbowed pipe fitting	3.1-12
Photo 3.1-15	Elbowed pipe fittings	3.1-13
Photo 3.1-16	Elbowed pipe fittings	3.1-13
Photo 3.1-17	Screening on elbowed pipe fitting	3.1-14
Photo 3.1-18	Ramp to roof	3.1-14
Photo 3.1-19	Debris on ramp to roof	3.1-15
Photo 3.1-20	Fence and gate around roof perimeter	3.1-15
Photo 3.1-21	Roof manholes	3.1-16
Photo 3.1-22	Roof manholes	3.1-16
Photo 3.1-23	Roof manholes and equipment	3.1-17
Photo 3.1-24	Roof manhole interior	3.1-17
Photo 3.1-25	Roof manhole interior	3.1-18
Photo 3.1-26	Roof manhole interior	3.1-18
Photo 3.1-27	Debris and vegetation on roof	3.1-19
Photo 3.1-28	Debris on roof around equipment	3.1-19
Photo 3.1-29	Debris on roof around equipment	3.1-20
Photo 3.1-30	Antenna and fence	3.1-20

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.1-31	Debris and vegetation on roof	3.1-21
Photo 3.1-32	Debris and vegetation on roof	3.1-21
Photo 3.1-33	Debris on roof	3.1-22
Photo 3.1-34	Roof exterior	3.1-22
Photo 3.1-35	Roof exterior	3.1-23
Photo 3.1-36	Roof exterior	3.1-23
Photo 3.1-37	Corrosion on capped openings in roof	3.1-24
Photo 3.1-38	Cracks in roof	3.1-24
Photo 3.1-39	Cracks in roof	3.1-25
Photo 3.1-40	Cracks in roof	3.1-25
Photo 3.1-41	Cracks in roof	3.1-26
Photo 3.1-42	Cracks in roof	3.1-26
Photo 3.1-43	Standing water, moss, and debris on roof	3.1-27
Photo 3.1-44	Pipe projection	3.1-27
Photo 3.1-45	Pipe projection	3.1-28
Photo 3.1-46	Vegetation extending along shell	3.1-28
Photo 3.1-47	Vegetation extending into tank	3.1-29
Photo 3.1-48	Equipment on shell	3.1-29
Photo 3.1-49	Interior ladder and bracket	3.1-30
Photo 3.1-50	Equipment on shell	3.1-30
Photo 3.1-51	Shell interior and interior ladder	3.1-31
Photo 3.1-52	Shell interior and corrosion on abandoned interior ladder bracket remains	3.1-31
Photo 3.1-53	Corrosion and rust tubercles on interior ladder bracket bolts and abandoned bracket remains	3.1-32
Photo 3.1-54	Interior ladder	3.1-32
Photo 3.1-55	Corrosion on interior pipe and bracket	3.1-33
Photo 3.1-56	Corrosion on interior pipe and bracket	3.1-33
Photo 3.1-57	Corrosion on interior pipe and bracket	3.1-34
Photo 3.1-58	Corrosion on interior pipe and bracket	3.1-34

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.1-59	Corrosion and rust staining at exposed steel on shell	3.1-35
Photo 3.1-60	Column	3.1-35
Photo 3.1-61	Column	3.1-36
Photo 3.1-62	Column and floor	3.1-36
Photo 3.1-63	Silt on floor	3.1-37
Photo 3.1-64	Silt on floor	3.1-37
Photo 3.1-65	Shell and floor	3.1-38
Photo 3.1-66	Shell and floor	3.1-38
Photo 3.1-67	Floor	3.1-39
Photo 3.1-68	Pipe opening	3.1-39
Photo 3.1-69	Corrosion around pipe opening above sump	3.1-40
Photo 3.2-1	Tank 823 and site	3.2-6
Photo 3.2-2	Tank 823 and site	3.2-6
Photo 3.2-3	Tank 823 and valve vault adjacent to tank	3.2-7
Photo 3.2-4	Tank 823	3.2-7
Photo 3.2-5	Tank 823	3.2-8
Photo 3.2-6	Tank 823	3.2-8
Photo 3.2-7	Tank 823	3.2-9
Photo 3.2-8	Shell and roof overhang	3.2-9
Photo 3.2-9	Shell exterior	3.2-10
Photo 3.2-10	Equipment and debris on shell	3.2-10
Photo 3.2-11	Stairs to vault	3.2-11
Photo 3.2-12	Piping and equipment in vault.	3.2-11
Photo 3.2-13	Valve vault piping	3.2-12
Photo 3.2-14	Valve vault piping	3.2-12
Photo 3.2-15	Valve vault piping	3.2-13
Photo 3.2-16	Corrosion on piping	3.2-13
Photo 3.2-17	Corrosion around pipe penetration	3.2-14

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.2-18	Corrosion around pipe penetration and gage on pipe	3.2-14
Photo 3.2-19	Sump and pump in vault	3.2-15
Photo 3.2-20	Overflow pipe and debris in drain basin	3.2-15
Photo 3.2-21	Overflow pipe and straw in drain basin	3.2-16
Photo 3.2-22	Overflow pipe in drain basin	3.2-16
Photo 3.2-23	Screened overflow pipe discharge	3.2-17
Photo 3.2-24	Shell and downspout from gutter	3.2-17
Photo 3.2-25	Vegetation and debris in gutter.	3.2-18
Photo 3.2-26	Gutter along roof	3.2-18
Photo 3.2-27	Exterior ladder and roof safety railing	3.2-19
Photo 3.2-28	Roof access and roof safety railing	3.2-19
Photo 3.2-29	Gap between toe bar and roof	3.2-20
Photo 3.2-30	Pump equipment on roof	3.2-20
Photo 3.2-31	Pump equipment on roof	3.2-21
Photo 3.2-32	Sensor equipment on roof	3.2-21
Photo 3.2-33	Sensor equipment on roof	3.2-22
Photo 3.2-34	Roof manhole	3.2-22
Photo 3.2-35	Corrosion on exposed steel in roof manhole neck	3.2-23
Photo 3.2-36	Corrosion on exposed steel in roof manhole neck	3.2-23
Photo 3.2-37	Roof manhole	3.2-24
Photo 3.2-38	Corrosion on exposed steel at deteriorated concrete in roof manhole neck	3.2-24
Photo 3.2-39	Roof manhole cover interior	3.2-25
Photo 3.2-40	Roof exterior	3.2-25
Photo 3.2-41	Roof vent neck	3.2-26
Photo 3.2-42	Roof vent	3.2-26
Photo 3.2-43	Screened roof vent	3.2-27
Photo 3.2-44	Roof vent	3.2-27
Photo 3.2-45	Screened roof vent	3.2-28
Photo 3.2-46	Tank interior	3.2-28

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.2-47	Roof interior	3.2-29
Photo 3.2-48	Roof and shell	3.2-29
Photo 3.2-49	Overflow inlet weir box	3.2-30
Photo 3.2-50	Columns	3.2-30
Photo 3.2-51	Shell interior	3.2-31
Photo 3.2-52	Tank interior	3.2-31
Photo 3.2-53	Interior piping	3.2-32
Photo 3.2-54	Interior piping	3.2-32
Photo 3.2-55	Interior ladder and brackets	3.2-33
Photo 3.2-56	Interior piping	3.2-33
Photo 3.2-57	Interior piping	3.2-34
Photo 3.2-58	Corrosion on interior piping and bracket	3.2-34
Photo 3.2-59	Corrosion interior piping and interior piping splash block	3.2-35
Photo 3.2-60	Column	3.2-35
Photo 3.2-61	Shell interior	3.2-36
Photo 3.2-62	Shell interior	3.2-36
Photo 3.2-63	Shell interior	3.2-37
Photo 3.2-64	Shell and floor	3.2-37
Photo 3.2-65	Shell and floor	3.2-38
Photo 3.2-66	Concrete and silt on floor.	3.2-38
Photo 3.2-67	Concrete and silt on floor	3.2-39
Photo 3.3-1	Tank 535	3.3-6
Photo 3.3-2	Tank 535	3.3-6
Photo 3.3-3	Tank 535	3.3-7
Photo 3.3-4	Tank 535	3.3-7
Photo 3.3-5	Tank 535	3.3-8
Photo 3.3-6	Tank 535	3.3-8
Photo 3.3-7	Valve vault	3.3-9
Photo 3.3-8	Water standing in valve vault	3.3-9

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.3-9	Valve vault exterior	3.3-10
Photo 3.3-10	Cracks in valve vault access opening cover	3.3-10
Photo 3.3-11	Cracks and hole in valve vault access opening cover	3.3-11
Photo 3.3-12	Valve vault interior	3.3-11
Photo 3.3-13	Valve vault interior	3.3-12
Photo 3.3-14	Corrosion and mildew on valve vault piping	3.3-12
Photo 3.3-15	Corrosion and mildew on valve vault piping	3.3-13
Photo 3.3-16	Corrosion on valve vault piping nuts and bolts	3.3-13
Photo 3.3-17	Corrosion on valve vault piping	3.3-14
Photo 3.3-18	Sump in valve vault	3.3-14
Photo 3.3-19	Exposed wiring in valve vault	3.3-15
Photo 3.3-20	Overflow pipe	3.3-15
Photo 3.3-21	Corrosion on overflow pipe screening	3.3-16
Photo 3.3-22	Apparent leak in concrete shell	3.3-16
Photo 3.3-23	Electrical equipment on shell	3.3-17
Photo 3.3-24	Information painted on tank	3.3-17
Photo 3.3-25	Chip in shell corner	3.3-18
Photo 3.3-26	Corrosion on exposed rebar in shell	3.3-18
Photo 3.3-27	Corrosion on exposed rebar in shell	3.3-19
Photo 3.3-28	Roof overhang	3.3-19
Photo 3.3-29	Exterior ladder	3.3-20
Photo 3.3-30	Roof access	3.3-20
Photo 3.3-31	Roof manhole	3.3-21
Photo 3.3-32	Roof manhole	3.3-21
Photo 3.3-33	Roof manhole	3.3-22
Photo 3.3-34	Deteriorated roof manhole neck	3.3-22
Photo 3.3-35	Roof manhole interior	3.3-23
Photo 3.3-36	Pump equipment on roof	3.3-23
Photo 3.3-37	Piping is located on the roof	3.3-24
Photo 3.3-38	Pump equipment on roof	3.3-24
Photo 3.3-39	Corrosion on roof safety railing	3.3-25

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.3-40	Broken toe bar section	3.3-25
Photo 3.3-41	Cracks in roof.	3.3-26
Photo 3.3-42	Hairline cracks in roof.	3.3-26
Photo 3.3-43	Roof vent	3.3-27
Photo 3.3-44	Cracks in roof vent concrete vent neck	3.3-27
Photo 3.3-45	Rust staining and open bolt holes on flange around roof vent screening	3.3-28
Photo 3.3-46	Open bolt holes at flange around roof vent screening	3.3-28
Photo 3.3-47	Roof interior	3.3-29
Photo 3.3-48	Roof interior	3.3-29
Photo 3.3-49	Tank interior	3.3-30
Photo 3.3-50	Tank interior	3.3-30
Photo 3.3-51	Tank interior	3.3-31
Photo 3.3-52	Roof and shell	3.3-31
Photo 3.3-53	Corrosion on inlet pipe	3.3-32
Photo 3.3-54	Roof and shell	3.3-32
Photo 3.3-55	Corrosion on exposed steel in roof	3.3-33
Photo 3.3-56	Interior ladder and corrosion on interior piping	3.3-34
Photo 3.3-57	Corrosion on interior piping and brackets	3.3-34
Photo 3.3-58	Corrosion and rust tubercles on interior ladder and brackets	3.3-34
Photo 3.3-59	Corrosion and rust tubercles on interior ladder and bracket bolts	3.3-35
Photo 3.3-60	Corrosion and rust tubercles on interior ladder	3.3-35
Photo 3.3-61	Corrosion and rust tubercles on interior ladder	3.3-36
Photo 3.3-62	Corrosion and rust tubercles on interior piping	3.3-36
Photo 3.3-63	Corrosion and rust tubercles on interior piping	3.3-37
Photo 3.3-64	Corrosion and rust tubercles on interior piping	3.3-37
Photo 3.3-65	Corrosion and rust tubercles on interior piping	3.3-38
Photo 3.3-66	Corrosion and rust tubercles on interior piping	3.3-38
Photo 3.3-67	Corrosion and rust tubercles on interior piping	3.3-39

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.3-68	Efflorescence near top of shell	3.3-39
Photo 3.3-69	Efflorescence on shell	3.3-40
Photo 3.3-70	Shell interior	3.3-40
Photo 3.3-71	Graffiti on interior shell	3.3-41
Photo 3.3-72	Graffiti on interior shell	3.3-41
Photo 3.3-73	Discoloration on shell	3.3-42
Photo 3.3-74	Discoloration on shell	3.3-42
Photo 3.3-75	Shell and floor	3.3-43
Photo 3.3-76	Silt on floor	3.3-43
Photo 3.3-77	Silt on floor	3.3-44
Photo 3.3-78	Pipe openings in sump	3.3-44
Photo 3.3-79	Cracking in concrete block under piping	3.3-45
Photo 3.4-1	Tank 492	3.4-6
Photo 3.4-2	Tank 492	3.4-6
Photo 3.4-3	Tank 492	3.4-7
Photo 3.4-4	Tank 492	3.4-7
Photo 3.4-5	Stairs, pump equipment on roof, and valve vault exterior	3.4-8
Photo 3.4-6	Valve vault access	3.4-8
Photo 3.4-7	Corrosion on exposed rebar around valve vault access	3.4-9
Photo 3.4-8	Valve vault ladder	3.4-9
Photo 3.4-9	Corrosion and metal loss on valve vault ladder	3.4-10
Photo 3.4-10	Valve vault interior	3.4-10
Photo 3.4-11	Valve vault interior	3.4-11
Photo 3.4-12	Valves and piping adjacent to tank	3.4-11
Photo 3.4-13	Valves and piping adjacent to tank	3.4-12
Photo 3.4-14	Exterior piping	3.4-12
Photo 3.4-15	Overflow pipe projection	3.4-13
Photo 3.4-16	Gaps in screening and corrosion on visible surfaces of overflow	3.4-13

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.4-17	Corrosion on overflow	3.4-14
Photo 3.4-18	Gaps in screening and corrosion on visible surfaces of overflow	3.4-14
Photo 3.4-19	Exterior piping	3.4-15
Photo 3.4-20	Tank number	3.4-15
Photo 3.4-21	Corrosion on exposed steel near top of shell	3.4-16
Photo 3.4-22	Corrosion on exposed steel near top of shell	3.4-16
Photo 3.4-23	Roof overhang	3.4-17
Photo 3.4-24	Platform and roof safety railing	3.4-17
Photo 3.4-25	Roof manhole	3.4-18
Photo 3.4-26	Roof manhole interior	3.4-18
Photo 3.4-27	Roof manhole interior	3.4-19
Photo 3.4-28	Piping and pump equipment on roof.	3.4-19
Photo 3.4-29	Roof vents, pumps, and piping on roof	3.4-20
Photo 3.4-30	Piping on roof	3.4-20
Photo 3.4-31	Piping on roof	3.4-21
Photo 3.4-32	Piping U-bolted to bracket on roof	3.4-21
Photo 3.4-33	Equipment on roof	3.4-22
Photo 3.4-34	Safety railing around roof	3.4-22
Photo 3.4-35	Roof exterior	3.4-23
Photo 3.4-36	Roof exterior	3.4-23
Photo 3.4-37	Concrete projection on roof	3.4-24
Photo 3.4-38	Roof vent	3.4-24
Photo 3.4-39	Corrosion and rust staining around roof vent screening	3.4-25
Photo 3.4-40	Roof vent	3.4-25
Photo 3.4-41	Corrosion and rust staining around roof vent screening.	3.4-26
Photo 3.4-42	Roof interior	3.4-26
Photo 3.4-43	Roof interior	3.4-27
Photo 3.4-44	Roof and shell	3.4-27
Photo 3.4-45	Shell interior	3.4-28
Photo 3.4-46	Shell interior	3.4-28

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.4-47	Shell interior	3.4-29
Photo 3.4-48	Pipe projection from shell	3.4-29
Photo 3.4-49	Pipe projection from shell	3.4-30
Photo 3.4-50	Corrosion on interior piping	3.4-30
Photo 3.4-51	Corrosion on interior ladder	3.4-31
Photo 3.4-52	Corrosion on interior ladder bracket and bolts	3.4-31
Photo 3.4-53	Corrosion and rust tubercles on interior piping	3.4-32
Photo 3.4-54	Corrosion and rust tubercles on capped interior pipe	3.4-32
Photo 3.4-55	Corrosion and rust tubercles on interior piping	3.4-33
Photo 3.4-56	Pipe opening in sump	3.4-33
Photo 3.4-57	Column	3.4-34
Photo 3.4-58	Shell and floor	3.4-34
Photo 3.4-59	Shell and floor	3.4-35
Photo 3.4-60	Silt on floor	3.4-35
Photo 3.5-1	Tank 612 and site	3.5-6
Photo 3.5-2	Tank 612	3.5-6
Photo 3.5-3	Tank 612	3.5-7
Photo 3.5-4	Tank 612 and unused electrical equipment stored adjacent to tank	3.5-7
Photo 3.5-5	Access to site	3.5-8
Photo 3.5-6	Peeled coating near base of shell	3.5-8
Photo 3.5-7	Peeled coating on shell	3.5-9
Photo 3.5-8	Mildew and dirt on shell	3.5-9
Photo 3.5-9	Mildew and dirt on shell	3.5-10
Photo 3.5-10	Tank number	3.5-10
Photo 3.5-11	Elbowed pipe fitting	3.5-11
Photo 3.5-12	Elbowed pipe fitting	3.5-11
Photo 3.5-13	Elbowed pipe fitting	3.5-12
Photo 3.5-14	Stairs	3.5-12

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.5-15	Corrosion on stairs	3.5-13
Photo 3.5-16	Chain at roof access	3.5-13
Photo 3.5-17	Roof manholes	3.5-14
Photo 3.5-18	Roof manhole	3.5-14
Photo 3.5-19	Equipment adjacent to roof manhole	3.5-15
Photo 3.5-20	Missing toe bar section along roof safety railing	3.5-15
Photo 3.5-21	Broken toe bar section	3.5-16
Photo 3.5-22	Roof exterior	3.5-16
Photo 3.5-23	Roof exterior	3.5-17
Photo 3.5-24	Roof interior	3.5-17
Photo 3.5-25	Roof interior	3.5-18
Photo 3.5-26	Roof and columns	3.5-18
Photo 3.5-27	Piping in tank	3.5-19
Photo 3.5-28	Piping in tank	3.5-19
Photo 3.5-29	Piping in tank	3.5-20
Photo 3.5-30	Piping in tank	3.5-20
Photo 3.5-31	Pipe opening	3.5-21
Photo 3.5-32	Corrosion at previous bracket bolt remains in shell	3.5-21
Photo 3.5-33	Shell and interior ladder.	3.5-22
Photo 3.5-34	Interior ladder	3.5-22
Photo 3.5-35	Interior ladder	3.5-23
Photo 3.5-36	Corrosion and rust tubercles on interior ladder and bracket	3.5-23
Photo 3.5-37	Corrosion and rust tubercles on interior ladder	3.5-24
Photo 3.5-38	Interior piping	3.5-24
Photo 3.5-39	Interior piping	3.5-25
Photo 3.5-40	Interior piping	3.5-25
Photo 3.5-41	Corrosion at exposed steel on shell	3.5-26
Photo 3.5-42	Shell interior	3.5-26
Photo 3.5-43	Shell interior	3.5-27
Photo 3.5-44	Corrosion at exposed steel in shell	3.5-27
Photo 3.5-45	Shell interior	3.5-28

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.5-46	Shell and floor	3.5-28
Photo 3.5-47	Shell and floor	3.5-29
Photo 3.5-48	Silt in sump	3.5-29
Photo 3.5-49	Piping in sump	3.5-30
Photo 3.5-50	Column	3.5-30
Photo 3.5-51	Outlet chamber	3.5-31
Photo 3.5-52	Corrosion and rust tubercles on piping and bracket in outlet chamber	3.5-31
Photo 3.5-53	Corrosion on ladder in outlet chamber	3.5-32
Photo 3.5-54	Corrosion and rust tubercles on piping in outlet chamber	3.5-32
Photo 3.5-55	Corrosion and rust tubercles on piping in outlet chamber	3.5-33
Photo 3.5-56	Piping in outlet chamber	3.5-33
Photo 3.5-57	Corrosion and rust tubercles on loose piping in outlet chamber	3.5-34
Photo 3.6-1	Tank 307 and site	3.6-10
Photo 3.6-2	Tank 307	3.6-10
Photo 3.6-3	Valve vault exterior	3.6-11
Photo 3.6-4	Valve vault piping	3.6-11
Photo 3.6-5	Overflow pipe discharge within a funnel	3.6-12
Photo 3.6-6	Conduits extending up column	3.6-12
Photo 3.6-7	Column foundation	3.6-13
Photo 3.6-8	Riser foundation	3.6-13
Photo 3.6-9	Riser piping	3.6-14
Photo 3.6-10	Riser piping and manhole neck	3.6-14
Photo 3.6-11	Tower ladder safety cage	3.6-15
Photo 3.6-12	Tower and scaffold equipment	3.6-15
Photo 3.6-13	Tower and scaffold equipment	3.6-16
Photo 3.6-14	Tower ladder, safety cage, and vandal deterrent	3.6-16
Photo 3.6-15	Column, strut, diagonal bracing, and antenna cable	3.6-17

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.6-16	Column, strut, diagonal bracing, and antenna cable	3.6-17
Photo 3.6-17	Column, riser, and underside of bowl during work operations.	3.6-18
Photo 3.6-18	Radial girders with repairs	3.6-18
Photo 3.6-19	Rough welding on radial girders	3.6-19
Photo 3.6-20	Underside of bowl and top of riser	3.6-19
Photo 3.6-21	Underside of bowl and top of riser	3.6-20
Photo 3.6-22	Underside of bowl and top of riser	3.6-20
Photo 3.6-23	Column and underside of bowl	3.6-21
Photo 3.6-24	Bowl	3.6-21
Photo 3.6-25	Underside of balcony	3.6-22
Photo 3.6-26	Exterior container	3.6-22
Photo 3.6-27	Container during work operations	3.6-23
Photo 3.6-28	Tower ladder	3.6-23
Photo 3.6-29	Tower ladder and safety cage	3.6-24
Photo 3.6-30	Balcony access	3.6-24
Photo 3.6-31	Broken target gage cable on balcony	3.6-25
Photo 3.6-32	Corrosion on balcony support structure members	3.6-25
Photo 3.6-33	Balcony	3.6-26
Photo 3.6-34	Shell ladder and safety cage	3.6-26
Photo 3.6-35	Overflow pipe and brackets	3.6-27
Photo 3.6-36	Overflow pipe along shell	3.6-27
Photo 3.6-37	Abandoned target gage bracket on shell	3.6-28
Photo 3.6-38	Conduits on shell	3.6-28
Photo 3.6-39	Shell exterior	3.6-29
Photo 3.6-40	Shell exterior	3.6-29
Photo 3.6-41	Spot coating failure on shell	3.6-30
Photo 3.6-42	Roof exterior	3.6-30
Photo 3.6-43	Covered opening in roof	3.6-31
Photo 3.6-44	Abandoned target gage equipment, brackets, and overflow pipe on roof	3.6-31

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.6-45	Unused antenna bracket on roof	3.6-32
Photo 3.6-46	Rust staining around sensor equipment on roof	3.6-32
Photo 3.6-47	Unused bracket on roof	3.6-33
Photo 3.6-48	Equipment on roof	3.6-33
Photo 3.6-49	Roof vent and equipment	3.6-34
Photo 3.6-50	Rust staining on roof vent screening	3.6-34
Photo 3.6-51	Equipment on roof platform	3.6-35
Photo 3.6-52	Corrosion around roof manhole opening	3.6-35
Photo 3.6-53	Equipment on roof platform	3.6-36
Photo 3.6-54	Antenna and equipment on roof	3.6-36
Photo 3.6-55	Equipment on roof	3.6-37
Photo 3.6-56	Obstruction lights on roof	3.6-37
Photo 3.6-57	Corrosion on roof interior and support structure	3.6-38
Photo 3.6-58	Corrosion on roof interior and support structure	3.6-38
Photo 3.6-59	Corrosion and metal loss on roof interior and support structure	3.6-39
Photo 3.6-60	Corrosion on roof interior and support structure	3.6-39
Photo 3.6-61	Corrosion on roof interior and support structure	3.6-40
Photo 3.6-62	Corrosion on roof interior and support structure	3.6-40
Photo 3.6-63	Corrosion on roof interior and support structure	3.6-41
Photo 3.6-64	Corrosion on roof interior and support structure	3.6-41
Photo 3.6-65	Corrosion and metal loss on roof interior and support structure	3.6-42
Photo 3.6-66	Corrosion and metal loss on roof interior and support structure	3.6-42
Photo 3.6-67	Corrosion and metal loss on roof, stiffener, and bolts	3.6-43
Photo 3.6-68	Corrosion and metal loss on roof, stiffener, and bolts	3.6-43
Photo 3.6-69	Corrosion on shell	3.6-44
Photo 3.6-70	Corrosion on shell	3.6-44
Photo 3.6-71	Corrosion on bowl	3.6-45
Photo 3.6-72	Cathodic protection equipment	3.6-45

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.6-73	Corrosion on bowl	3.6-46
Photo 3.6-74	Corrosion on bowl	3.6-46
Photo 3.6-75	Bowl interior	3.6-47
Photo 3.6-76	Corrosion on column and bowl	3.6-47
Photo 3.6-77	Corrosion on column	3.6-48
Photo 3.6-78	Corrosion on riser projection around inlet/outlet pipe opening	3.6-48
Photo 3.7-1	Site above Tank 214	3.7-5
Photo 3.7-2	Playground above Tank 214	3.7-5
Photo 3.7-3	Piping from adjacent building to tank	3.7-6
Photo 3.7-4	Piping from adjacent building to tank	3.7-6
Photo 3.7-5	Gooseneck vent	3.7-7
Photo 3.7-6	Gooseneck vents	3.7-7
Photo 3.7-7	Corrosion around gooseneck vent screening	3.7-8
Photo 3.7-8	Corrosion around gooseneck vent screening	3.7-8
Photo 3.7-9	Roof manholes	3.7-9
Photo 3.7-10	Roof manholes	3.7-9
Photo 3.7-11	Roof manholes within shrubbery	3.7-10
Photo 3.7-12	Cracks in roof manhole neck.	3.7-10
Photo 3.7-13	Hairline cracks in roof manhole exterior	3.7-11
Photo 3.7-14	Cracks in roof manhole exterior	3.7-11
Photo 3.7-15	Lock on roof manhole covers	3.7-12
Photo 3.7-16	Corrosion on interior of roof manhole cover	3.7-12
Photo 3.7-17	Roof manhole interior	3.7-13
Photo 3.7-18	Roof manhole interior	3.7-13
Photo 3.7-19	Interior ladders	3.7-14
Photo 3.7-20	Interior ladder and bracket	3.7-14
Photo 3.7-21	Equipment projecting from shell	3.7-15
Photo 3.7-22	Corrosion on interior piping	3.7-15

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.7-23	Corrosion on interior piping	3.7-16
Photo 3.7-24	Roof and shell	3.7-16
Photo 3.7-25	Shell interior	3.7-17
Photo 3.7-26	Shell and interior ladder	3.7-17
Photo 3.7-27	Corrosion and rust tubercles on interior ladder	3.7-18
Photo 3.7-28	Shell and interior ladder	3.7-18
Photo 3.7-29	Interior ladder	3.7-19
Photo 3.7-30	Shell interior	3.7-19
Photo 3.7-31	Shell interior	3.7-20
Photo 3.7-32	Shell interior	3.7-20
Photo 3.7-33	Piping near base of shell	3.7-21
Photo 3.7-34	Piping near base of shell	3.7-21
Photo 3.7-35	Piping near base of shell	3.7-22
Photo 3.7-36	Shell and floor	3.7-22
Photo 3.7-37	Shell and floor	3.7-23
Photo 3.7-39	Debris on floor	3.7-23
Photo 3.7-39	Debris on floor	3.7-24
Photo 3.7-40	Debris on floor	3.7-24
Photo 3.7-41	Debris on floor	3.7-25
Photo 3.7-42	Debris on floor	3.7-25
Photo 3.7-43	Debris on floor	3.7-26
Photo 3.8-1	Tank 2105 and site	3.8-6
Photo 3.8-2	Tank 2105	3.8-6
Photo 3.8-3	Tank 2105	3.8-7
Photo 3.8-4	Valve vault access	3.8-7
Photo 3.8-5	Valve vault interior	3.8-8
Photo 3.8-6	Efflorescence in valve vault wall	3.8-8
Photo 3.8-7	Corrosion on exterior piping	3.8-9
Photo 3.8-8	Piping and equipment on shell	3.8-9
Photo 3.8-9	Overflow pipe	3.8-10
Photo 3.8-10	Overflow pipe discharge	3.8-10

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.8-11	Corrosion and perforated plate screen at overflow pipe flange	3.8-11
Photo 3.8-12	Corrosion on overflow pipe	3.8-11
Photo 3.8-13	Repaired areas in shell	3.8-12
Photo 3.8-14	Repaired area in shell	3.8-12
Photo 3.8-15	Shell and underside of roof overhang	3.8-13
Photo 3.8-16	Conduit and box broken from upper shell	3.8-13
Photo 3.8-17	Spalling in roof	3.8-14
Photo 3.8-18	Exterior ladder, conduits, and cabinets	3.8-14
Photo 3.8-19	Corrosion on exterior ladder bracket bolt	3.8-15
Photo 3.8-20	Roof access and roof safety railing	3.8-15
Photo 3.8-21	Roof manholes	3.8-16
Photo 3.8-22	Roof manhole interior	3.8-16
Photo 3.8-23	Sensor equipment in roof manhole interior	3.8-17
Photo 3.8-24	Standing water on roof	3.8-17
Photo 3.8-25	Roof exterior	3.8-18
Photo 3.8-26	Moss on roof	3.8-18
Photo 3.8-27	Corrosion on unscreened roof vent	3.8-19
Photo 3.8-28	Corrosion on unscreened roof vent	3.8-19
Photo 3.8-29	Rust staining and corrosion on exposed steel in roof	3.8-20
Photo 3.8-30	Roof and shell	3.8-20
Photo 3.8-31	Roof and shell	3.8-21
Photo 3.8-32	Corrosion on interior piping	3.8-21
Photo 3.8-33	Corrosion on exposed steel in shell	3.8-22
Photo 3.8-34	Cut-out between chambers	3.8-22
Photo 3.8-35	Interior ladder and bracket	3.8-23
Photo 3.8-36	Concrete spalls and corrosion and rust staining on exposed steel in shell	3.8-23
Photo 3.8-37	Corrosion and rust staining on exposed steel in shell	3.8-24
Photo 3.8-38	Corrosion and rust staining on exposed steel in shell	3.8-24
Photo 3.8-39	Concrete spalls and corrosion and rust staining on exposed steel in shell	3.8-25

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.8-40	Concrete spalls and corrosion and rust staining on exposed steel in shell	3.8-25
Photo 3.8-41	Interior ladder	3.8-26
Photo 3.8-42	Corrosion and rust tubercles on interior ladder bracket bolts	3.8-26
Photo 3.8-43	Interior ladder	3.8-27
Photo 3.8-44	Corrosion and rust tubercles on pipe projection from shell	3.8-27
Photo 3.8-45	Corrosion and rust tubercles on pipe projection from shell	3.8-28
Photo 3.8-46	Shell and floor	3.8-28
Photo 3.8-47	Corrosion and metal loss on pipe projection, and debris and silt on floor	3.8-29
Photo 3.8-48	Corrosion and rust tubercles on pipe projection	3.8-29
Photo 3.8-49	Corrosion and metal loss on pipe projection, and debris and silt on floor	3.8-30
Photo 3.8-50	Corrosion and metal loss on pipe projection	3.8-30
Photo 3.8-51	Pipe projection above sump and silt on floor	3.8-31
Photo 3.8-52	Corrosion and metal loss on pipe projection in sump	3.8-31
Photo 3.8-53	Corrosion and metal loss on pipe projection in sump	3.8-32
Photo 3.8-54	Corrosion and metal loss on pipe projection in sump	3.8-32
Photo 3.9-1	Tank 2106 and site	3.9-6
Photo 3.9-2	Tank 2106 and site	3.9-6
Photo 3.9-3	Tank 2106	3.9-7
Photo 3.9-4	Tank 2106	3.9-7
Photo 3.9-5	Tank 2106	3.9-8
Photo 3.9-6	Valve vault	3.9-8
Photo 3.9-7	Apparent leak located near base of shell	3.9-9
Photo 3.9-8	Apparent leak in shell	3.9-9
Photo 3.9-9	Corrosion on exterior piping	3.9-10
Photo 3.9-10	Corrosion on exterior piping, and loose sealant around pipe penetration	3.9-10
Photo 3.9-11	Overflow pipe	3.9-11

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.9-12	Overflow pipe discharge	3.9-11
Photo 3.9-13	Corrosion and perforated plate screen at overflow pipe flange	3.9-12
Photo 3.9-14	Exterior piping and equipment	3.9-12
Photo 3.9-15	Deteriorated sealant around pipe projection	3.9-13
Photo 3.9-16	Shell exterior	3.9-13
Photo 3.9-17	Shell exterior	3.9-14
Photo 3.9-18	Corrosion and rust staining at exposed steel in shell	3.9-14
Photo 3.9-19	Shell and underside of roof overhang	3.9-15
Photo 3.9-20	Deterioration in shell	3.9-15
Photo 3.9-21	Deterioration in shell	3.9-16
Photo 3.9-22	Exterior ladder, conduits, and cabinets	3.9-16
Photo 3.9-23	Roof access and roof safety railing	3.9-17
Photo 3.9-24	Roof safety railing	3.9-17
Photo 3.9-25	Roof manholes	3.9-18
Photo 3.9-26	Roof manhole interior	3.9-18
Photo 3.9-27	Roof manhole interior	3.9-19
Photo 3.9-28	Standing water on roof	3.9-19
Photo 3.9-29	Standing water on roof	3.9-20
Photo 3.9-30	Moss on roof	3.9-20
Photo 3.9-31	Corrosion on unscreened roof vent	3.9-21
Photo 3.9-32	Corrosion on unscreened roof vent	3.9-21
Photo 3.9-33	Corrosion around pipe opening in shell	3.9-22
Photo 3.9-34	Roof interior	3.9-22
Photo 3.9-35	Roof and shell	3.9-23
Photo 3.9-36	Roof and shell	3.9-23
Photo 3.9-37	Roof and shell	3.9-24
Photo 3.9-38	Cut-out between chambers	3.9-24
Photo 3.9-39	Corrosion at exposed steel in shell	3.9-25
Photo 3.9-40	Interior ladder and bracket	3.9-25
Photo 3.9-41	Corrosion at exposed steel in shell	3.9-26

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.9-42	Corrosion and rust tubercles on interior ladder bracket bolts.	3.9-26
Photo 3.9-43	Interior ladder	3.9-27
Photo 3.9-44	Corrosion and rust staining on exposed steel in shell	3.9-27
Photo 3.9-45	Corrosion and rust staining on exposed steel in shell	3.9-28
Photo 3.9-46	Corrosion on exposed steel in shell	3.9-28
Photo 3.9-47	Concrete spalls and corrosion on exposed steel in shell	3.9-29
Photo 3.9-48	Corrosion on exposed steel in shell	3.9-29
Photo 3.9-49	Corrosion on exposed steel in shell	3.9-30
Photo 3.9-50	Corrosion and rust tubercles on pipe projection from shell	3.9-30
Photo 3.9-51	Corrosion and rust tubercles on pipe projection from shell	3.9-31
Photo 3.9-52	Shell and floor	3.9-31
Photo 3.9-53	Silt on floor	3.9-32
Photo 3.9-54	Pipe projection above sump and silt on floor	3.9-32
Photo 3.9-55	Corrosion and metal loss on pipe projection in sump	3.9-33
Photo 3.9-56	Pipe projection above sump and silt on floor	3.9-33
Photo 3.9-57	Corrosion and metal loss on pipe projection in sump	3.9-34
Photo 3.9-58	Corrosion and rust tubercles on pipe projection	3.9-34
Photo 3.9-59	Corrosion and rust tubercles on pipe projection	3.9-35
Photo 3.10-1	Tank 425 and site	3.10-6
Photo 3.10-2	Tank 425	3.10-6
Photo 3.10-3	Tank 425 and site	3.10-7
Photo 3.10-4	Tank 425 and site	3.10-7
Photo 3.10-5	Valve vault	3.10-8
Photo 3.10-6	Valve vault	3.10-8
Photo 3.10-7	Valve vault piping	3.10-9
Photo 3.10-8	Valve vault	3.10-9
Photo 3.10-9	Exposed wiring in valve vault	3.10-10
Photo 3.10-10	Overflow pipe	3.10-10
Photo 3.10-11	Overflow pipe	3.10-11

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.10-12	Inlet pipe	3.10-11
Photo 3.10-13	Inlet pipe and bracket	3.10-12
Photo 3.10-14	Conduit extending to tank	3.10-12
Photo 3.10-15	Corrosion on exterior piping	3.10-13
Photo 3.10-16	Corrosion on exterior piping	3.10-13
Photo 3.10-17	Exterior piping and conduit	3.10-14
Photo 3.10-18	Corrosion on exterior piping	3.10-14
Photo 3.10-19	Corrosion on exterior piping	3.10-15
Photo 3.10-20	Exterior ladder and vandal deterrent	3.10-15
Photo 3.10-21	Exterior ladder and vandal deterrent	3.10-16
Photo 3.10-22	Corrosion on exterior ladder and bracket	3.10-16
Photo 3.10-23	Corrosion on exterior ladder bracket at roof	3.10-17
Photo 3.10-24	Roof access	3.10-17
Photo 3.10-25	Roof manholes and piping	3.10-18
Photo 3.10-26	Roof manholes and piping	3.10-18
Photo 3.10-27	Roof piping	3.10-19
Photo 3.10-28	Roof manholes and piping	3.10-19
Photo 3.10-29	Roof manhole	3.10-20
Photo 3.10-30	Cracked gasket in roof manhole	3.10-20
Photo 3.10-31	Roof manhole	3.10-21
Photo 3.10-32	Deterioration in roof manhole neck	3.10-21
Photo 3.10-33	Target gage equipment	3.10-22
Photo 3.10-34	Target gage equipment	3.10-22
Photo 3.10-35	Roof exterior	3.10-23
Photo 3.10-36	Roof exterior	3.10-23
Photo 3.10-37	Roof exterior	3.10-24
Photo 3.10-38	Roof exterior	3.10-24
Photo 3.10-39	Equipment mounted above roof	3.10-25
Photo 3.10-40	Roof interior	3.10-25
Photo 3.10-41	Pipe opening near top of shell	3.10-26
Photo 3.10-42	Pipe opening near top of shell	3.10-26

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.10-43	Rust staining beneath shell pipe opening	3.10-27
Photo 3.10-44	Corrosion on at exposed steel on shell	3.10-27
Photo 3.10-45	Efflorescence on shell	3.10-28
Photo 3.10-46	Efflorescence on shell	3.10-28
Photo 3.10-47	Efflorescence at corner	3.10-29
Photo 3.10-48	Efflorescence at corner	3.10-29
Photo 3.10-49	Efflorescence on shell	3.10-30
Photo 3.10-50	Sealant material in corner	3.10-30
Photo 3.10-51	Target gage float	3.10-31
Photo 3.10-52	Corrosion and rust tubercles on interior ladder	3.10-31
Photo 3.10-53	Corrosion and rust tubercles on interior ladder	3.10-32
Photo 3.10-54	Corrosion and rust tubercles on interior ladder	3.10-32
Photo 3.10-55	Corrosion and rust tubercles on interior ladder	3.10-33
Photo 3.10-56	Corrosion and rust tubercles on interior ladder	3.10-33
Photo 3.10-57	Corrosion and rust tubercles on interior piping	3.10-34
Photo 3.10-58	Corrosion and rust tubercles on interior piping	3.10-34
Photo 3.10-59	Corrosion and rust tubercles on interior piping	3.10-35
Photo 3.10-60	Pipe opening in shell and silt on floor	3.10-34
Photo 3.10-61	Pipe opening in shell	3.10-36
Photo 3.10-62	Debris and silt on floor	3.10-36
Photo 3.10-63	Debris and silt on floor	3.10-37
Photo 3.10-64	Debris and silt on floor	3.10-37
Photo 3.10-65	Debris and silt on floor	3.10-38
Photo 3.11-1	Tank 707 and site	3.11-8
Photo 3.11-2	Tank 707	3.11-8
Photo 3.11-3	Drain basin exterior	3.11-9
Photo 3.11-4	Drain basin interior	3.11-9
Photo 3.11-5	Concrete apron	3.11-10
Photo 3.11-6	Base of pedestal	3.11-10

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.11-7	Pedestal door and electrical equipment	3.11-11
Photo 3.11-8	Pedestal equipment, warning sign, and tank number	3.11-11
Photo 3.11-9	Warning sign	3.11-12
Photo 3.11-10	Skylight in pedestal	3.11-12
Photo 3.11-11	Pedestal manhole and obstruction light	3.11-13
Photo 3.11-12	Obstruction light	3.11-13
Photo 3.11-13	Bowl cone	3.11-14
Photo 3.11-14	Bowl cone	3.11-14
Photo 3.11-15	Obstruction light on roof	3.11-15
Photo 3.11-16	Roof exterior	3.11-15
Photo 3.11-17	Cracks in roof, and grounding cables on roof	3.11-16
Photo 3.11-18	Unused lug, cracks in roof, and grounding cable on roof	3.11-16
Photo 3.11-19	Cracks in coating and roof, and conduit on roof	3.11-17
Photo 3.11-20	Grounding cable, conduit, and cracks in coating and roof	3.11-17
Photo 3.11-21	Peeled coating and conduit on roof	3.11-18
Photo 3.11-22	Crack in roof	3.11-18
Photo 3.11-23	Grounding cable and cracks in roof	3.11-19
Photo 3.11-24	Faded coating on roof	3.11-19
Photo 3.11-25	Shielded vent and electrical equipment on access tube projection	3.11-20
Photo 3.11-26	Shielded vent on access tube projection	3.11-20
Photo 3.11-27	Lug on access tube projection	3.11-21
Photo 3.11-28	Obstruction lights and safety railing on access tube projection	3.11-21
Photo 3.11-29	Safety railing and roof manhole cover on access tube projection	3.11-22
Photo 3.11-30	Gap between toe bar and top of access tube projection	3.11-22
Photo 3.11-31	Safety railing on access tube projection	3.11-23
Photo 3.11-32	Safety railing and roof manhole on access tube projection	3.11-23
Photo 3.11-33	Roof manhole	3.11-24
Photo 3.11-34	Broken cover on roof manhole	3.11-24
Photo 3.11-35	Obstruction lights	3.11-25

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.11-36	Dry pedestal floor and piping	3.11-25
Photo 3.11-37	Stairs in dry pedestal	3.11-26
Photo 3.11-38	Stairs in dry pedestal	3.11-26
Photo 3.11-39	Stairs and safety railing	3.11-27
Photo 3.11-40	Stair and safety railing upright	3.11-27
Photo 3.11-41	Dry pedestal interior	3.11-28
Photo 3.11-42	Dry pedestal interior	3.11-28
Photo 3.11-43	Interior dry piping and brackets	3.11-29
Photo 3.11-44	Interior dry piping and brackets	3.11-29
Photo 3.11-45	Interior dry piping bracket attachment to pedestal	3.11-30
Photo 3.11-46	Platform between stair sections	3.11-30
Photo 3.11-47	Concrete pedestal interior	3.11-31
Photo 3.11-48	Platform, safety railing, and skylight	3.11-31
Photo 3.11-49	Skylight in pedestal	3.11-32
Photo 3.11-50	Platform, safety railing, pedestal manhole, and electrical equipment	3.11-32
Photo 3.11-51	Electrical equipment in pedestal	3.11-33
Photo 3.11-52	Underside of platform	3.11-33
Photo 3.11-53	Platform and safety railing	3.11-34
Photo 3.11-54	Platform and safety railing	3.11-34
Photo 3.11-55	Interior dry piping	3.11-35
Photo 3.11-56	Interior dry piping bracket and bowl cone	3.11-35
Photo 3.11-57	Expansion joint in interior dry piping	3.11-36
Photo 3.11-58	Expansion joint in interior dry piping	3.11-36
Photo 3.11-59	Interior dry piping	3.11-37
Photo 3.11-60	Interior dry piping	3.11-37
Photo 3.11-61	Expansion joint in interior dry piping	3.11-38
Photo 3.11-62	Expansion joint in interior dry piping	3.11-38
Photo 3.11-63	Access tube, ladder, safety cage, piping, and platform	3.11-39
Photo 3.11-64	Access tube, ladder, safety cage, piping, and platform	3.11-39
Photo 3.11-65	Access tube, ladder, safety cage, piping, and platform	3.11-40

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.11-66	Access tube, ladder, safety cage, and platform	3.11-40
Photo 3.11-67	Access tube, ladder, piping, and platform	3.11-41
Photo 3.11-68	Access tube, ladder, and safety cage	3.11-41
Photo 3.11-69	Access tube, ladder, platform, and conduits	3.11-42
Photo 3.11-70	Electrical equipment in access tube	3.11-42
Photo 3.11-71	Electrical equipment and vent opening to container	3.11-43
Photo 3.11-72	Gasket material around access door to wet container	3.11-43
Photo 3.11-73	Access door to wet container	3.11-44
Photo 3.11-74	Access door and platform to wet container	3.11-44
Photo 3.11-75	Vent opening near top of access tube	3.11-45
Photo 3.11-76	Access tube, manhole, and ladder	3.11-45
Photo 3.11-77	Access tube, manhole, and ladder	3.11-46
Photo 3.11-78	Vent from access tube interior in container	3.11-46
Photo 3.11-79	Interior container roof	3.11-47
Photo 3.11-80	Sensor equipment on interior container roof	3.11-47
Photo 3.11-81	Rust staining on interior container roof	3.11-48
Photo 3.11-82	Interior container roof and stiffeners	3.11-48
Photo 3.11-83	Interior container roof and stiffeners	3.11-49
Photo 3.11-84	Interior container roof, stiffeners, and upper bowl cone	3.11-49
Photo 3.11-85	Interior container roof, stiffeners, and upper bowl cone	3.11-50
Photo 3.11-86	Overflow inlet funnel	3.11-50
Photo 3.11-87	Platform in interior container	3.11-51
Photo 3.11-88	Apparent sensor equipment extending into container	3.11-51
Photo 3.11-89	Access opening through container platform	3.11-52
Photo 3.11-90	Access opening through container platform	3.11-52
Photo 3.11-91	Access tube, interior container ladder, and platform	3.11-53
Photo 3.11-92	Access tube, interior container ladder, and platform	3.11-53
Photo 3.11-93	Access tube, interior container ladder, and platform	3.11-54
Photo 3.11-94	Access tube and platform	3.11-54
Photo 3.11-95	Gap between platform and toe bar	3.11-55
Photo 3.11-96	Access tube and platform	3.11-55

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.11-97	Underside of platform	3.11-56
Photo 3.11-98	Interior container ladder and safety cage	3.11-56
Photo 3.11-99	Access tube and interior container ladder	3.11-57
Photo 3.11- 100	Access tube and interior container ladder	3.11-57
Photo 3.11-101	Corrosion on pipe projection	3.11-58
Photo 3.11-102	Corrosion on pipe projection	3.11-58
Photo 3.11-103	Pipe opening	3.11-59
Photo 3.11-104	Bowl dome and cone	3.11-59
Photo 3.11-105	Bowl dome and cone	3.11-60
Photo 3.11-106	Bowl cone	3.11-60
Photo 3.11-107	Rust staining on bowl cone	3.11-61
Photo 3.12-1	Tank 1011 and site	3.12-6
Photo 3.12-2	Tank 1011 and site	3.12-6
Photo 3.12-3	Piping extending to tank	3.12-7
Photo 3.12-4	Overflow pipe, exterior piping, and drain basin	3.12-7
Photo 3.12-5	Drain basin interior	3.12-8
Photo 3.12-6	Tank foundation and bottom plate	3.12-8
Photo 3.12-7	Corrosion along edge and weld spatter on top surface of bottom plate	3.12-9
Photo 3.12-8	Gap between foundation and bottom plate	3.12-9
Photo 3.12-9	Anchor bolt and gussets	3.12-10
Photo 3.12-10	Anchor bolt, gussets, and grounding cable	3.12-10
Photo 3.12-11	Corrosion on valve for exterior piping	3.12-11
Photo 3.12-12	Piping extending to tank	3.12-11
Photo 3.12-13	Pipe U-bolted to bracket	3.12-12
Photo 3.12-14	Piping extending from building to tank	3.12-12
Photo 3.12-15	Control cabinet, exterior piping, and overflow pipe	3.12-13
Photo 3.12-16	Air break in overflow pipe	3.12-13
Photo 3.12-17	Overflow pipe	3.12-14

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.12-18	Control cabinet and exterior piping	3.12-14
Photo 3.12-19	Valve and equipment in exterior piping	3.12-15
Photo 3.12-20	Shell manhole	3.12-15
Photo 3.12-21	Shell exterior	3.12-16
Photo 3.12-22	Exterior ladder and safety cage	3.12-16
Photo 3.12-23	Exterior ladder and safety cage	3.12-17
Photo 3.12-24	Exterior ladder and bracket	3.12-17
Photo 3.12-25	Exterior piping	3.12-18
Photo 3.12-26	Equipment penetrating roof manhole cover	3.12-18
Photo 3.12-27	Roof manhole	3.12-19
Photo 3.12-28	Corrosion on roof safety railing	3.12-19
Photo 3.12-29	Debris on roof	3.12-20
Photo 3.12-30	Roof exterior	3.12-20
Photo 3.12-31	Weld spatter on roof	3.12-21
Photo 3.12-32	Roof safety railing and roof manhole/vent	3.12-21
Photo 3.12-33	Roof safety railing and roof manhole/vent	3.12-22
Photo 3.12-34	Bent toe bar	3.12-22
Photo 3.12-35	Debris on screening prior to removal	3.12-23
Photo 3.12-36	Roof manhole/vent interior	3.12-23
Photo 3.12-37	Roof vent opening	3.12-24
Photo 3.12-38	Rust staining along roof stiffener	3.12-24
Photo 3.12-39	Rust staining along roof stiffener	3.12-25
Photo 3.12-40	Roof rafters	3.12-25
Photo 3.12-41	Rust staining along roof stiffeners	3.12-26
Photo 3.12-42	Rust staining along roof stiffeners	3.12-26
Photo 3.12-43	Overflow inlet funnel	3.12-27
Photo 3.12-44	Pipe opening in roof	3.12-27
Photo 3.12-45	Rust staining on upper shell	3.12-28
Photo 3.12-46	Interior ladder	3.12-28
Photo 3.12-47	Interior ladder	3.12-29
Photo 3.12-48	Shell stiffener	3.12-29

LIST OF PHOTOGRAPHS (CONT'D)

Photo No.	Description	Page No.
Photo 3.12-49	Shell stiffener	3.12-30
Photo 3.12-50	Shell manhole interior	3.12-30
Photo 3.12-51	Interior piping	3.12-31
Photo 3.12-52	Interior piping	3.12-31
Photo 3.12-53	Pipe opening and silt on floor	3.12-32
Photo 3.12-54	Pipe opening and silt on floor	3.12-32
Photo 3.12-55	Unused gasket and silt on floor	3.12-33

LIST OF TABLES

Table No.	Title	Page No.
TABLE 2-1	Tanks Inspected	2-1
TABLE C.1-1	Tank 238 Evaluation of Concrete Ground Tanks	C.1-3
TABLE C.1-2	Tank 238 Summary Condition Evaluation Standards	C.1-13
TABLE C.2-1	Tank 823 Evaluation of Concrete Ground Tanks	C.2-4
TABLE C.2-2	Tank 823 Summary Condition Evaluation Standards	C.2-14
TABLE C.3-1	Tank 535 Evaluation of Concrete Ground Tanks	C.3-4
TABLE C.3-2	Tank 535 Summary Condition Evaluation Standards	C.3-14
TABLE C.4-1	Tank 492 Evaluation of Concrete Ground Tanks	C.4-4
TABLE C.4-2	Tank 492 Summary Condition Evaluation Standards	C.4-14
TABLE C.5-1	Tank 612 Evaluation of Concrete Ground Tanks	C.5-3
TABLE C.5-2	Tank 612 Summary Condition Evaluation Standards	C.5-13
TABLE C.6-1	Tank 307 Exterior Coating and Metal Condition	C.6-7
TABLE C.6-2	Tank 307 Interior Coating and Metal Condition	C.6-8
TABLE C.6-3	Tank 307 Evaluation of Elevated Water Tanks	C.6-9
TABLE C.6-4	Tank 307 Summary Condition Evaluation Standards	C.6-28
TABLE C.7-1	Tank 214 Evaluation of Concrete Ground Tanks	C.7-3
TABLE C.7-2	Tank 214 Summary Condition Evaluation Standards	C.7-13
TABLE C.8-1	Tank 2105 Evaluation of Concrete Ground Tanks	C.8-4
TABLE C.8-2	Tank 2105 Summary Condition Evaluation Standards	C.8-14

TABLE C.9-1 Tank 2106 Evaluation of Concrete Ground Tanks C.9-4

TABLE C.9-2 Tank 2106 Summary Condition Evaluation Standards C.9-14

TABLE C.10-1 Tank 425 Evaluation of Concrete Ground Tanks C.10-4

TABLE C.10-2 Tank 425 Summary Condition Evaluation Standards..... C.10-14

TABLE C.11-1 Tank 707 Evaluation of Concrete Tanks C.11-6

TABLE C.11-2 Tank 707 Summary Condition Evaluation Standards..... C.11-16

TABLE C.12-1 Tank 1011 Exterior Coating and Metal Condition C.12-4

TABLE C.12-2 Tank 1011 Interior Coating and Metal Condition..... C.12-5

TABLE C.12-3 Tank 1011 Evaluation of Steel Ground Water Tanks C.12-6

TABLE C.12-4 Tank 1011 Summary Condition Evaluation Standards..... C.12-17

TABLE D-1 Atomic Absorption Analysis Results from Tank 823 ..... D-2

TABLE D-2 Atomic Absorption Analysis Results from Tank 535 ..... D-2

TABLE D-3 Atomic Absorption Analysis Results from Tank 612 ..... D-2

TABLE D-4 Atomic Absorption Analysis Results from Tank 307 ..... D-3

TABLE D-5 Atomic Absorption Analysis Results from Tank 707 ..... D-3

1. INTRODUCTION

1.1 BACKGROUND/OBJECTIVES

This report was prepared as part of the Water Tank Inspection Program administered by the Ocean Construction Division of the Naval Facilities Expeditionary Warfare Center, NAVFAC EXWC.

This program provides inspection, assessment, repair recommendations, and estimates of repair costs for water tank facilities. All of these services, including this report, were provided by Tank Industry Consultants, under the responsible charge of Gregory R. “Chip” Stein, P.E., in accordance with Contract No. N62583-10-D-0340.

Twelve tanks were evaluated at the Naval Air Station in Sigonella, Italy. Tank 307 was undergoing work operations at the time of the field evaluation. The remaining tanks were in operation and the interiors were evaluated by a remotely operated vehicle (ROV). Nine were partially or completely buried concrete tanks (Tanks 238, 823, 535, 492, 612, 214, 2105, 2106, and 425), and one was a welded steel ground level tank (1011). One was an elevated legged tank constructed of welded steel (Tank 307), and another was an elevated concrete tank (Tank 707).

The evaluations were performed on November 9 through 16, 2012, under the charge of James A. Peyer, NACE-Certified Coating Inspector, Level 3 (#8543), of Tank Industry Consultants. Additional key personnel involved with the evaluation and report are listed in Appendix A.

1.2 INSPECTION BRIEFINGS

The following individuals were present at the field evaluations:

NAME	ASSOCIATION	PHONE
Martin Gaffey, P.E.	NAVFAC EXWC	(202) 433-5170
Lt. Charles	NAVFAC PWD	(335) 597-9668
Hal Thomas	PME Eng. & Design Head	(314) 624-6809
Jose Miramontes	UEM CPO	(314) 624-5438
James Peyer	Tank Industry Consultants	(317) 271-3100
Harold Knight	Tank Industry Consultants	(317) 271-3100
Noah Peyer	Tank Industry Consultants	(317) 271-3100

2. ACTIVITY DESCRIPTION

TABLE 2-1
TANKS INSPECTED

Tank No.	Capacity (Gallons)	Type	Approximate Dimensions	Water Purpose	NFA
238	900,000	Concrete	65 ft (19.8 m) wide x 115 ft (35.1 m) long, 19 ft (5.8 m) interior height	Nonpotable	NFA100001276601
823	680,000	Concrete	68 ft (20.7) wide x 101 ft 5 in. (31 m) long, 17 ft 7 in. (5.3 m) interior height	Nonpotable	NFA100001277897
535	317,000	Concrete	49 ft (14.9 m) wide x 69 ft (21 m) long	Potable	NFA100001277879
492	400,000	Concrete	63 ft 8 in. (19.4 m) wide x 70 ft 3 in. (21.4 m) long, 16 ft 6 in. (5 m) interior height	Potable	NFA100001275899
612	976,270	Concrete	65 ft 6 in. (20 m) wide x 86 ft 8 in. (26.4 m) long, 12 ft 3 in. (3.7 m) interior height	Nonpotable	NFA100001276736
307	210,000	Welded Steel	Container diameter 26 ft (8 m, 20 ft 5 in. (6.3 m) shell height	Potable	NFA100001275906
214	528,344	Concrete	4 chambers, each 19 ft 8 in. (6 m) wide x 80 ft (24.4 m) long, 11 ft (3.5 m) interior height	Potable	NFA200000172509
2105	47,500	Concrete	18 ft (5.5 m) wide x 35 ft 8 in. (10.8 m) long	Nonpotable	NFA100001277325
2106	47,500	Concrete	18 ft (5.5 m) wide x 35 ft 8 in. (10.8 m) long	Nonpotable	NFA100001277334
425	200,000	Concrete	58 ft 4 in. (17.8 m) wide x 9 ft 8 in. (18.2 m) long, 16 ft 5 in. (5 m) interior height	Nonpotable	NFA100001276585
707	288,000	Concrete		Potable	NFA100001276601
1011	200,000	Welded Steel	Container diameter 33 ft (10.1 m), 16 ft 8 in. (5.1 m) interior height	Nonpotable	NFA100000470820

LOCATION MAP

GRAPHIC SCALES	DATE	TIC TANK INDUSTRY CONSULTANTS	NAVAL FACILITIES ENGINEERING SERVICE CENTER EAST COAST DETACHMENT WASHINGTON, DC	
NOT TO SCALE	NOVEMBER 2012	CONTRACT NUMBER N62583-10-D-340	NAVAL AIR STATION SIGONELLA, ITALY **LOCATION MAP**	FIG. NO. 2-1

3. TANKS INSPECTED

The following sections contain discussion of observations from the field evaluations and recommendations for rehabilitation of the tanks. Each section is divided into the following sub-sections

1. Description of the Facilities
2. Observed Conditions
3. Comparison of Previous Inspection Results
4. Structural Condition Assessment
5. Recommendations

The inspection procedure is presented in Appendix B and structural data appears in Appendix C.

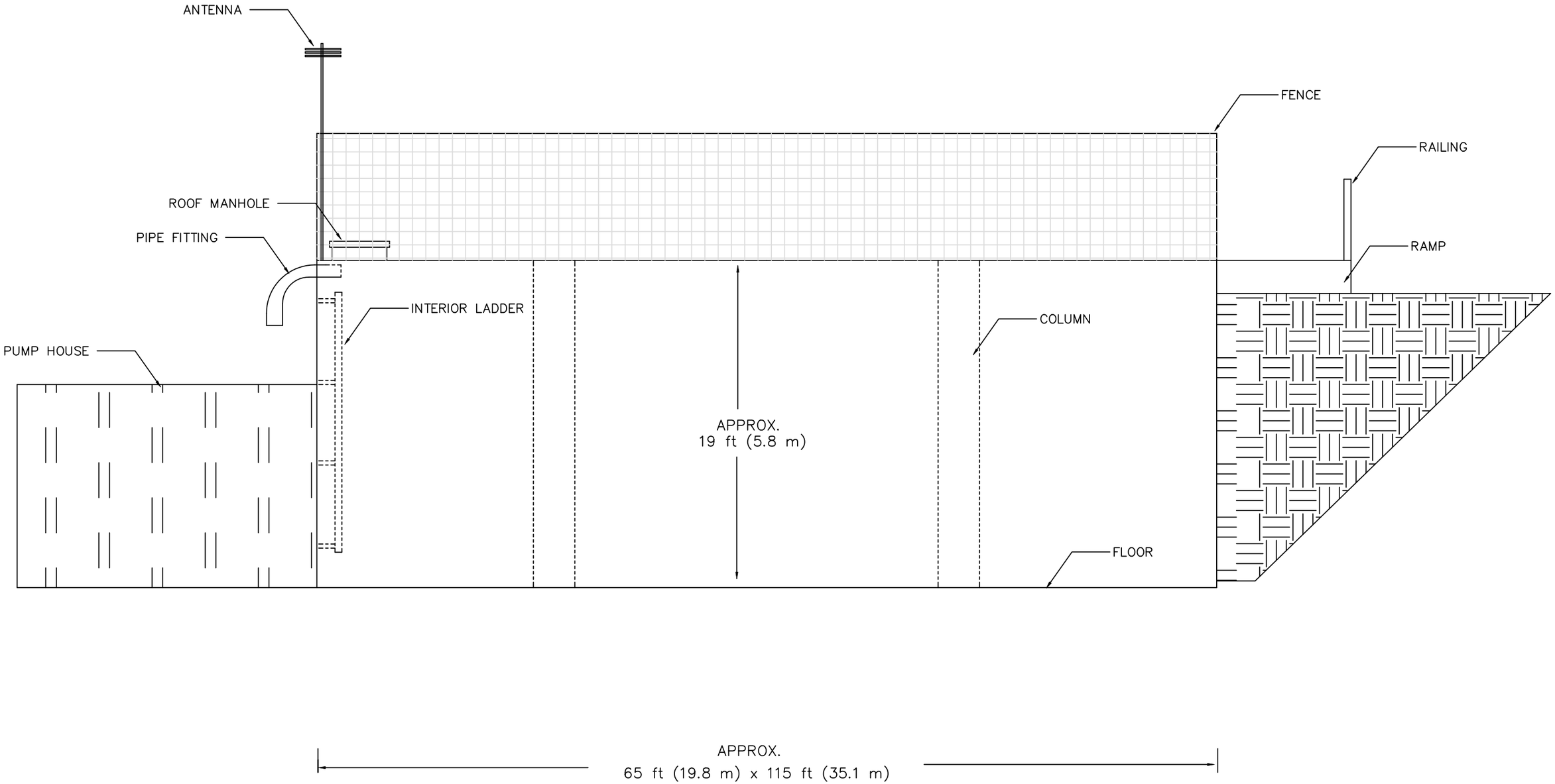
3.1 TANK 238

Tank 238 stores nonpotable water for the Naval Air Station I in Sigonella, Italy.

3.1.1 Description of the Facility

Tank 238 is three-chamber concrete tank which is partially located below grade and has a capacity of 900,000 gallons of nonpotable water. Measurements taken at the field evaluation indicated the tank projects from approximately 3 ft (0.9 m) to 18 ft (5.5 m) above grade. The tank is approximately 65 ft (19.8 m) x 115 ft (35.1 m) with an interior height of approximately 19 ft (5.8 m). (See Figure 3.1-1)

TANK 238, NOMENCLATURE



Distribution authorized to U.S. Government agencies and their contractors for administrative/operational purposes; November 2012. Other reqeustes shall be referred to NAVFAC–EXWC (or sponsor).
This drawing is intended only for illustration of report nomenclature and is not for design purposes.
Some features have been eliminated, simplified, relocated, etc., for the sake of clarification and, therefore, do Not reflect the actual configuration.

GRAPHIC SCALE	DATE	TIC Tank Industry Consultants	NAVAL FACILITIES ENGINEERING SERVICE CENTER EAST COAST DETACHMENT WASHINGTON, DC	
NOT TO SCALE	November 2012	Contract Number N62583–10–D–0340	NAVAL AIR STATION I SIGONELLA, ITALY NOMENCLATURE	FIG. NO. 3.1–1

3.1.2 Observed Conditions

Tank 238 is located at the Naval Air Station I in Sigonella, Italy (See photos 3.1-1 through 3.1-3). The site is enclosed by a chain link fence which is topped with barbed wire and has a locked gate on the southeast side of the site. There is a pump house attached to the south side of the tank, and two high voltage cabinets, and a light pole located south of the tank adjacent to the valve building (See photos 3.1-4 and 3.1-5).

The tank site is covered with grass, and a concrete apron is located around the base of the north, west, and east sides of the tank (See photo 3.1-6). A pile of branches as well as some leaves and grass clippings are located on the apron and adjacent to the tank walls, and vegetation grows up and touches the tank (See photos 3.1-2 and 3.1-6 through 3.1-9). A sealant material is located at the interface between the apron and the shell, and voids up to 3 in. (76 mm) are located in this area (See photos 3.1-7 through 3.1-9).

The exterior concrete shell projection was in good condition at the time of the field evaluation as only a few minor hairline cracks were observed (See photos 3.1-10 through 3.1-11). There is mildew in some areas. A conduit extends along the east side of the shell (See photo 3.1-10).

Six fittings that function as both overflows and venting project from near the top of the shell and elbow downward before discharging (See photos 3.1-12, 3.1-13, 3.1-15, and 3.1-16). Perforated plate screening is located on the discharges which is intact (See photos 3.1-14 and 3.1-17). There was no significant corrosion or coating failure observed on the fittings at the time of the field evaluation. Four of the fittings are oriented such that they discharge above the roof of the pump house, and the other two discharge above the concrete apron.

A ramp provides access from the north side of the concrete apron to the roof, and there is debris on it (See photos 3.1-18 and 3.1-19). A chain link fence extends around the perimeter of the roof which has a locked gate (See photo 3.1-21). An antenna is mounted to the fence on the south side of the roof (See photo 3.1-30). The roof's edge does not have safety railing at the roof manholes which is an OSHA deficiency.

The concrete roof is in fair condition as there are some hairline cracks, particularly on the east side of the roof (See photos 3.1-34 through 3.1-36 and 3.1-38 through 3.1-42). Leaves and debris have accumulated on the roof against the chain link fence and around the roof manholes, and vegetation has grown in some of the leaf-covered areas (See photos 3.1-27 and 3.1-31 through 3.1-33). Moss and mildew are located in the roof, and there is standing water (See photos 3.1-23 and 3.1-43). What appears to be sensor equipment penetrates near the center chamber roof manhole (See photos 3.1-28 and 3.1-29). Three capped pipes are flush with the roof (See photo 3.1-37).

The roof has three manholes such that one is located above each of the chambers (See photos 3.1-22 through 3.1-26). The roof manholes have hinged and locked covers.

The interior concrete surfaces are in generally adequate condition. The roof in the two larger chambers has six columns in each chamber (See photos 3.1-60 through 3.1-62). There are a few hairline cracks in the walls, and corrosion is located at the visible form tie ends (See photo 3.1-61). The silt on the floor restricts its evaluation (See photos 3.1-62 through 3.1-67). Vegetation extends into the tank through the roof (See photos 3.1-46 and 3.1-47).

A ladder is located in each chamber beneath the roof manhole, and the ladders are welded to brackets which are bolted to the shell (See photos 3.1-51 and 3.1-54). There is some corrosion on the bracket bolts (See photo 3.1-53). The interior ladders have been replaced since the previous evaluation although the remains of abandoned brackets are located on the shell, and there are corrosion and rust tubercles on the abandoned bracket remains (See photos 3.1-49, 3.1-52, and 3.1-53). OSHA and safety-related deficiencies on the ladders include: (1) the 15 in. (381 mm) ladder width does not meet the minimum required 16 in. (406 mm), and (2) the 6-3/4 in. (165 mm) ladder toe room does not precisely meet the minimum required 7 in. (178 mm).

Pipe openings are located near the top of the shell (See photos 3.1-44 and 3.1-45). There is corrosion and rust tubercles on all of the pipes observed in the tank (See photos 3.1-55 through 3.1-58). Pipe openings are located in the shell wall just above sumps in the floor (See photos 3.1-68 and 3.1-69). What appears to be sensor

equipment is located on the shell adjacent to the roof manhole (See photos 3.1-48 and 3.1-50).

PHOTO 3.1-1 Tank 238 and site.

PHOTO 3.1-2 Tank 238.

PHOTO 3.1-3 Tank 238.

PHOTO 3.1-4 Tank 238.

PHOTO 3.1-5 Tank 238.


PHOTO 3.1-6 Concrete apron around tank.

PHOTO 3.1-7 Debris and voids in sealant around apron-to-tank interface.

PHOTO 3.1-8 Voids in sealant around apron-to-tank interface.

PHOTO 3.1-9 Debris and voids in sealant around apron-to-tank interface.

PHOTO 3.1-10 Shell exterior.

PHOTO 3.1-11 Shell exterior.

PHOTO 3.1-12 Elbowed pipe fitting.

PHOTO 3.1-13 Elbowed pipe fitting.

PHOTO 3.1-14 Screening on elbowed pipe fitting.

PHOTO 3.1-15 Elbowed pipe fittings.

PHOTO 3.1-16 Elbowed pipe fittings.

PHOTO 3.1-17 Screening on elbowed pipe fitting.

PHOTO 3.1-18 Ramp to roof.

PHOTO 3.1-19 Debris on ramp to roof.

PHOTO 3.1-20 Fence and gate around roof perimeter.

PHOTO 3.1-21 Roof manholes.

PHOTO 3.1-22 Roof manholes.

PHOTO 3.1-23 Roof manholes and equipment. Note standing water.

PHOTO 3.1-24 Roof manhole interior.

PHOTO 3.1-25 Roof manhole interior.

PHOTO 3.1-26 Roof manhole interior.

PHOTO 3.1-27 Debris and vegetation on roof.

PHOTO 3.1-28 Debris on roof around equipment.

PHOTO 3.1-29 Debris on roof around equipment.

PHOTO 3.1-30 Antenna and fence.

PHOTO 3.1-31 Debris and vegetation on roof.

PHOTO 3.1-32 Debris and vegetation on roof.

PHOTO 3.1-33 Debris on roof.

PHOTO 3.1-34 Roof exterior.

PHOTO 3.1-35 Roof exterior.

PHOTO 3.1-36 Roof exterior.

PHOTO 3.1-37 Corrosion on capped openings in roof.

PHOTO 3.1-38 Cracks in roof.

PHOTO 3.1-39 Cracks in roof.

PHOTO 3.1-40 Cracks in roof.

PHOTO 3.1-41 Cracks in roof.

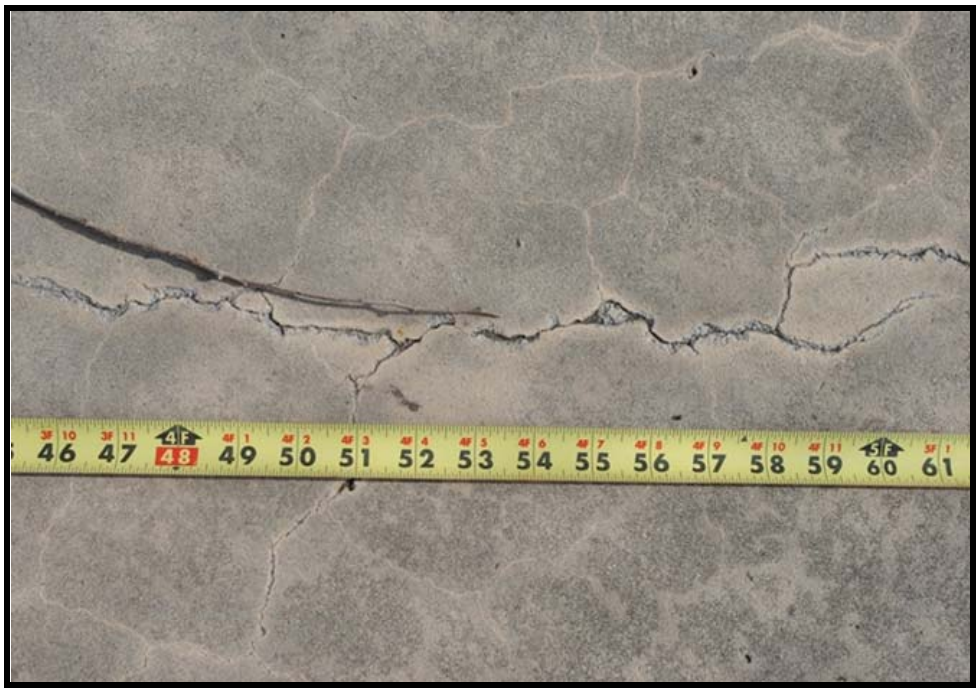


PHOTO 3.1-42 Cracks in roof.

PHOTO 3.1-43 Standing water, moss, and debris on roof.

PHOTO 3.1-44 Pipe projection.

PHOTO 3.1-45 Pipe projection.

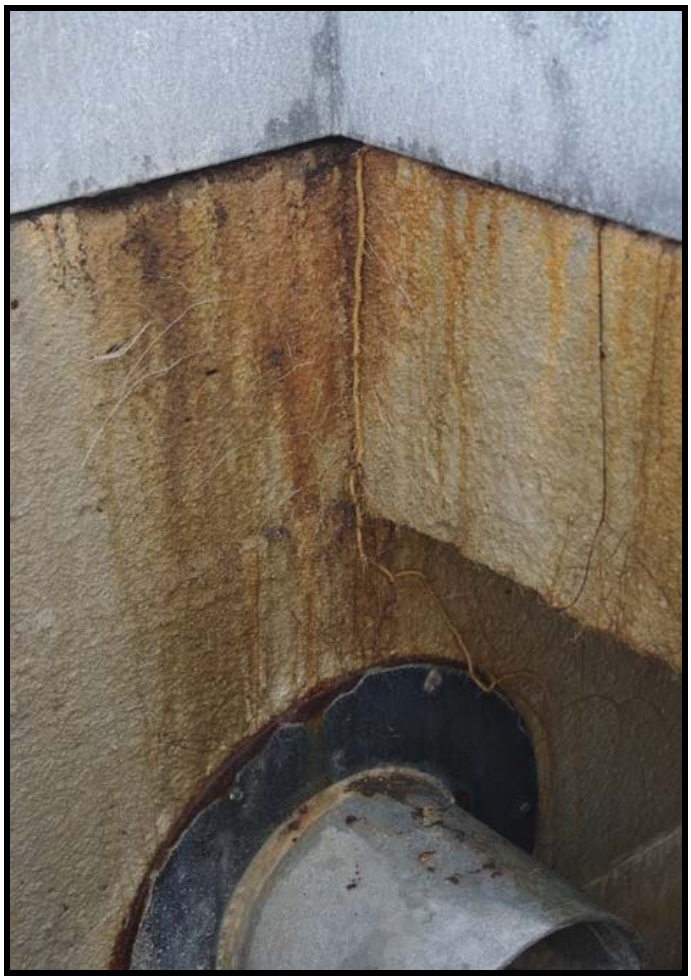


PHOTO 3.1-46 Vegetation extending along shell.

PHOTO 3.1-47 Vegetation extending into tank.

PHOTO 3.1-48 Equipment on shell.

PHOTO 3.1-49 Interior ladder and bracket. Note apparent location of previous ladder bracket.

PHOTO 3.1-50 Equipment on shell.

PHOTO 3.1-51 Shell interior and interior ladder.

PHOTO 3.1-52 Shell interior and corrosion on abandoned interior ladder bracket remains.

PHOTO 3.1-53 Corrosion and rust tubercles on interior ladder bracket bolts and abandoned bracket remains.

PHOTO 3.1-54 Interior ladder.

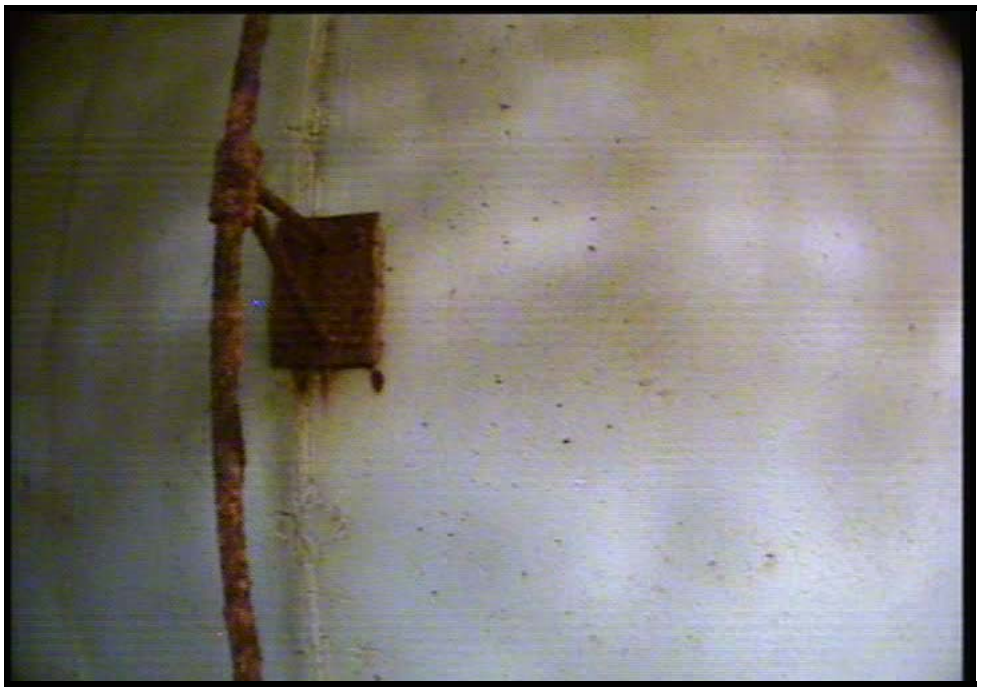


PHOTO 3.1-55 Corrosion on interior pipe and bracket.

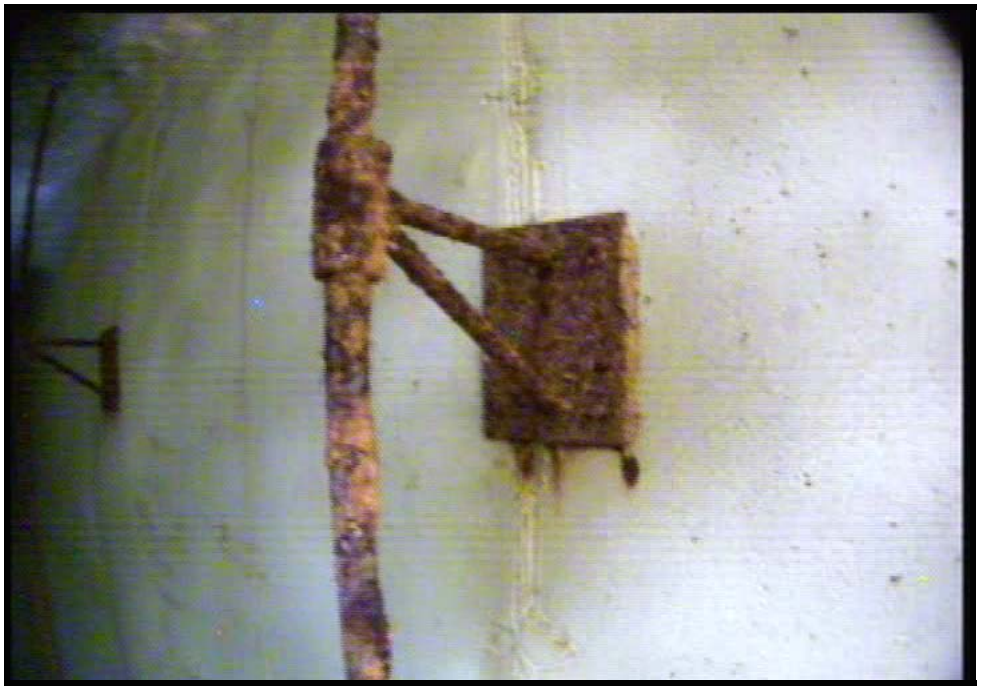


PHOTO 3.1-56 Corrosion on interior pipe and bracket.

PHOTO 3.1-57 Corrosion on interior pipe and bracket.

PHOTO 3.1-58 Corrosion on interior pipe and bracket.

PHOTO 3.1-59 Corrosion and rust staining at exposed steel on shell.

PHOTO 3.1-60 Column.

PHOTO 3.1-61 Column.

PHOTO 3.1-62 Column and floor.

PHOTO 3.1-63 Silt on floor.

PHOTO 3.1-64 Silt on floor.

PHOTO 3.1-65 Shell and floor.

PHOTO 3.1-66 Shell and floor.

PHOTO 3.1-67 Floor.

PHOTO 3.1-68 Pipe opening.

PHOTO 3.1-69 Corrosion around pipe opening above sump.

3.1.3 Comparison of Previous Inspection Results

The tank was previously evaluated by Tank Industry Consultants on March 5, 2008, and evaluation report CR-6480-OCN was issued. Since the time of the previous evaluation, voids up to 3 in. (76 mm) have developed between the base of the tank and the surrounding concrete apron, and the interior ladders have been replaced.

3.1.4 Structural Condition Assessment

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 Navy and the Engineer.

This tank is located in a seismically active region. This evaluation and reported condition do not verify the tank's original design compliance for seismic or coastal wind loading in accordance with current design requirements, as it was outside the scope of this report. Likewise, recommendations for this tank do not include modifications that 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.

3.1.5 Recommendations

Site:

Site Maintenance: The site should be maintained so that proper drainage away from the tank continues. The branches, debris, and leaves should be regularly removed from the apron and the roof, and the vegetation growing between the shell and concrete apron should be removed.

Site Access and Restoration: Contractor and heavy equipment access to the site would be difficult due to the small size of the immediate tank site. Provisions should be included in the specifications for the restoration of any paving, curbing, sidewalks, or other surfaces and structures disturbed by the contractor's work.

Sealant Maintenance: The existing sealant located at the shell-to-concrete apron interface should be removed and replaced with a flexible polyurethane sealant.

Exterior Surfaces:

Exterior Concrete: The exterior concrete surfaces were in generally good overall condition as no significant cracking and spalling were noted. The exterior surfaces should be re-evaluated in 4 to 5 years to determine if repairs are required at that time. When cracks develop, they should be prepared according to the specifications of the concrete crack repair material manufacturer. These areas to be repaired should be prepared by wet blast cleaning to remove dust, laitance, grease, or other bond inhibiting materials and blown off with high-pressure air. The cracks in the concrete should then be repaired by routing out the crack to a minimum depth of 1 in. (25 mm, with a minimum 90° angle from the surface) and repairing with a cement-based patching compound. The sequence and performance of these concrete repairs shall be such that the structural integrity of the tank area is not compromised.

Rehabilitation Schedule: To obtain the lowest possible prices for the work outlined in the recommendations, the Navy should have the specifications prepared and the work bid in the fall, with the work scheduled to start in the winter.

Shell Manholes: It is recommended that the Navy classify this tank as a confined space, and initiate the appropriate confined space access measures whenever anyone is going to access the tank interior.

Pipe Fittings: Installing an elastomeric check valve on the discharge end of the elbowed pipe projections would prevent the ingress of birds, small animals, and insects into the tank and deter clogging. However, a new means of ventilation would need to be installed.

Clog-Resistant Vents: The tank does not have clog-resistant vents. The 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, AWWA D110 does not require a clog-resistant vent, and a concrete roof is typically capable of withstanding more pressure or vacuum than a steel roof.

Roof Safety Railing: Safety railing which meets current OSHA requirements should be installed at the roof access and adjacent to the roof manholes. When the safety railing is installed, the existing fence could be removed.

Interior Surfaces:

Interior Concrete: The interior concrete surfaces appeared to be in adequate condition as no significant cracking and chipping were observed. The interior surfaces should be re-evaluated in 3 to 4 years to determine if repairs are required at that time.

Interior Piping: The interior piping should be cleaned to the equivalent of an SSPC-SP 10, Near-White Blast Cleaning and an epoxy coating system applied. This should be performed within the next year.

Interior Ladders: Interior ladders are susceptible to accelerated rates of corrosion. If the Navy decides to keep an interior ladder, the existing access ladders should be replaced with new ladders which meet current OSHA requirements. The existing ladders did not include slip-resistant rungs. Slip-resistant rungs are required for all ladders constructed after March 1991 by the OSHA Construction standards.

However, slip-resistant rungs are not required by the OSHA General Industry standards for ladders or by the AWWA standards.

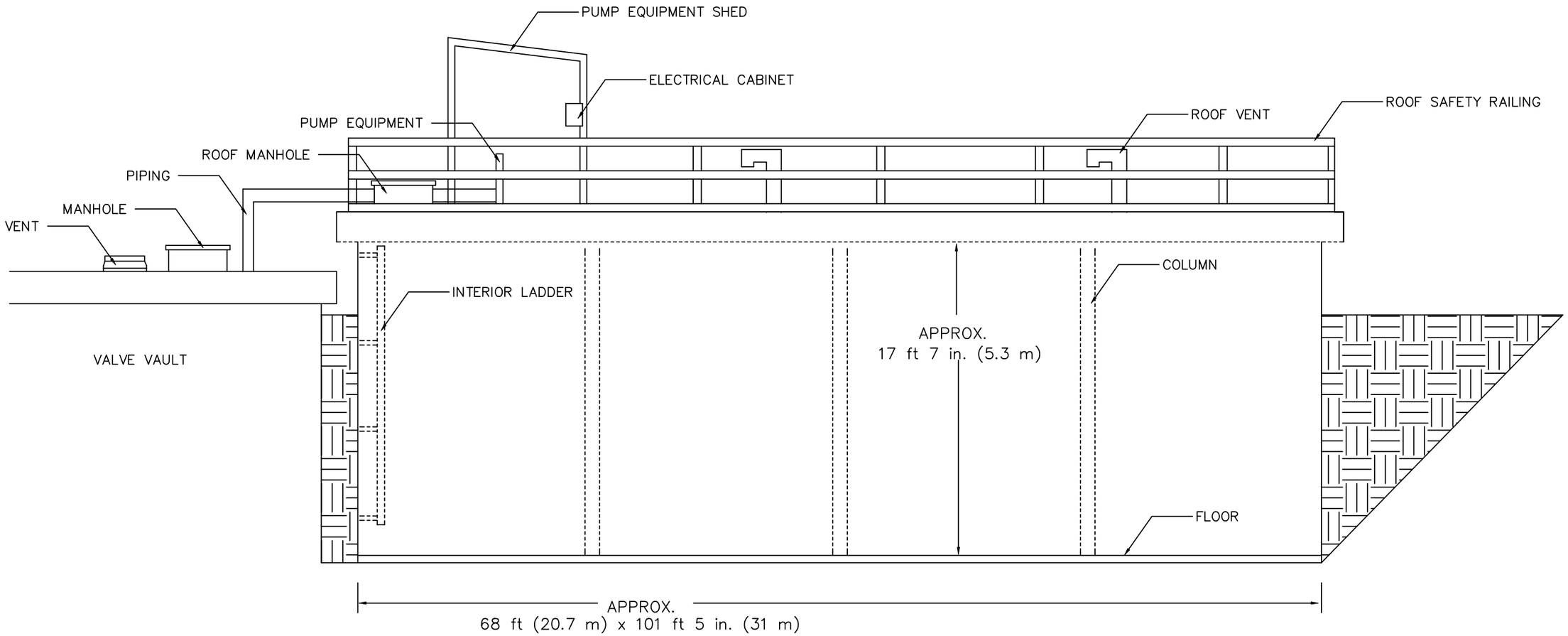
3.2 TANK 823

Tank 823 stores nonpotable water for the Naval Air Station II in Sigonella, Italy.

3.2.1 Description of the Facility

Tank 823 is a concrete tank located partially below grade with a capacity of 680,000 gallons of nonpotable water. Measurements taken at the field evaluation indicated the tank projected from approximately 3 ft (0.9 m) to 4 ft 9 in. (1.4 m) above grade. The exterior of the tank measured approximately 68 ft (20.7 m) x 100 ft 5 in. (30.6 m), and the interior height measured approximately 16 ft 8 in. (5.1 m) to 18 ft (5.5 m). (See Figure 3.2-1)

TANK 823, NOMENCLATURE



Distribution authorized to U.S. Government agencies and their contractors for administrative/operational purposes; November 2012. Other reqeustes shall be referred to NAVFAC–EXWC (or sponsor).
This drawing is intended only for illustration of report nomenclature and is not for design purposes.
Some features have been eliminated, simplified, relocated, etc., for the sake of clarification and, therefore, do Not reflect the actual configuration.

GRAPHIC SCALE	DATE	TIC Tank Industry Consultants	NAVAL FACILITIES ENGINEERING SERVICE CENTER EAST COAST DETACHMENT WASHINGTON, DC	
NOT TO SCALE	November 2012	Contract Number N62583–10–D–0340	NAVAL AIR STATION I SIGONELLA, ITALY NOMENCLATURE	FIG. NO. 3.2–1

3.2.2 Observed Conditions

Tank 823 is located at the Naval Air Station II in Sigonella, Italy. A chain link fence topped with barbed wire is located around part of the site and has a locked gate on the east side of the site (See photos 3.2-1 and 3.2-3). Building 833 is located to the south of the tank. The tank site is covered with grass, and some grass is touching the tank (See photo 3.2-5). Straw is located around the tank (See photo 3.2-4).

A valve vault is attached to the south side of the tank which is accessed by stairs (See photos 3.2-3 and 3.2-11). The entrance was not locked prior to or after the field evaluation. Four vault pipes penetrate the tank wall, and there is some corrosion on the piping (See photos 3.2-13 through 3.2-18). A heater, lights, and electric cabinets are located in the vault, and the vault contains a sump and pump (See photos 3.12 and 3.2-19). The 46-1/2 in. (1181 mm) minimum handrail height on the valve vault stairs exceeds the maximum allowed 34 in. (863 mm) which is a safety deficiency.

The exterior concrete shell surfaces are in generally good overall condition as there are only a few hairline cracks (See photos 3.2- 7 through 3.2-9). The part of the shell which was visible from the valve vault is also in good overall condition (See photo 3.2-14). An area which had been patched is located on the west side of the shell. Conduit is attached to the shell, and straw is stuck in and around the conduit (See photo 3.2-10).

The overflow pipes have been replaced since the previous evaluation. Two overflow pipes now project from near the top of the shell and elbow downward before discharging within drain basins (See photos 3.2-20 and 3.2-22). The overflow pipes have above-grade air breaks although there is straw and debris in the drain basin around one of the discharges (See photo 3.2-21). Perforated plate screens are located at the discharges which appear to be intact, and some of the flange bolt holes are open (See photos 3.2-20 and 3.2-23).

A two-rung ladder has been installed from the surrounding sidewalk to the roof of the tank (See photo 3.2-27). The ladder is welded to brackets which are welded to the roof, and the ladder has terminals at the roof.

The concrete roof is in good overall condition except for a few minor hairline cracks (See photo 3.2-40). The roof overhangs the shell, and a gutter extends along the east side of the roof (See photo 3.2-8). The gutter and some of the downspouts are clogged with vegetation and debris (See photos 3.2-24 through 3.2-26). Piping and pumping equipment is located on the roof (See photos 3.2-6, 3.2-30, and 3.2-31). What appeared to be sensor equipment is also located on the roof (See photos 3.2-32 and 3.2-33).

Safety railing has been installed around the perimeter of the roof which is constructed of pipe and flat bar members (See photo 3.2-27). OSHA and safety-related deficiencies noted include: (1) the access opening does not have closure chains to deter personnel from inadvertently falling from the roof (See photo 3.2-28), and (2) the gaps between the roof and toe bar exceed the maximum allowed 1/4 in. (6 mm, See photo 3.2-29).

The roof has two manholes which include hinged covers (See photos 3.2-34, 3.2-37, and 3.2-39). The roof manholes were not locked prior to or after the field evaluation. There are cracks, spalls, and exposed rebar in the concrete neck surfaces of the manholes (See photos 3.2-35, 3.2-36, and 3.2-38).

Two gooseneck-type vents are located in the roof (See photos 3.2-42 and 3.2-44). Since the previous evaluation, the vent screening has been replaced with a perforated plate screen which is intact (See photos 3.2-43 and 3.2-45). There are minor hairline cracks in the neck of the north vent. Some of the flange bolt holes are open, and there is rust staining on the flanges (See photos 3.2-41, 3.2-43, and 3.2-45).

The interior concrete surfaces are in generally good condition (See photos 3.2-46 through 3.2-48, 3.2-50 through 3.2-53, and 3.2-60 through 3.2-65). Most of the interior surfaces are uncoated, but a blue coating is located on the shell just below the roof. The coating has peeled in a few random areas. The evaluation of the floor is restricted slightly by the presence of some silt. What appeared to be a couple of pipes filled with concrete are located on the floor (See photos 3.2-66 and 3.2-67).

A ladder is located beneath each roof manhole, and the ladders are welded to brackets which are bolted to the shell. There is corrosion on some of the bracket bolts (See photo 3.2-55). The interior ladders have been replaced since the previous

evaluation. The ladders are not equipped with safe-climbing devices. OSHA and safety-related deficiencies include: (1) the 15 in. (381 mm) width does not meet the minimum required 16 in. (406 mm), (2) the 6-3/4 in. toe room (172 mm) does not precisely meet the required 7 in. (178 mm) minimum, and (3) the 25 in. (635 mm) head clearance does not meet the required 30 in. (762 mm) minimum.

The overflow pipes include concrete weir box inlets. The inlets are located such that the high water line is below the roof (See photo 3.2-49). Pipes projected from the wall above a sump in the floor and elbowed downward before ending. A pipe extends horizontally parallel to the floor before elbowing upward, running up the wall, and ending in a “T”-shape. The horizontal pipe rests on concrete support blocks. There is silt on the top surface of most of the piping, and corrosion and rust tubercles on the horizontal piping (See photos 3.2-53, 3.2-54, and 3.2-56 through 3.2-59).

PHOTO 3.2-1 Tank 823 and site.

PHOTO 3.2-2 Tank 823 and site.

PHOTO 3.2-3 Tank 823 and valve vault adjacent to tank.

PHOTO 3.2-4 Tank 823.

PHOTO 3.2-5 Tank 823.

PHOTO 3.2-6 Tank 823.

PHOTO 3.2-7 Tank 823.

PHOTO 3.2-8 Shell and roof overhang.

PHOTO 3.2-9 Shell exterior.

PHOTO 3.2-10 Equipment and debris on shell.

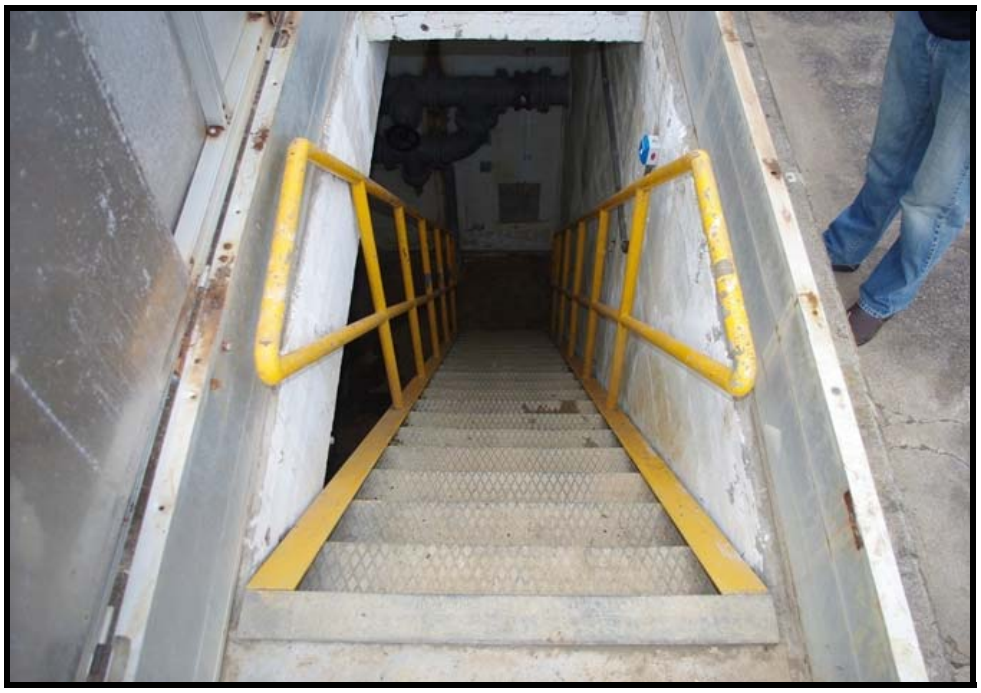


PHOTO 3.2-11 Stairs to vault.

PHOTO 3.2-12 Piping and equipment in vault.

PHOTO 3.2-13 Valve vault piping.

PHOTO 3.2-14 Valve vault piping.

PHOTO 3.2-15 Valve vault piping.

PHOTO 3.2-16 Corrosion on piping.

PHOTO 3.2-17 Corrosion around pipe penetration.

PHOTO 3.2-18 Corrosion around pipe penetration and gage on pipe.

PHOTO 3.2-19 Sump and pump in vault.

PHOTO 3.2-20 Overflow pipe and debris in drain basin. Note open flange bolt holes.

PHOTO 3.2-21 Overflow pipe and straw in drain basin.

PHOTO 3.2-22 Overflow pipe in drain basin.

PHOTO 3.2-23 Screened overflow pipe discharge. Note open bolt holes and debris.

PHOTO 3.2-24 Shell and downspout from gutter.

PHOTO 3.2-25 Vegetation and debris in gutter.

PHOTO 3.2-26 Gutter along roof.

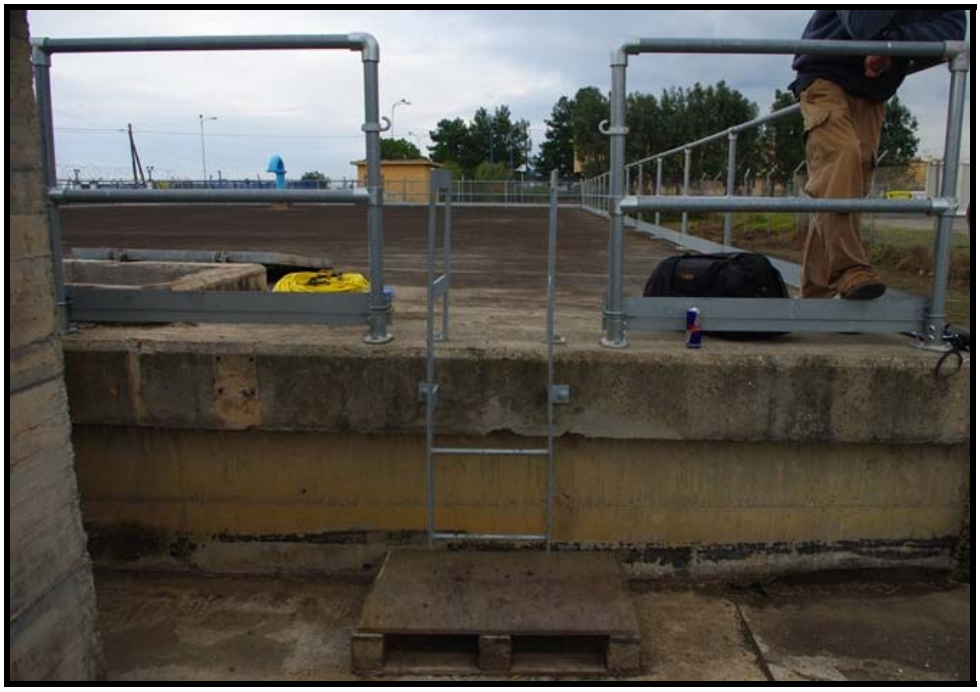


PHOTO 3.2-27 Exterior ladder and roof safety railing.

PHOTO 3.2-28 Roof access and roof safety railing.

PHOTO 3.2-29 Gap between toe bar and roof.

PHOTO 3.2-30 Pump equipment on roof.

PHOTO 3.2-31 Pump equipment on roof.

PHOTO 3.2-32 Sensor equipment on roof.

PHOTO 3.2-33 Sensor equipment on roof.


PHOTO 3.2-34 Roof manhole.

PHOTO 3.2-35 Corrosion on exposed steel in roof manhole neck.

PHOTO 3.2-36 Corrosion on exposed steel in roof manhole neck.

PHOTO 3.2-37 Roof manhole.

PHOTO 3.2-38 Corrosion on exposed steel at deteriorated concrete in roof manhole neck.

PHOTO 3.2-39 Roof manhole cover interior.

PHOTO 3.2-40 Roof exterior.

PHOTO 3.2-41 Roof vent neck. Note open bolt holes.

PHOTO 3.2-42 Roof vent.

PHOTO 3.2-43 Screened roof vent. Note open bolt holes.

PHOTO 3.2-44 Roof vent.

PHOTO 3.2-45 Screened roof vent. Note open bolt holes.

PHOTO 3.2-46 Tank interior.

PHOTO 3.2-47 Roof interior.

PHOTO 3.2-48 Roof and shell.

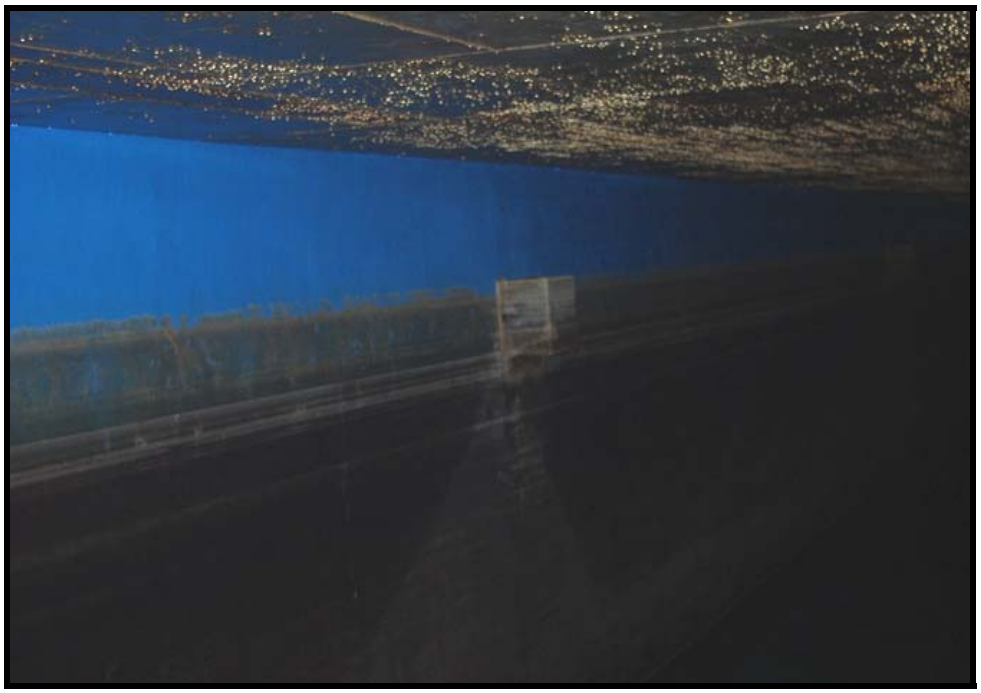


PHOTO 3.2-49 Overflow inlet weir box.

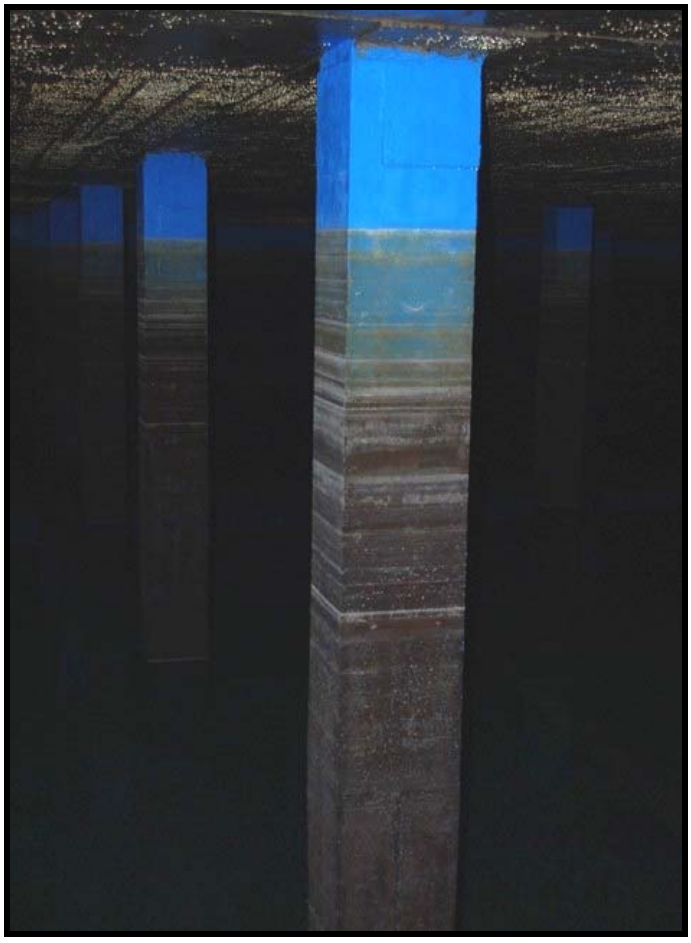


PHOTO 3.2-50 Columns.

PHOTO 3.2-51 Shell interior.

PHOTO 3.2-52 Tank interior.

PHOTO 3.2-53 Interior piping.

PHOTO 3.2-54 Interior piping.

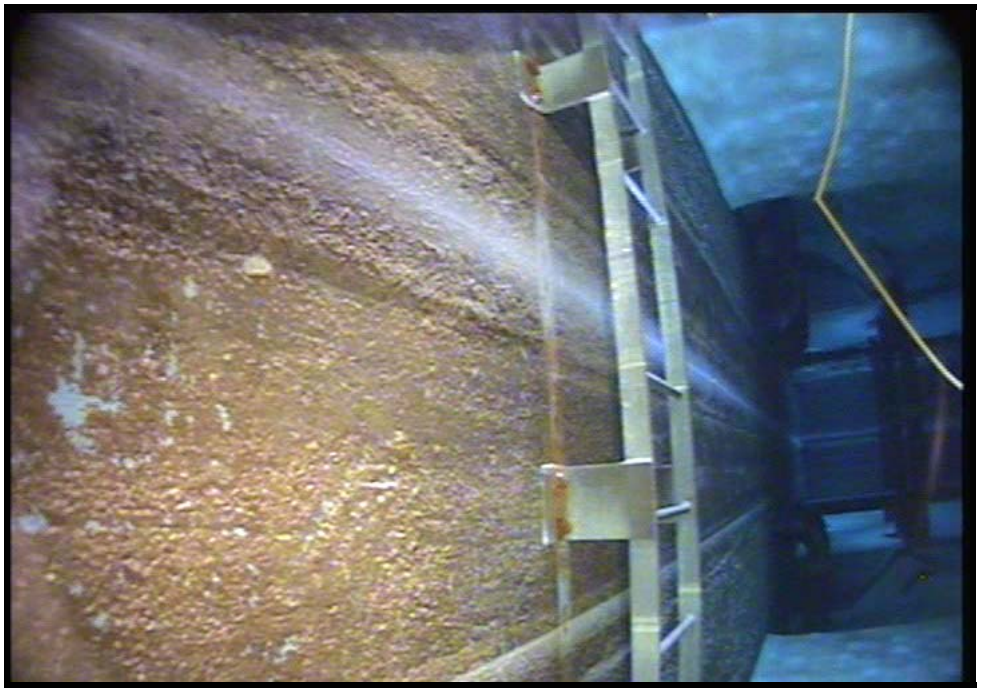


PHOTO 3.2-55 Interior ladder and brackets. Note corrosion on bolts.

PHOTO 3.2-56 Interior piping.

PHOTO 3.2-57 Interior piping.

PHOTO 3.2-58 Corrosion on interior piping and bracket.

PHOTO 3.2-59 Corrosion interior piping and interior piping splash block.

PHOTO 3.2-60 Column.

PHOTO 3.2-61 Shell interior.

PHOTO 3.2-62 Shell interior.

PHOTO 3.2-63 Shell interior.

PHOTO 3.2-64 Shell and floor.

PHOTO 3.2-65 Shell and floor.

PHOTO 3.2-66 Concrete and silt on floor.

PHOTO 3.2-67 Concrete and silt on floor.

3.2.3 Comparison of Previous Inspection Results

The tank was previously evaluated by Tank Industry Consultants on March 6 and 7, 2008, and an evaluation report CR-6480-OCN was issued. Since the time of the previous evaluation, it appeared that some repairs and modifications have been made to the tank which include:

- The overflow pipes and the gooseneck-type vents have been replaced.
- The interior ladders have been replaced.
- What appeared to be sensor equipment has been installed on the roof.
- Safety railing has been installed around the perimeter of the roof.

3.2.4 Structural Condition Assessment

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 Navy and the Engineer.

This tank is located in a seismically active region. This evaluation and reported condition do not verify the tank's original design compliance for seismic or coastal wind loading in accordance with current design requirements, as it was outside the scope of this report. Likewise, recommendations for this tank do not include modifications that 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.

3.2.5 Recommendations

Site:

Site Maintenance: The site should be maintained so that proper drainage away from the tank continues. The grass should be regularly trimmed so it does not touch the shell. The vegetation and debris should be removed from the downspouts, cutter, and overflow pipe basins.

Site Access and Restoration: Contractor and heavy equipment access to the site would be difficult due to the small size of the immediate tank site. Provisions should be included in the specifications for the restoration of any paving, curbing, sidewalks, or other surfaces and structures disturbed by the contractor's work. Appropriate precautions should be taken for work around the equipment adjacent to the tank.

Valve Vault: The piping and valves located in the valve vault should be cleaned and painted. The exterior concrete surfaces should be cleaned to the equivalent of a brush-off blast cleaning and painted with a concrete sealer. The valve vault access should be locked at all times in order to limit liability to the Navy and to protect water system security. If the strict compliance with OSHA standards is desired, the handrail on the safety railing should be lowered to be 34 in. (863.6 mm).

Exterior Surfaces:

Exterior Concrete: The concrete exterior was in generally good condition as no significant deterioration was noted. When cracks develop, they should be prepared according to the specifications of the concrete crack repair material manufacturer. These areas to be repaired should be prepared by wet blast cleaning to remove dust, laitance, grease, or other bond inhibiting materials and blown off with high-pressure air. The cracks in the concrete should then be repaired by routing out the crack to a minimum depth of 1 in. (25 mm, with a minimum 90° angle from the surface) and repairing with a cement-based patching compound. The sequence and performance of these concrete repairs shall be such that the structural integrity of the tank area is not compromised.

Rehabilitation Schedule: To obtain the lowest possible prices for the work outlined in the recommendations, the Navy should have the specifications prepared and the work bid in the fall, with the work scheduled to start in the winter.

Shell Manholes: It is recommended that the Navy classify this tank as a confined space, and initiate the appropriate confined space access measures whenever anyone is going to access the tank interior.

Overflow Pipes: The straw and debris should be removed from around the overflow pipe drain basins, and bolts should be installed in the open holes on the flanges. Installing elastomeric check valves on the discharge ends of the overflow pipes would prevent the ingress of birds, small animals, and insects into the tank and deter clogging.

Clog-Resistant Vents: The roof vents are not clog-resistant. The 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, AWWA D110 does not require a clog-resistant vent, and a concrete roof is typically capable of withstanding more pressure or vacuum than a steel roof. Bolts should be installed at the open holes.

Roof Safety Railing: The toe bar should be lowered so the gap between it and the roof is less than 1/4 in. wide, and closure chains should be installed at the access opening.

Interior Surfaces:

Interior Concrete: The coating on the concrete interior of the tank appeared to be in good condition as no deterioration was observed at the time of the field evaluation. The interior surfaces should be re-evaluated in 3 to 4 years to determine if deterioration is noted which requires repair.

Interior Piping: The piping should be cleaned to the equivalent of an SSPC-SP 10, Near-White Blast Cleaning and an epoxy coating system applied. This should be performed within the next 3 to 4 years.

Interior Ladders: Interior ladders are susceptible to accelerated rates of corrosion. If the Navy decides to keep an interior ladder, the existing access ladders should be replaced with new ladders which meet current OSHA requirements. The existing ladders did not include slip-resistant rungs. Slip-resistant rungs are required for all ladders constructed after March 1991 by the OSHA Construction standards. However, slip-resistant rungs are not required by the OSHA General Industry standards for ladders or by the AWWA standards.

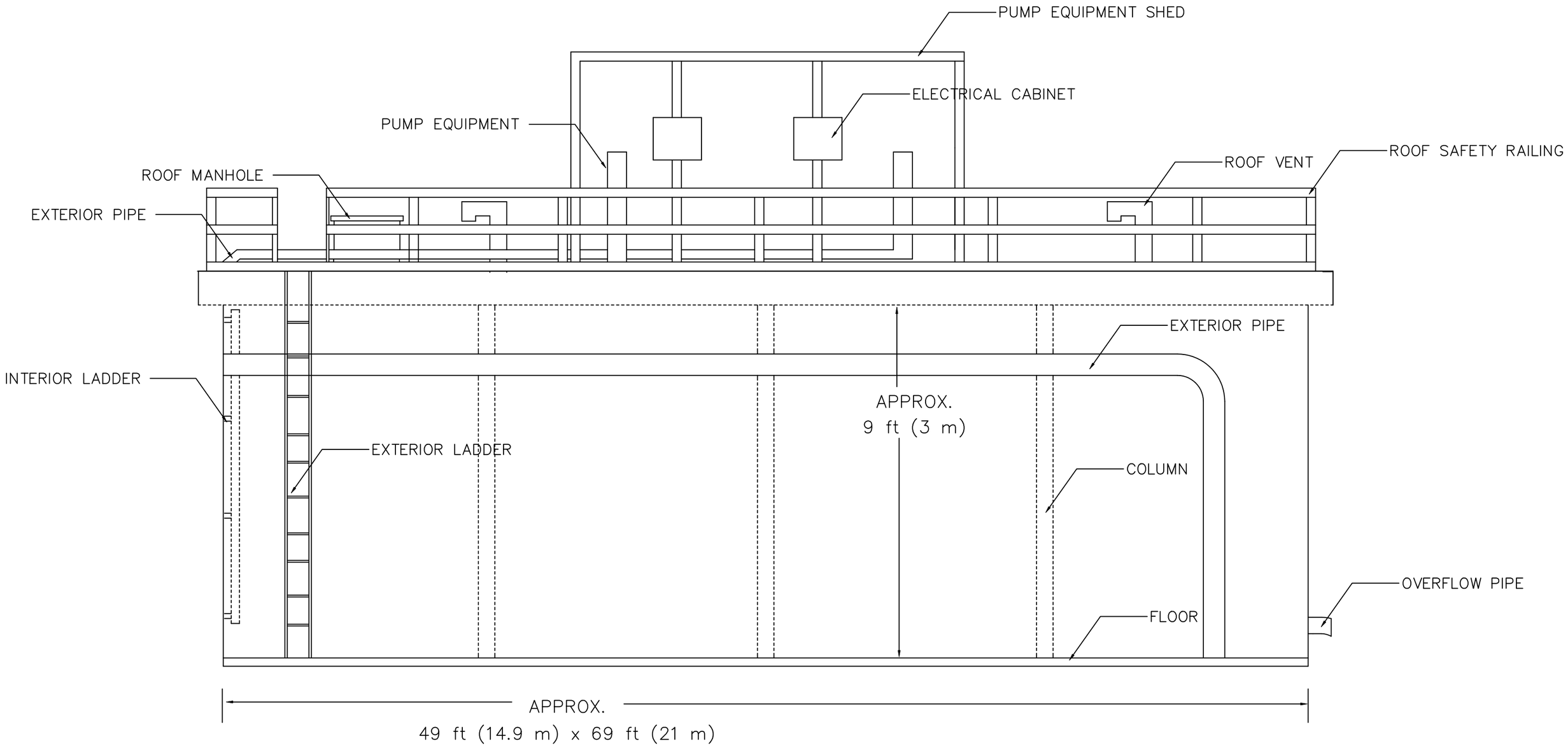
3.3 TANK 535

Tank 535 stores potable water for the Naval Air Station II in Sigonella, Italy.

3.3.1 Description of the Facility

Tank 535 is a two-chamber concrete tank located partially below grade with a capacity of 317,000 gallons of potable water. Information provided by the Navy at the time of the initial field evaluation stated the tank was approximately 49 ft (14.9 m) x 69 ft (21 m). (See Figure 3.3-1)

TANK 535, NOMENCLATURE



Distribution authorized to U.S. Government agencies and their contractors for administrative/operational purposes; November 2012. Other reqeustes shall be referred to NAVFAC–EXWC (or sponsor).
This drawing is intended only for illustration of report nomenclature and is not for design purposes.
Some features have been eliminated, simplified, relocated, etc., for the sake of clarification and, therefore, do Not reflect the actual configuration.

GRAPHIC SCALE	DATE	TIC Tank Industry Consultants	NAVAL FACILITIES ENGINEERING SERVICE CENTER EAST COAST DETACHMENT WASHINGTON, DC	
NOT TO SCALE	November 2012	Contract Number N62583–10–D–0340	NAVAL AIR STATION I SIGONELLA, ITALY NOMENCLATURE	FIG. NO. 3.3–1

3.3.1 Observed Conditions

Tank 535 is located at the Naval Air Station II in Sigonella, Italy (See photos 3.3-1 and 3.3-2). Tank 492 is located to the west, and a roof overhang is located above a breezeway between the Tanks 492 and 535. Several miscellaneous items are stored in the breezeway and unused piping sections and pallets as well as other miscellaneous equipment are stored adjacent to the tank (See photos 3.3-3 through 3.3-6). Tank 612 is located to the north of the subject tank. The site is covered with asphalt.

The tank has two valve vaults. One of the vaults is located southwest of the tank and was filled with water at the time of the field evaluation (See photos 3.3-7 and 3.3-8). The other vault is south of the tank on the site (See photo 3.3-9). Both of the valve vault accesses are locked, but two of the covers on the south vault are broken (See photos 3.3-10 and 3.3-11). There is extensive mildew and corrosion on the piping in vault (See photos 3.3-12 through 3.3-17). The south vault has lights, a sump, and a pump (See photo 3.3-18). Safety-related and OSHA deficiencies noted include: (1) the 2 in. (51 mm) x 3/8 in. (19 mm) ladder side rails do not precisely meet the required 2-1/2 in. (64 mm) x 3/8 in. (19 mm) minimum, (2) the 5/8 in. (16 mm) diameter ladder rungs do not precisely meet the required 3/4 in. (19 mm) diameter minimum, (3) the 24-1/2 in. (622 mm) head clearance on the ladder does not meet the required 30 in. (762 mm) minimum, and (4) wiring is exposed in the south vault (See photo 3.3-19).

The uncoated concrete shell surfaces are in generally poor condition. A leak is located under the cabinet mounted on the west side of the shell (See photos 3.3-22 and 3.3-23). A large chip is located within one of the corners (See photo 3.3-25). Hairline cracks and efflorescence are located in the west side of the shell. Form ties project from the south and east side of the shell, and there is corrosion on them (See photos 3.3-26 and 3.3-27). The tank number is mounted on the shell, and a warning sign is located on the shell adjacent to the ladder (See photo 3.3-29). “Tank #3” has been painted on the shell in yellow paint (See photo 3.3-24). The leak is an operational deficiency that may lead to a structural deficiency if left as is.

The overflow pipe projects from the base of the shell and discharges above grade (See photo 3.3-20). The discharge end of the pipe is screened, and there is corrosion on the pipe and screening (See photo 3.3-21). Some of the bolt holes in the

flange are open. The screening is intact but it is not adequately sized to prevent the ingress of insects into the tank, which is a sanitary deficiency.

A ladder provides access from near grade to the roof which is equipped with bolted brackets (See photo 3.3-29). Some of the brackets and bolts are rusty but appear to be in nearly their original structural condition. The ladder does not have a safe-climbing device, but there are terminals at the roof access (See photo 3.3-30). Safety-related and OSHA deficiencies noted include: (1) the 2 in. (51 mm) x 3/8 in. (19 mm) side rails do not precisely meet the required 2-1/2 in. (64 mm) x 3/8 in. (19 mm) minimum, and (2) the 5/8 in. (16 mm) diameter ladder rungs do not precisely meet the required 3/4 in. (19 mm) diameter minimum.

Safety railing extends around the perimeter of the roof which is constructed of welded pipe members. The safety railing has been painted, but there is corrosion on it (See photo 3.3-39). The railing has been equipped with a toe bar since the previous evaluation, but some section of the toe bar are broken and lying on the roof. OSHA and safety-related deficiencies noted include: (1) the access opening does not have closure chains to deter personnel from inadvertently falling from the roof, (2) some of the toe bar sections have broken (See photo 3.3-40), and (3) the gaps between the roof and toe bar exceed the maximum allowed 1/4 in. (6 mm).

The concrete roof appears to be in good overall condition as there are only a few hairline cracks and some efflorescence (See photos 3.3-42 and 3.3-43). The roof overhangs the shell, and it appeared the overhang had been repaired previously. Piping and pump equipment have been installed on the south part of the roof (See photos 3.3-36 through 3.3-38).

The roof has two manholes which include locked covers (See photos 3.3-31 through 3.3-33 and 3.3-35). There are cracks, spalls, and exposed rebar in the concrete necks (See photo 3.3-34).

Two gooseneck-type vents are located in the roof, and cracks are located in their concrete necks (See photos 3.3-43 and 3.3-44). There is corrosion on the steel vent and screening, and some of the bolt holes on the flanges are open (See photos 3.3-45 and 3.3-46). The screening is intact although it is not adequately sized to prevent the ingress of insects into the tank which is a sanitary deficiency.

The interior concrete surfaces are in good condition except for corrosion on an isolated area of exposed steel in the roof and efflorescence near the top of the shell (See photos 3.3-55, 3.3-68 through 3.3-70, 3.3-73, and 3.3-74). There is graffiti on the shell (See photos 3.3-71 and 3.3-72). There were no significant areas of cracking, spalling, or deterioration noted at the time of the field evaluation (See photos 3.3-47 through 3.3-52 and 3.3-54). The silt on the floor restricts its evaluation (See photos 3.3-75 through 3.3-77).

A ladder is located beneath each roof manhole, and the ladders have bolted brackets (See photo 3.3-56). The interior ladders have been replaced since the previous evaluation, but the ladders are covered with corrosion and rust tubercles (See photos 3.3-58 through 3.3-61). The ladders are not equipped with safe-climbing devices, and the safety cage has been removed from the north ladder. OSHA and safety-related deficiencies include: (1) the 24-1/4 in. (616 mm) head clearance does not meet the required 30 in. (762 mm) minimum, and (2) the rust tubercles on the ladders could injure the climber's hands.

A "T"-shaped pipe projects from the floor had has two pipe brackets along the shell (See photos 3.3-53, 3.3-56, and 3.3-57). Another pipe extends horizontally across the floor and rests on concrete supports (See photo 3.3-64). A few minor cracks are located in the concrete supports (See photo 3.3-79). Pipes and pumping equipment extend into the tank from the roof. A sump was located in the floor of the tank, and there are two pipe openings in the sump (See photo 3.3-78). There is significant corrosion and rust tubercles on the interior piping (See photos 3.3-62 through 3.3-67).

PHOTO 3.3-1 Tank 535.

PHOTO 3.3-2 Tank 535.

PHOTO 3.3-3 Tank 535.

PHOTO 3.3-4 Tank 535.

PHOTO 3.3-5 Tank 535.

PHOTO 3.3-6 Tank 535.

PHOTO 3.3-7 Valve vault.

PHOTO 3.3-8 Water standing in valve vault.

PHOTO 3.3-9 Valve vault exterior.

PHOTO 3.3-10 Cracks in valve vault access opening cover.

PHOTO 3.3-11 Cracks and hole in valve vault access opening cover.

PHOTO 3.3-12 Valve vault interior.

PHOTO 3.3-13 Valve vault interior.

PHOTO 3.3-14 Corrosion and mildew on valve vault piping.

PHOTO 3.3-15 Corrosion and mildew on valve vault piping.

PHOTO 3.3-16 Corrosion on valve vault piping nuts and bolts.

PHOTO 3.3-17 Corrosion on valve vault piping.

PHOTO 3.3-18 Sump in valve vault.

PHOTO 3.3-19 Exposed wiring in valve vault.

PHOTO 3.3-20 Overflow pipe.

PHOTO 3.3-21 Corrosion on overflow pipe screening. Note open bolt holes in flange.

PHOTO 3.3-22 Apparent leak in concrete shell.

PHOTO 3.3-23 Electrical equipment on shell.

PHOTO 3.3-24 Information painted on tank.

PHOTO 3.3-25 Chip in shell corner.

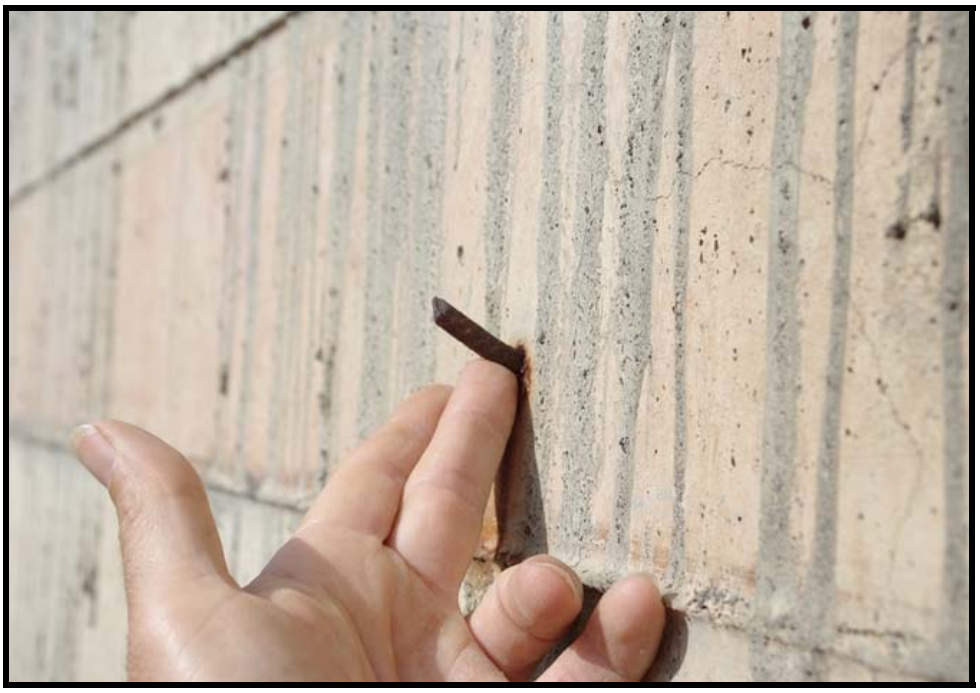


PHOTO 3.3-26 Corrosion on exposed rebar in shell.

PHOTO 3.3-27 Corrosion on exposed rebar in shell.

PHOTO 3.3-28 Roof overhang.

PHOTO 3.3-29 Exterior ladder.

PHOTO 3.3-30 Roof access.

PHOTO 3.3-31 Roof manhole.

PHOTO 3.3-32 Roof manhole.

PHOTO 3.3-33 Roof manhole.

PHOTO 3.3-34 Deteriorated roof manhole neck.

PHOTO 3.3-35 Roof manhole interior.

PHOTO 3.3-36 Pump equipment on roof.

PHOTO 3.3-37 Piping is located on the roof.

PHOTO 3.3-38 Pump equipment on roof.

PHOTO 3.3-39 Corrosion on roof safety railing.

PHOTO 3.3-40 Broken toe bar section.

PHOTO 3.3-41 Cracks in roof.

PHOTO 3.3-42 Hairline cracks in roof.

PHOTO 3.3-43 Roof vent. Note rust staining and open bolt holes at flanges.

PHOTO 3.3-44 Cracks in roof vent concrete vent neck.

PHOTO 3.3-45 Rust staining and open bolt holes on flange around roof vent screening.

PHOTO 3.3-46 Open bolt holes at flange around roof vent screening.

PHOTO 3.3-47 Roof interior.

PHOTO 3.3-48 Roof interior.

PHOTO 3.3-49 Tank interior.

PHOTO 3.3-50 Tank interior.

PHOTO 3.3-51 Tank interior. Note roof equipment projection.

PHOTO 3.3-52 Roof and shell.

PHOTO 3.3-53 Corrosion on inlet pipe.

PHOTO 3.3-54 Roof and shell.

PHOTO 3.3-55 Corrosion on exposed steel in roof.

PHOTO 3.3-56 Interior ladder and corrosion on interior piping.

PHOTO 3.3-57 Corrosion on interior piping and brackets.

PHOTO 3.3-58 Corrosion and rust tubercles on interior ladder and brackets.

PHOTO 3.3-59 Corrosion and rust tubercles on interior ladder and bracket bolts.

PHOTO 3.3-60 Corrosion and rust tubercles on interior ladder.

PHOTO 3.3-61 Corrosion and rust tubercles on interior ladder.

PHOTO 3.3-62 Corrosion and rust tubercles on interior piping.

PHOTO 3.3-63 Corrosion and rust tubercles on interior piping.

PHOTO 3.3-64 Corrosion and rust tubercles on interior piping.

PHOTO 3.3-65 Corrosion and rust tubercles on interior piping.

PHOTO 3.3-66 Corrosion and rust tubercles on interior piping.

PHOTO 3.3-67 Corrosion and rust tubercles on interior piping.

PHOTO 3.3-68 Efflorescence near top of shell.

PHOTO 3.3-69 Efflorescence on shell.

PHOTO 3.3-70 Shell interior.

PHOTO 3.3-71 Graffiti on interior shell.

PHOTO 3.3-72 Graffiti on interior shell.

PHOTO 3.3-73 Discoloration on shell.

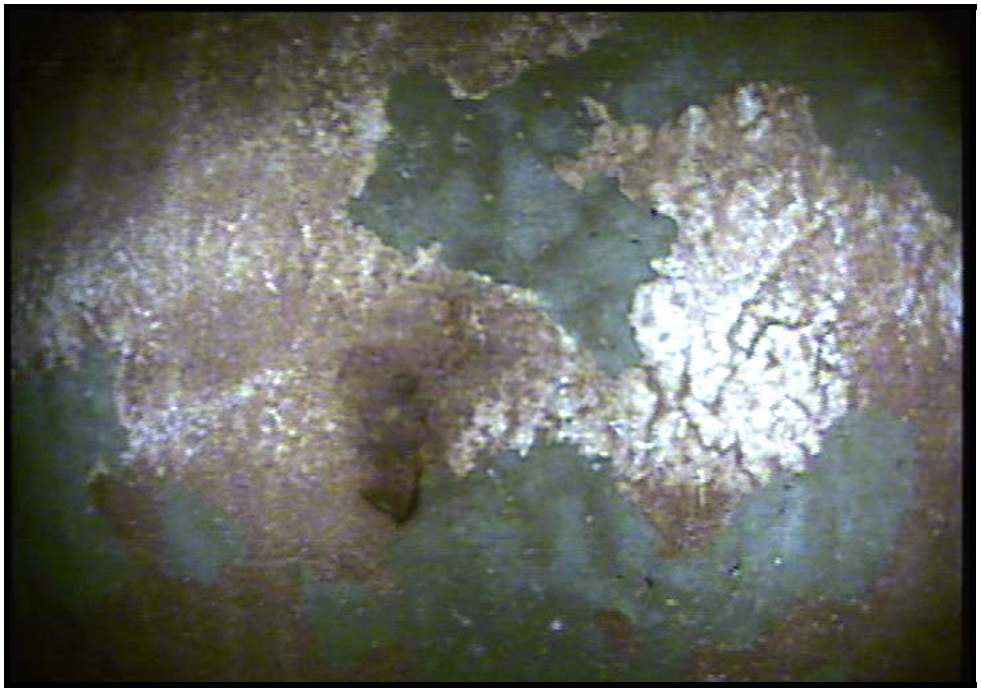


PHOTO 3.3-74 Discoloration on shell.

PHOTO 3.3-75 Shell and floor.

PHOTO 3.3-76 Silt on floor.

PHOTO 3.3-77 Silt on floor.

PHOTO 3.3-78 Pipe openings in sump.

PHOTO 3.3-79 Cracking in concrete block under piping.

3.3.2 Comparison of Previous Inspection Results

The tank was previously evaluated by Tank Industry Consultants on March 3, 2008, and an evaluation report CR-6480-OCN was issued. Since the time of the previous evaluation, it appeared that some repairs and modifications have been made to the tank which include:

- The interior ladders have been replaced.
- A toe bar has been installed on the roof safety railing.
- Piping and pump equipment have been installed on the south part of the roof.

3.3.3 Structural Condition Assessment

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 Navy and the Engineer.

This tank is located in a seismically active region. This evaluation and reported condition do not verify the tank's original design compliance for seismic or coastal wind loading in accordance with current design requirements, as it was outside the scope of this report. Likewise, recommendations for this tank do not include modifications that 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.

3.3.4 Recommendations

Site:

Site Maintenance: The site should be maintained so that proper drainage away from the tank continues. The vegetation should be removed from around the base of the shell.

Site Access and Restoration: Contractor and heavy equipment access to the site would be difficult due to the small size of the immediate tank site. Provisions should be included in the specifications for the restoration of any paving, curbing, sidewalks, or other surfaces and structures disturbed by the contractor's work. Appropriate precautions should be taken for work around the equipment adjacent to the tank.

Valve Vaults: The ladder in the south vault should be replaced with a ladder which meets current requirements. The piping and valves located in both valve vaults should be cleaned and painted. The exterior concrete surfaces should be cleaned to the equivalent of a brush-off blast cleaning and painted with a concrete sealer. The valve vault access should be modified so that it can be locked at all times in order to limit liability to the Navy and to protect water system security. The southwest vault should be equipped with a sump and a pump to eliminate the standing water. The exposed wiring in the south vault should be covered, and the broken covers on the south vault access openings should be repaired or replaced.

Exterior Surfaces:

Exterior Concrete: The exterior concrete surfaces were in poor condition and a leak was observed; it is recommended the exterior surfaces be repaired within the next year. The cracks in the underside of the roof overhang should be prepared according to the specifications of the concrete crack repair material manufacturer. These areas to be repaired should be prepared by wet blast cleaning to remove dust, laitance, grease, or other bond inhibiting materials and blown off with high-pressure air. The cracks in the concrete should then be repaired by routing out the crack to a minimum depth of 1 inch (25 mm, with a minimum 90° angle from the surface) and repairing with a cement-based patching compound. The sequence and performance of these concrete repairs shall be

such that the structural integrity of the tank area is not compromised. In order to repair the leak, epoxy injection may be required.

Rehabilitation Schedule: To obtain the lowest possible prices for the work outlined in the recommendations, the Navy should have the specifications prepared and the work bid in the fall, with the work scheduled to start in the winter.

Shell Manholes: It is recommended that the Navy classify this tank as a confined space, and initiate the appropriate confined space access measures whenever anyone is going to access the tank interior.

Overflow Pipe: The overflow pipe discharge should be equipped with a screened, counter-weighted flap gate or elastomeric check valve to prevent the ingress of birds, small animals, and insects into the tank. The air break should be adequately sized to allow the proper functioning of the new flap gate or check valve. The overflow effluent should be directed away from the shell using a concrete splash block. Bolts should be installed in the open bolt holes.

Exterior Ladder: The exterior ladder should be replaced with a ladder which meets current dimensional requirements. The existing ladders did not include slip-resistant rungs. Slip-resistant rungs are required for all ladders constructed after March 1991 by the OSHA Construction standards. However, slip-resistant rungs are not required by the OSHA General Industry standards for ladders or by the AWWA standards.

Roof Safety Railing: The broken toe bar sections should be reinstalled, and the toe bar lowered so the gap between it and the roof is less than 1/4 in. (6 mm) wide. Closure chains should be installed at the access opening.

Clog-Resistant Vents: The roof vents are not of a clog-resistant design. The 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, AWWA D110 does not require a clog-resistant vent, and a concrete roof is typically capable of withstanding more pressure or vacuum than a steel roof. Until such time as new vents are installed, the screening should be replaced with new screening which prevents the ingress of insects into the tank. Bolts should be installed in the open bolt holes on the flanges.

Interior Surfaces:

Interior Concrete: The coating on the concrete interior of the tank appeared to be in generally good overall condition as no significant cracking and chipping were observed. The interior surfaces should be re-evaluated in 3 to 4 years to determine if repairs are required at that time.

Interior Piping: The piping should be cleaned to the equivalent of an SSPC-SP 10, Near-White Blast Cleaning and an epoxy coating system applied. This should be performed within the next year.

Interior Ladders: Interior ladders are susceptible to accelerated rates of corrosion. If the Navy decides to keep an interior ladder, the existing access ladders should be replaced with new ladders which meet current OSHA requirements. The existing ladders did not include slip-resistant rungs. Slip-resistant rungs are required for all ladders constructed after March 1991 by the OSHA Construction standards. However, slip-resistant rungs are not required by the OSHA General Industry standards for ladders or by the AWWA standards.

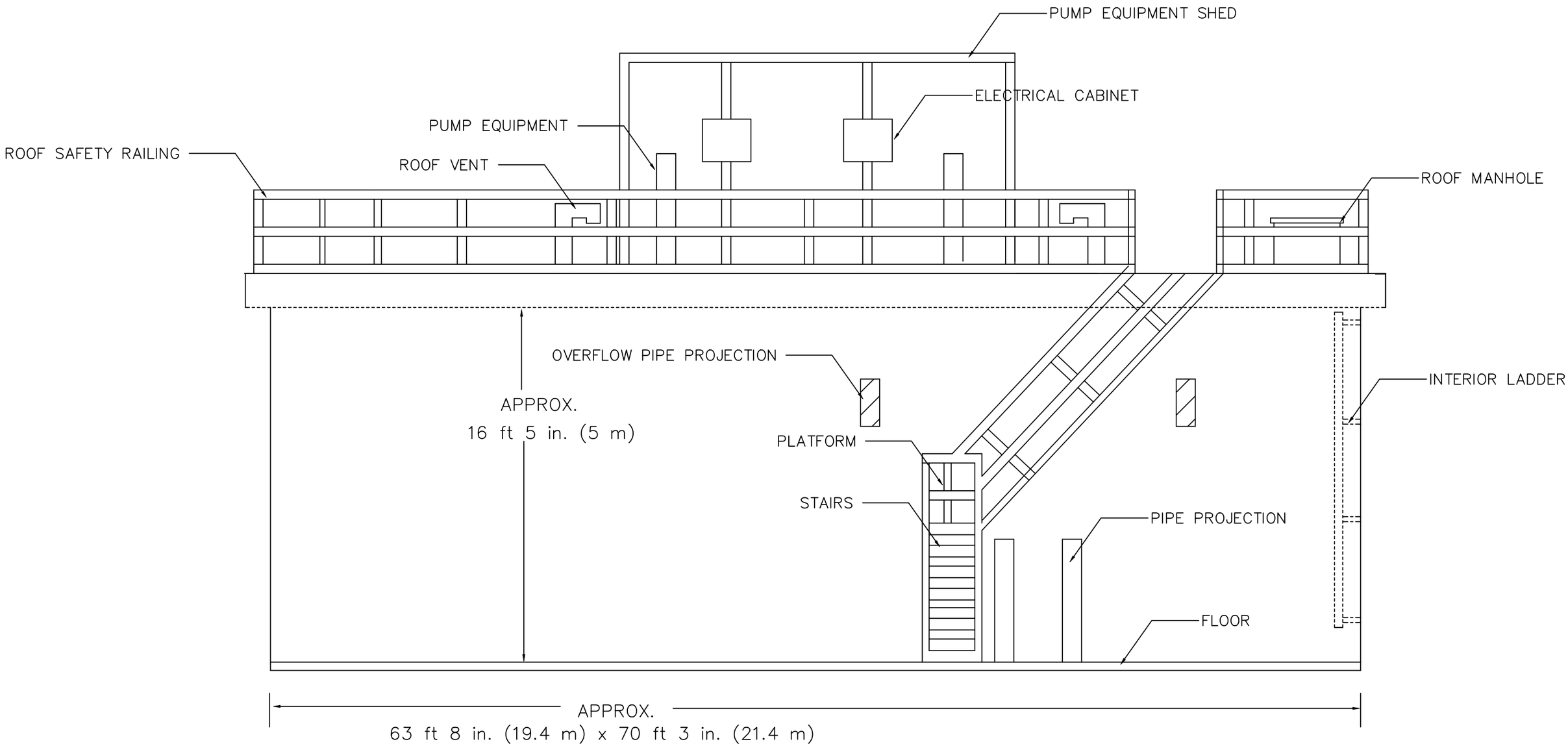
3.4 TANK 492

Tank 492 stores potable water for the Naval Air Station II in Sigonella, Italy.

3.4.1 Description of the Facility

Tank 492 is a two-chamber concrete tank which is located partially below grade with a capacity of 400,000 gallons of potable water. Measurements taken at the field evaluation indicated the tank projected from approximately 8 ft (2.4 m) above grade. The exterior of the tank measured approximately 63 ft 8 in. (19.4 m) x 70 ft 3 in. (21.4 m), and the interior height was approximately 16 ft 6 in. (5 m). (See Figure 3.4-1)

TANK 492, NOMENCLATURE



Distribution authorized to U.S. Government agencies and their contractors for administrative/operational purposes; November 2012. Other reqeustes shall be referred to NAVFAC–EXWC (or sponsor).
This drawing is intended only for illustration of report nomenclature and is not for design purposes.
Some features have been eliminated, simplified, relocated, etc., for the sake of clarification and, therefore, do Not reflect the actual configuration.

GRAPHIC SCALE	DATE	TIC Tank Industry Consultants	NAVAL FACILITIES ENGINEERING SERVICE CENTER EAST COAST DETACHMENT WASHINGTON, DC	
NOT TO SCALE	November 2012	Contract Number N62583–10–D–0340	NAVAL AIR STATION I SIGONELLA, ITALY NOMENCLATURE	FIG. NO. 3.4–1

3.4.2 Observed Conditions

Tank 492 is located at the Naval Air Station II in Sigonella, Italy (See photos 3.4-1 through 3.4-3). Tank 535 is located to the east, and a roof overhang is located above a breezeway between the Tanks 492 and 535. Several miscellaneous items are stored in the breezeway (See photo 3.4-4). Tank 612 is located to the north of the subject tank. The site is covered with asphalt, and rusty valves project adjacent to the south side of the tank (See photos 3.4-12 and 3.4-13).

A valve vault is located south of the tank adjacent to the stairs (See photo 3.4-5). The cover on the access has a lock, but the cover could not be secured and is removable (See photo 3.4-6). The vault has a sump, but approximately 5 ft (1.5 m) of water was standing in the vault at the time of the field evaluation (See photos 3.4-10 and 3.4-11). The concrete surfaces surrounding the access have cracked and spalled, exposing rebar (See photo 3.4-7). Corrosion and metal loss are noted on the visible piping (See photos 3.4-10 and 3.4-11). Safety-related and OSHA deficiencies on the valve vault ladder include: (1) the 2 in. (51 mm) x 3/8 in. (19 mm) side rails did not precisely meet the required 2-1/2 in. (64 mm) x 3/8 in. (19 mm) minimum, (2) the 24 in. (610 mm) head clearance does not meet the required 30 in. (762 mm) minimum, and (3) significant corrosion and metal loss are located on the vault ladder (See photos 3.4-8 and 3.4-9).

The uncoated concrete shell surfaces are in good condition. Except for corrosion observed on some exposed steel near the top of the shell, no other significant areas of deterioration are noted (See photos 3.4-21 through 3.4-23). Form ties project from the shell, and there is corrosion on them. The tank number is mounted on the shell (See photo 3.4-20).

Each of the chambers has an overflow pipe which projects from near the top of the shell and discharges above grade (See photos 3.4-15 and 3.4-17). There is corrosion on the exterior of one of the overflow pipes, and on the visible interior surfaces of both pipes (See photos 3.4-16 through 3.4-18). The discharge ends of the pipes are screened, but the screening is not adequately

sized to prevent the ingress of insects into the tank and there are gaps, which is a sanitary deficiency.

Stairs extend from grade to the roof, and safety railing is located on both sides of the stairs (See photo 3.4-5). The stairs are constructed of concrete, and the safety railing is constructed of welded pipe members. The stairs and safety railing appeared to be in adequate condition at the time of the field evaluation. The stairs have two platforms such that one is located near the middle of the stairs and one is located at the roof access. The platforms also have safety railing constructed of welded pipe members (See photo 3.4-24). OSHA and safety-related deficiencies include: (1) the 39 in. (991 mm) to 40-3/4 in. (1022 mm) height of the handrail along the stairs exceeds the maximum allowed 34 in. (864 mm), and (2) the platforms do not have 4 in. (102 mm) high toe bars.

Two pipes extend from below grade and penetrate near the top of the east side of the shell (See photos 3.4-14 and 3.4-19). Another pipe extends from grade and penetrates near the top of the southwest corner of the shell. Several conduits and cabinets are mounted to the shell and roof (See photos 3.4-33). A pump station is located on the south part of the roof (See photos 3.4-28 and 3.4-29). A new pipe is U-bolted to new brackets on the roof (See photos 3.4-30 through 3.4-32). Unused pipe projections on the roof have been covered with fiberglass and concrete since the previous evaluation (See photo 3.4-37).

The concrete roof is in good condition. It appears the damaged overhang and concrete surfaces have been repaired since the previous evaluation (See photos 3.4-35 and 3.4-36).

Safety railing extends around the perimeter of the roof which is constructed of welded pipe members (See photo 3.4-34). A toe bar has been installed on the roof safety railing.

The roof has two manholes both of which have hinged and locked covers (See photo 3.4-25). Since the previous evaluation, a broken hinge on one of the manholes has been replaced, and the concrete necks have been repaired (See photos 3.4-26 and 3.4-27).

A gooseneck-type vent is located in the roof above each chamber (See photos 3.4-38 and 3.4-40). There is corrosion on the vents and some of bolt holes on the flange are open (See photos 3.4-39 and. 3.4-41). Although the roof vent screening is intact, it is not sized to prevent the ingress of insects into the tank which is a sanitary deficiency.

The interior concrete surfaces appear to be in good overall condition (See photos 3.4-44 through 3.4-47 and 3.4-57 through 3.4-59). The tiled-covered roof has been resurfaced since the previous evaluation (See photos 3.4-42 and 3.4-43). The presence of silt restricts the evaluation of the floor (See photo 3.4-60).

A ladder is located in each chamber beneath the roof manhole, and the ladders are welded to brackets which are bolted into the shell (See photo 3.4-51). The interior ladders have been replaced since the previous evaluation, but the ladders are covered with corrosion and rust tubercles (See photo 3.4-50). The ladders are not equipped with safe-climbing devices, and the safety cages have been removed. OSHA and safety-related deficiencies include: (1) the 15 in. (381 mm) ladder width does not precisely meet the minimum required 16 in. (406 mm), (2) the 26 in. (660 mm) head clearance does not meet the required 30 in. (762 mm) minimum, and (3) the rust tubercles on the ladder could injure the climber.

Two pipes project from near the top of the shell (See photos 3.4-48 and 3.4-49). Pipes and pump equipment project into the tank from the roof, and there is corrosion and rust tubercles on them (See photo 3.4-50). A pipe projects through near the center of the shell and elbows upward (See photo 3.4-53). This pipe is capped, and there are corrosion and rust tubercles on it (See photo 3.4-54). There is a pipe opening near the center of the shell adjacent to the upward elbowed pipe and above a sump (See photo 3.4-55). Another pipe opening is located in the sump (See photo 3.4-56).

PHOTO 3.4-1 Tank 492.

PHOTO 3.4-2 Tank 492.

PHOTO 3.4-3 Tank 492.

PHOTO 3.4-4 Tank 492.

PHOTO 3.4-5 Stairs, pump equipment on roof, and valve vault exterior.

PHOTO 3.4-6 Valve vault access.