Kula Nani Estates Community Association

75,000 Gallon Elevated Water Storage Tank
Professional Examination and Evaluation

Prepared For:
Kula Nani Estates Community Association Water System
Kula, Maui

Prepared By:
Donald P. Owens
NACE Certified Coating Inspector No. 6374

Owens
Inspection Services, LLC
Coating Consulting and Inspection

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PROFESSIONAL EXAMINATION AND EVALUATION

FOR

75,000 GALLON
ELEVATED WATER STORAGE TANK

KULA NANI ESTATES COMMUNITY ASSOCIATION
WATER SYSTEM
KULA, MAUI

February 2017

I hereby certify that this report was prepared by me or under my direct supervision and that I am certified by the National Association of Corrosion Engineers International.

By 

Donald P. Owens
NACE Coating Inspector, Level III-Certified
Certification Number 6374

Date March 14, 2017

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PART 1 - GENERAL

1.01 SCOPE:

A. In Accordance with AWWA Standards, water storage tanks should be cleaned and inspected on a regular basis for two reasons. First, as water is held in the container, suspended solids settle out of the water into the bottom of the container. Sediment and deposits on container walls decrease the effectiveness of disinfectants, which may compromise the container's sanitary integrity. Secondly, water storage tank maintenance is becoming more costly and complex. The coating system inside your container was costly to install and will only reach its full life expectancy if it is properly maintained. Preventative maintenance is therefore the key to saving money by ensuring that the interior coating system reaches its full potential. AWWA M42 – Steel Water Storage Tanks Standard states, "Tanks should be washed out and inspected at least once every three to five years, and where water supplies have sediment problems, annual wash outs are recommended."

B. A professional examination and evaluation of the Kula Nani Estates Community Association Water System's 75,000-gallon elevated water storage tank was conducted on February 3, 2017. During this examination and evaluation the sediment was removed from the interior of the container. An inspection of the interior and exterior coating systems, foundations, structural members, and appurtenances was accomplished.

C. This examination and evaluation was authorized by the Kula Nani Estates Community Association as part of the Owens Inspection Services, LLC Water Storage Tank Maintenance Program. This elevated water storage tank was cleaned and rigged by personnel from Tenyer Coatings, Inc., and examined by Mr. Donald Owens and Mr. Michael Colberg from Owens Inspection Services, LLC.

1.02 REFERENCE STANDARDS:

A. The information obtained during the examination and evaluation of the elevated water storage tank is compiled in this report and includes a professional examination of the exterior and interior coating systems, foundations, structural members, and appurtenances. These areas were examined with respect to current American Water Works Association (AWWA) M42 "Steel Water Storage Tanks", Occupational Safety and Health

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Association (OSHA) 29 CFR General Industry Standards, National Association of Corrosion Engineers (NACE) International, Steel Structure Painting Council (SSPC) and Federal and State Homeland Security requirements to prepare the recommendations, cost estimate of needed repairs, and ongoing annual budget bound within this report.

1.03 GENERAL TANK INFORMATION:

A. This elevated water storage tank is of welded steel, cylindrical top with a conical bottom construction and a 75,000-gallon capacity supported on four columns. The elevated water storage tank was erected by Land Construction Company in 1980 and measures 120 feet and 0 inches to high water level with a 25 foot and 0 inches head range within the container.

B. This elevated water storage tank is owned by the Kula Nani Estates Community Association and is located in Kula, Maui on Ululani Road. Mr. Brad Dugan oversees the maintenance issues for the elevated water storage tank and can be contacted at 808 264-1063.

1.04 HISTORICAL INFORMATION:

A. The exterior of the elevated water storage tank was last over coated with an aliphatic acrylic polyurethane system applied by Tenyer Coating, Inc. of Badger, Minnesota in 2017. The interior of the elevated water storage tank container was last coated with a polyamide epoxy coating system by Tenyer Coating, Inc. in 2002.

B. The existing riser and expansion joint was replaced in 2009 by Tenyer coating, Inc.

C. The elevated water storage tank was last examined and evaluated by Owens Inspection Services, LLC on January 17, 2013.

D. The elevated water storage tank exterior and interior surfaces were cleaned and touched up by Tenyer Coating, Inc. in 2011. An additional access hatch was also installed on the roof of the elevated water storage tank to comply with current OSHA requirements for confined space.

E. The deep pitting that was identified on the lower section of the columns and the column shoes were welded and touched up by Tenyer Coating, Inc. in February 2013.

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F. The elevated water storage tank exterior and interior surfaces were cleaned and touched up by Tenyer Coating, Inc. in 2015.

G. The elevated water storage tank was last examined and evaluated by Owens Inspection Services, LLC on February 3, 2017.

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PART 2 – EXAMINATION

2.01 EXTERIOR AND INTERIOR COATING SYSTEMS:

A. The exterior coating system is in good condition with a small corrosion hole that was identified and repaired during the examination on the elevated water storage tank supporting tower. The Dry Film Thickness (DFT) of the exterior coating system was measured in accordance with SSPC-PA2 "Measurement of Dry Paint Thickness with Magnetic Gages," and an average DFT of 13.1 mils was recorded on the elevated water storage tank supporting tower and an average DFT of 19.0 mils was recorded on the container. In accordance with ASTM D610-85 "Evaluating Degree of Rusting on Painted Surfaces," a rust grade of 10 was recorded, which indicates that less than 1% of the surface is rusted.

B. The interior coating system is in fair condition with iron and manganese staining noted below high water level. Approximately 2 inches of settled solids was removed from the container during the cleaning process. The settled solids appeared to be a mixture of iron and manganese sludge. No visible signs of animal, insect or plant debris were observed on the interior of the container. The Dry Film Thickness (DFT) of the interior coating system was measured in accordance with SSPC-PA2 "Measurement of Dry Paint Thickness with Magnetic Gages," and an average DFT of 15.6 mils was recorded. In accordance with ASTM D610-85 "Evaluating Degree of Rusting on Painted Surfaces," a rust grade of 10 was recorded, which indicates that less than 1% of the surface is rusted.

2.02 APPURTENANCES:

A. The exterior ladder is welded securely to the column of the elevated water storage tank supporting tower. The exterior ladder measures 16 inches wide with 3/4 inch rungs spaced 12 inches on center with an 8-inch toe depth. The exterior ladder side rails measure 2 inches by 1/4 inch. A functional safety climb device is used for fall protection. The ladder is compliant with current OSHA requirements.

B. The roof shell ladder is welded securely to the side wall of the container. The roof shell ladder measures 16 inches wide with 3/4 inch rungs spaced 12 inches on center with a 7-inch toe depth. The roof shell ladder side rails

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measure 2 inches by 1/4 inch. A functional safety climb device is used for fall protection. The exterior ladder is compliant with current OSHA requirements.

C. This elevated water storage tank has three access hatches. One 24-inch diameter access hatch is located on the north roof side of the container, with a 6-inch curb and a hinged cover with a 2-inch downward overlap. One 24-inch diameter access hatch is located on the south roof side of the container, with a 6-inch curb and a hinged cover with a 2-inch downward overlap. One 24-inch diameter bolt flanged access hatch with gasket located under the vent. The access hatches are in good operational condition and seal properly. They are also compliant with current AWWA and OSHA requirements for confined space entry.

D. A 6-inch diameter overflow pipe exits the container at high water level, and discharges 36 inches above grade through a flanged number 4 mesh non-corrodible screen into a sump pit. The overflow pipe is welded securely to the column of the elevated water storage tank supporting tower. The overflow pipe is in good operational condition and compliant with current AWWA requirements.

E. An 8-inch diameter inlet pipe with an expansion joint located at the base of the container delivers the water approximately 12 inches above the base of the container. The inlet pipe appears to be in good condition with a minimal amount of rust tubercles observed within the pipe.

F. This elevated water storage tank contains a 24-inch diameter mushroom style vent with a number 24 mesh screen located at the center of the roof. The roof vent and screen are in good operational condition and compliant with current AWWA requirements.

G. The elevated water storage tank balcony and railing system are welded securely to the roof of the container. The balcony measures 48 inches square with a top rail measurement of 42 inches, a mid rail measurement of 21 inches and a 4 inch toe kick. The balcony and railing system is unobstructed and compliant with current OSHA requirements.

H. A 4-inch diameter t-style drain plug and coupler are located at the bottom of the container. The drain plug and coupler are in good operational condition.

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2.03 STRUCTURAL MEMBERS:

A. The foundations appear to be in good condition with no spalling, cracking or exposed aggregate observed during the examination. The grout between the foundation and the columns of the elevated water storage tank supporting tower are in good condition. The anchor bolts that connect the supporting tower columns to the foundation are tightly secured and in good condition.

B. The diagonal and riser braces are in good condition. They are straight and tightly secured with no metal loss observed during this examination. The clevises, wing plates, turnbuckles and brace to column connections are structurally sound with no metal loss observed.

C. This elevated water storage tank is supported on four columns, which are satisfactorily aligned with no settling observed during this examination. No metal loss was observed on the column shoe at the connection with the anchor bolts.

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PART 3 - EVALUATION

3.01 REMEDIAL ACTION:

A. At the conclusion of the examination, the elevated water storage tank was disinfected in accordance with AWWA C652, "Disinfection of Water-Storage Facilities" Method #3.

3.02 EXECUTIVE SUMMARY:

A. It is our opinion that the exterior coating is in good condition and has approximately 15 years of useful life remaining. The interior coating system below high water level is in fair condition with approximately four years of useful life remaining.

B. The appurtenances are in good condition and compliant with current AWWA and OSHA requirements. For this reason, we do not see a need for any additional AWWA and/or OSHA upgrades soon.

C. The structural members of the elevated water storage tank are in good condition with no significant deterioration noted during the examination. We do recommend that the hole that was identified and filled with putty on the elevated water storage tank supporting tower be welded at the next available refurbishing project.

D. We estimate that it would cost the Kula Nani Estates Community Association approximately $2,000,000 to replace this elevated water storage tank with one of similar size and style. However, with ongoing maintenance, an elevated water storage tank like this may be used indefinitely. For this reason, we recommend that the elevated water storage tank be cleaned and examined in accordance with AWWA M42 "Steel Water-Storage Tanks" so that the condition of the interior and exterior coating systems, foundations, structural members, and appurtenances can be monitored and the long-term budget evaluated and updated.

E. Table 1 developed an estimate of the annual cost required to maintain the elevated water storage tank interior and exterior coating systems, wash out and AWWA Examination and Evaluation every three years. This is the annual operating budget for the elevated water storage tank maintenance and

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will need to be provided by the Kula Nani Estates Community Association. As the funds accumulate the maintenance needs of the elevated water storage tank will be addressed.

F. The following analysis was conducted using a present worth assuming a 3% inflation rate with an annual interest rate of 8% on the money. The current coating cost was estimated assuming that the elevated water storage tank contains 3,725 square feet of interior surface and 7,250 square feet of exterior surface. The equation does not allow for exterior lead abatement procedures and a lead and chromate test should be conducted if the exterior coating is removed.

TABLE 1 – BUDGET ANALYSIS REPORT

Kula Nani Estates Community Association
50 Year Coating Cost Projections
75,000 Gallon Elevated Water Storage Tank

Coating Frequency:	
Interior	20 years
Exterior	15 years
Washout	Every three years
Inspection	Every three years
Inflation Rate:	3%
Interest Rate:	8%
Capacity:	75,000 Gallons
Style:	Welded Steel, Cylindrical top with a conical bottom
Current Costs:	
Interior	$70,775
Exterior	$126,000
Washout	$29,000
Examination	$9,000

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WATER STORAGE TANK REPORT

Year	Future Cost			Present Worth			
	Wash Out	Interior	Exterior	Wash Out	Interior	Exterior	Total
2017	$0	$0	$0	$0	$0	$0	$0
2018	$0	$0	$0	$0	$0	$0	$0
2019	$0	$0	$0	$0	$0	$0	$0
2020	$42,769.33	$0	$0	$31,437	$0	$0	$31,437
2021	$0	$82,048	$0	$0	$55,840	$0	$55,840
2022	$0	$0	$0	$0	$0	$0	$0
2023	$0	$0	$0	$0	$0	$0	$0
2024	$48,137.26	$0	$0	$26,007	$0	$0	$26,007
2025	$0	$0	$0	$0	$0	$0	$0
2026	$0	$0	$0	$0	$0	$0	$0
2027	$0	$0	$0	$0	$0	$0	$0
2028	$54,178.91	$0	$0	$21,515	$0	$0	$21,515
2029	$0	$0	$0	$0	$0	$0	$0
2030	$0	$0	$0	$0	$0	$0	$0
2031	$0	$0	$0	$0	$0	$0	$0
2032	$60,978.84	$0	$202,193	$17,799	$0	$59,018	$76,817
2033	$0	$0	$0	$0	$0	$0	$0
2034	$0	$0	$0	$0	$0	$0	$0
2035	$0	$0	$0	$0	$0	$0	$0
2036	$68,632.23	$0	$0	$14,725	$0	$0	$14,725
2037	$0	$0	$0	$0	$0	$0	$0
2038	$0	$0	$0	$0	$0	$0	$0
2039	$0	$0	$0	$0	$0	$0	$0
2040	$77,246.18	$0	$0	$0	$0	$0	$0
2041	$0	$148,187	$0	$0	$21,638	$0	$21,638
2042	$0	$0	$0	$0	$0	$0	$0
2043	$0	$0	$0	$0	$0	$0	$0
2044	$86,941.25	$0	$0	$10,078	$0	$0	$10,078
2045	$0	$0	$0	$0	$0	$0	$0
2046	$0	$0	$0	$0	$0	$0	$0
2047	$0	$0	$315,010	$0	$0	$28,986	$28,986
2048	$97,853.14	$0	$0	$8,337	$0	$0	$8,337

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2049	$0	$0	$0	$0	$0	$0	$0
2050	$0	$0	$0	$0	$0	$0	$0
2051	$0	$0	$0	$0	$0	$0	$0
2052	$110,134.58	$0	$0	$6,897	$0	$0	$6,897
2053	$0	$0	$0	$0	$0	$0	$0
2054	$0	$0	$0	$0	$0	$0	$0
2055	$0	$0	$0	$0	$0	$0	$0
2056	$123,957.44	$0	$0	$5,706	$0	$0	$5,706
2057	$0	$0	$0	$0	$0	$0	$0
2058	$0	$0	$0	$0	$0	$0	$0
2059	$0	$0	$0	$0	$0	$0	$0
2060	$139,515.19	$0	$0	$4,720	$0	$0	$4,720
2061	$0	$267,642	$0	$0	$8,385	$0	$8,385
2062	$0	$0	$490,776	$0	$0	$14,236	$14,236
2063	$0	$0	$0	$0	$0	$0	$0
2064	$157,025.57	$0	$0	$3,905	$0	$0	$3,905
2065	$0	$0	$0	$0	$0	$0	$0
	$1,067,370	$497,877	$1,007,979	$151,126	$85,863	$102,240	$339,229

Total Estimated Cost over 50 years: **$2,573,226**

Present Worth (investment needed today to pay for costs over the next 50 years) **$339,229**

Annual Budget **$27,730**

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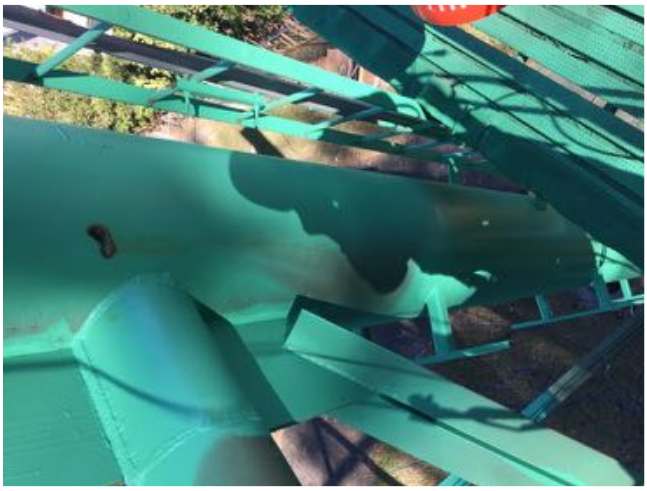

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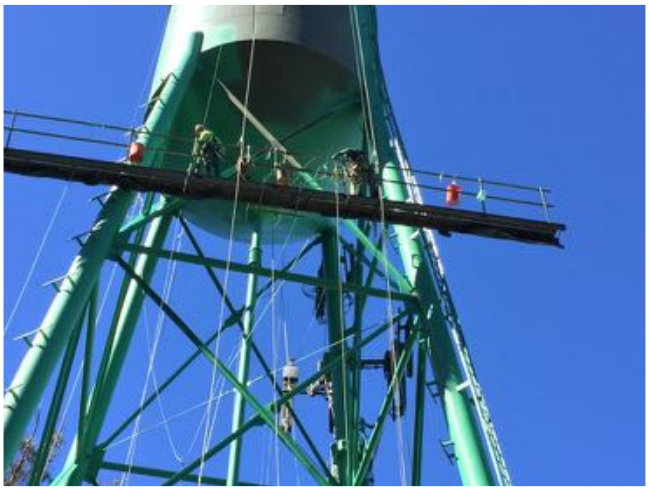
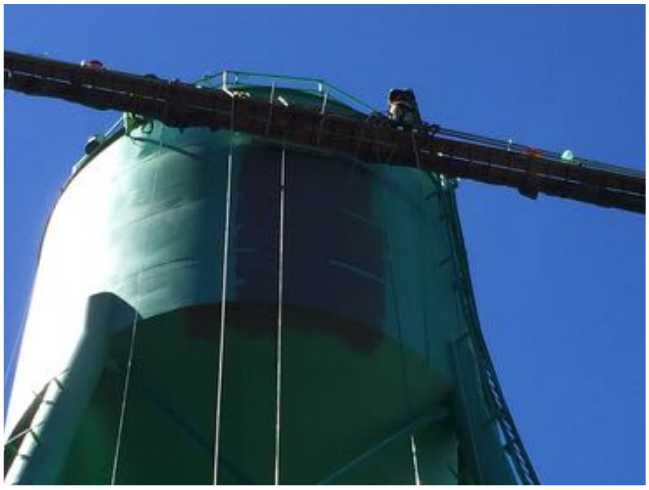


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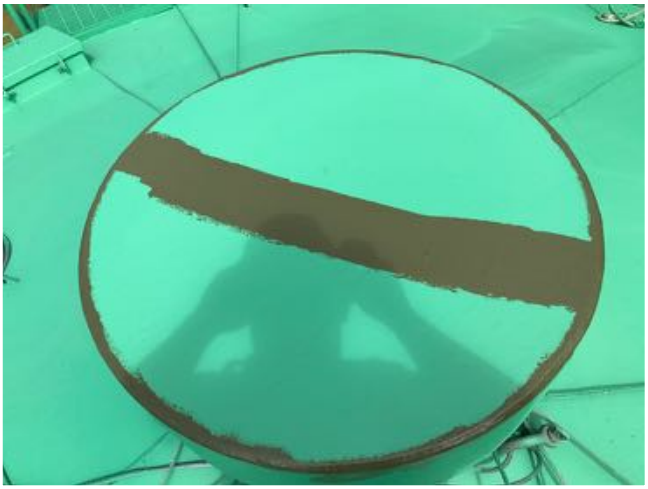
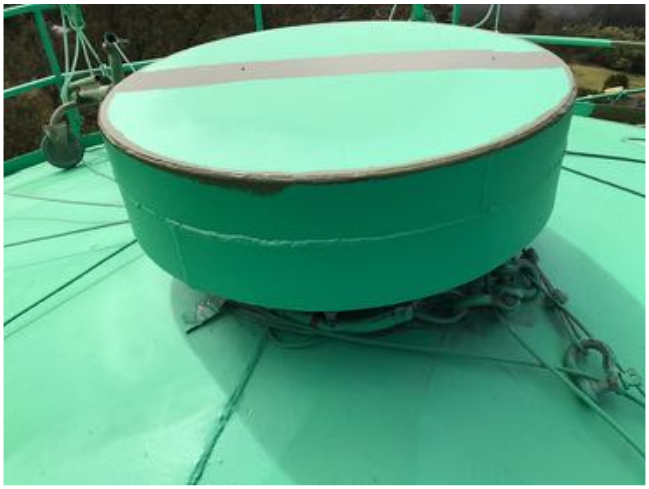

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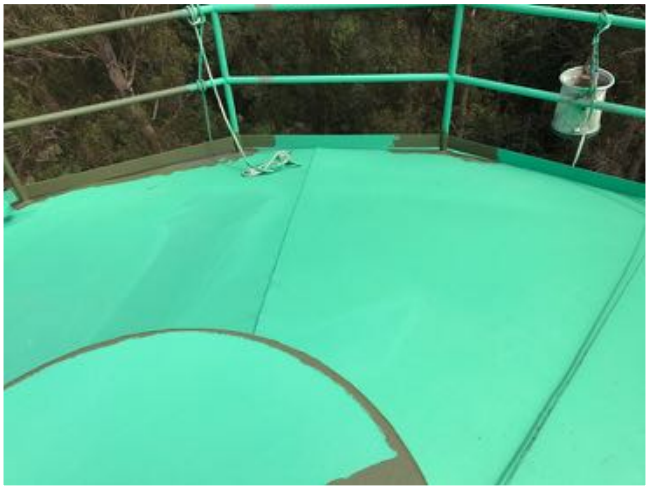

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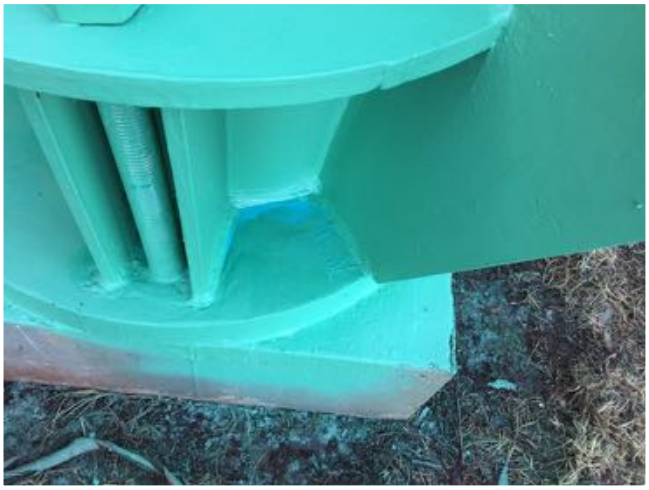



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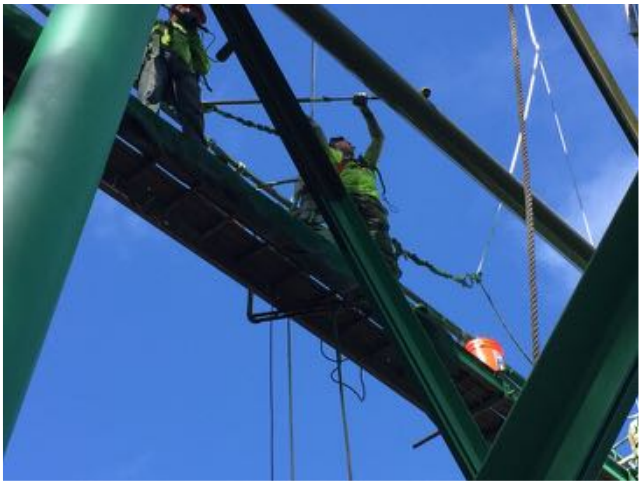


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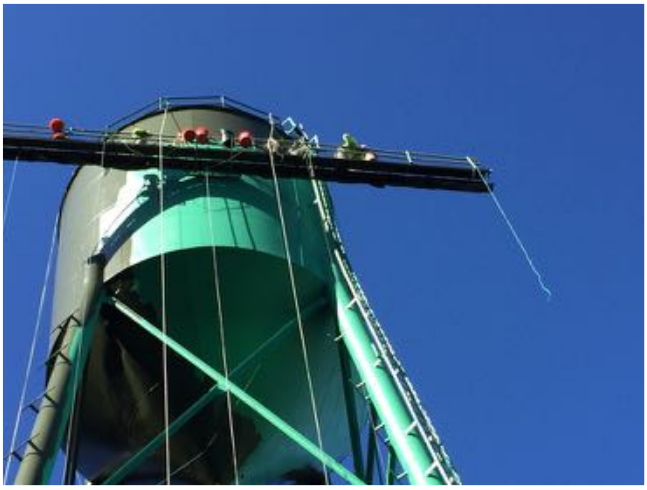

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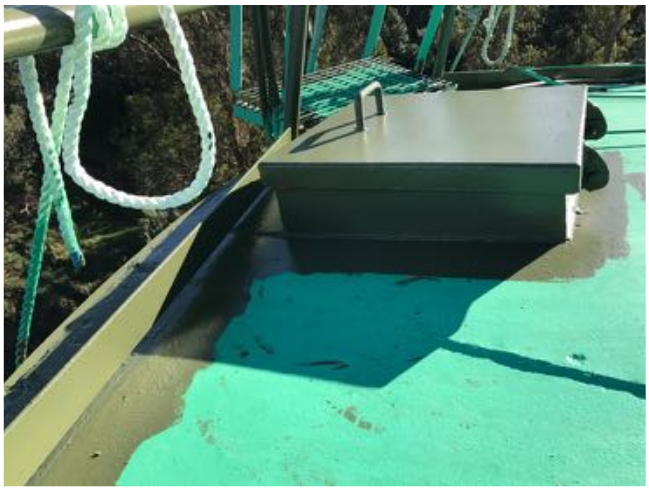


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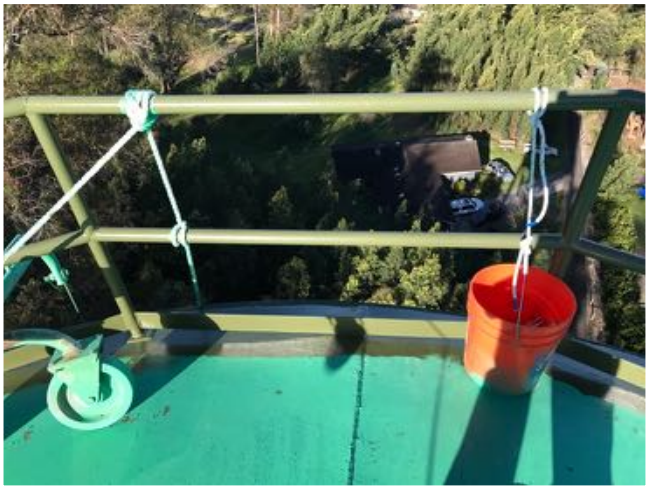



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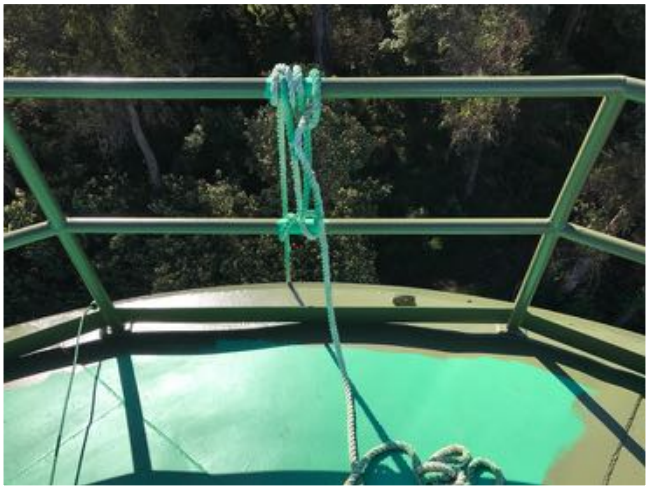



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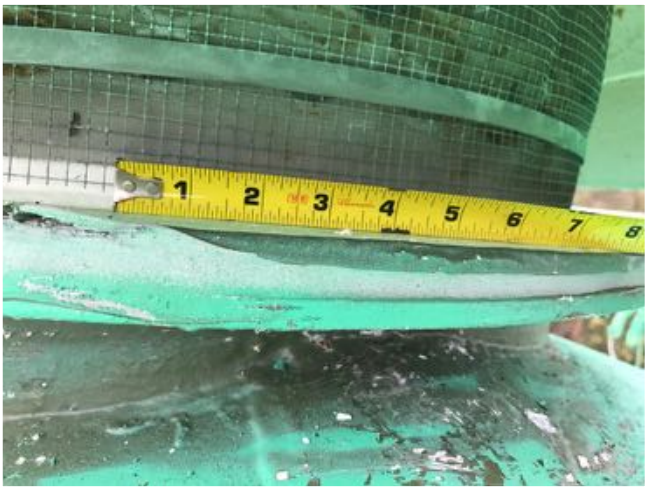

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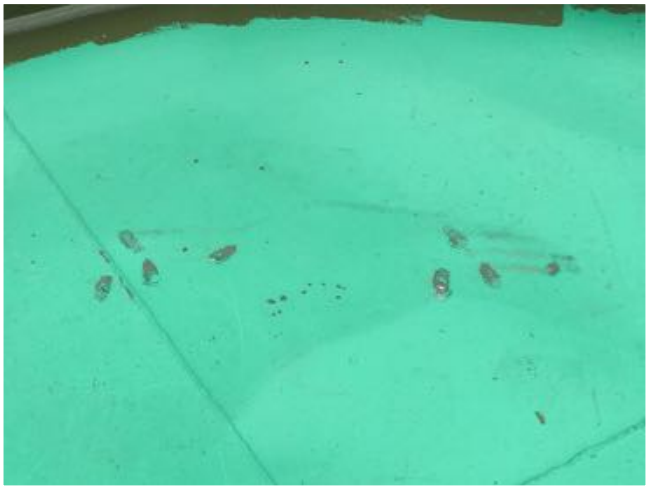

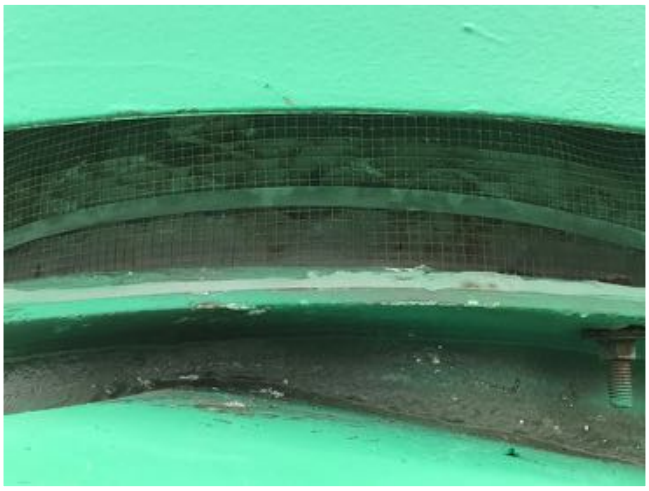
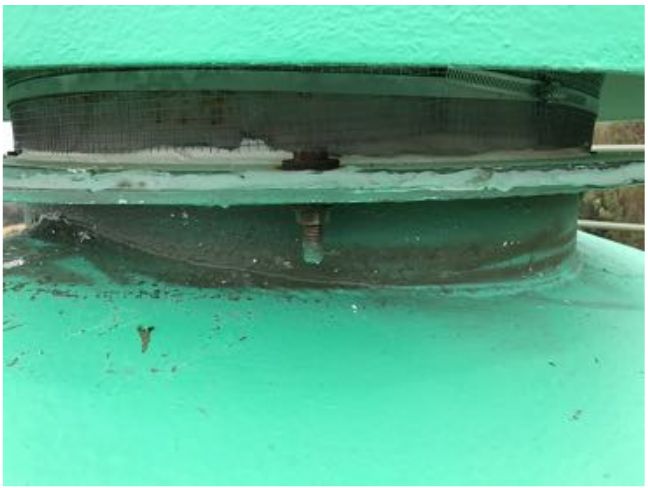


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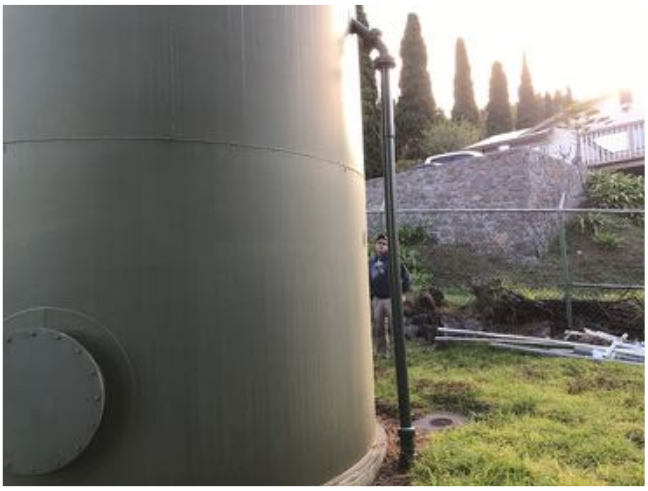

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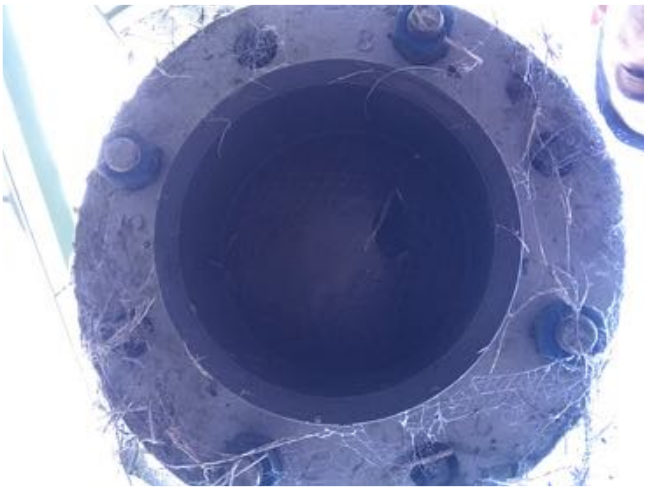

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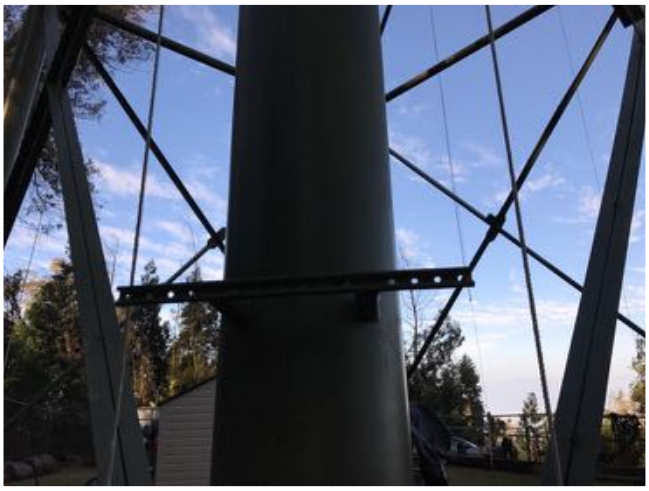

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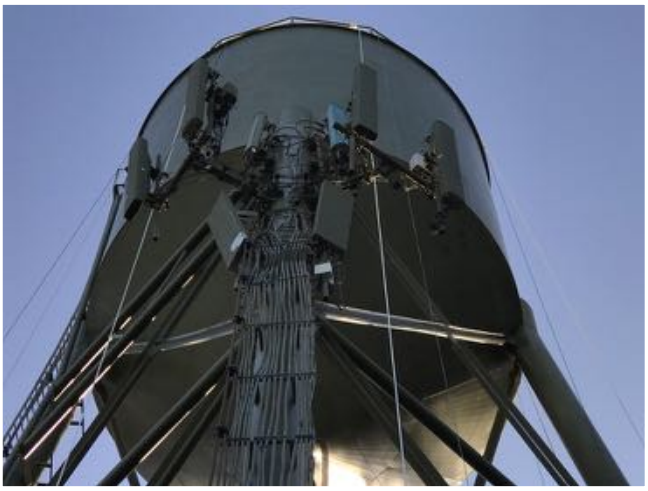

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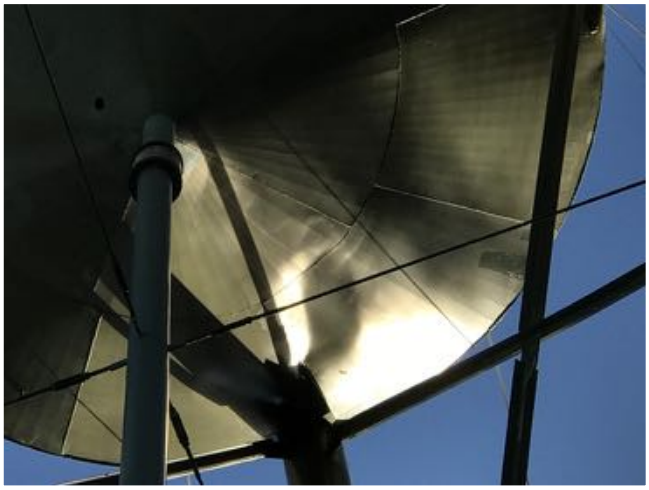
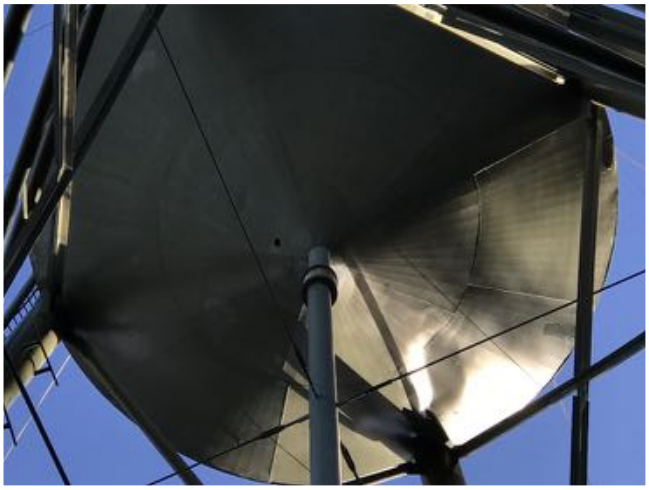



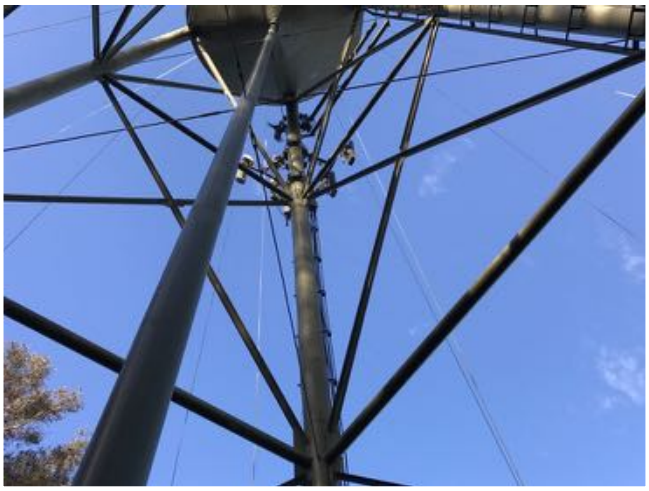

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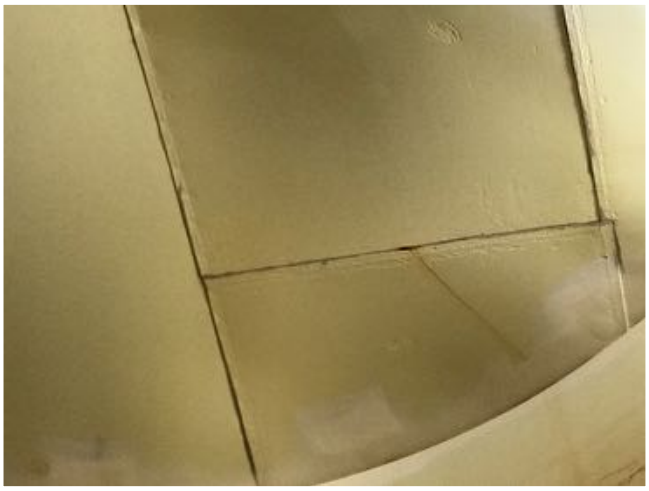

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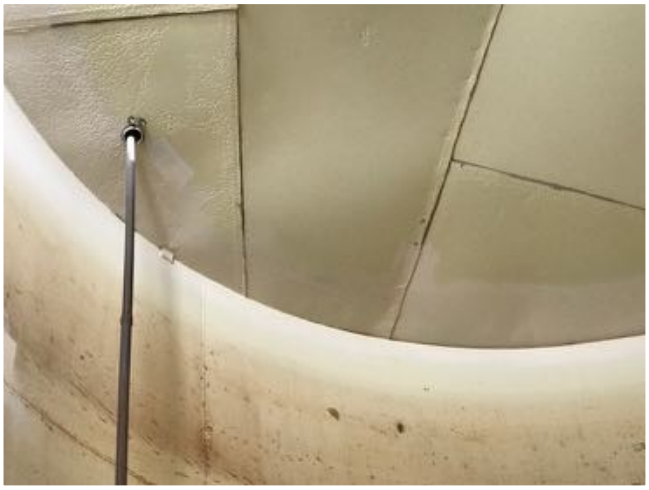



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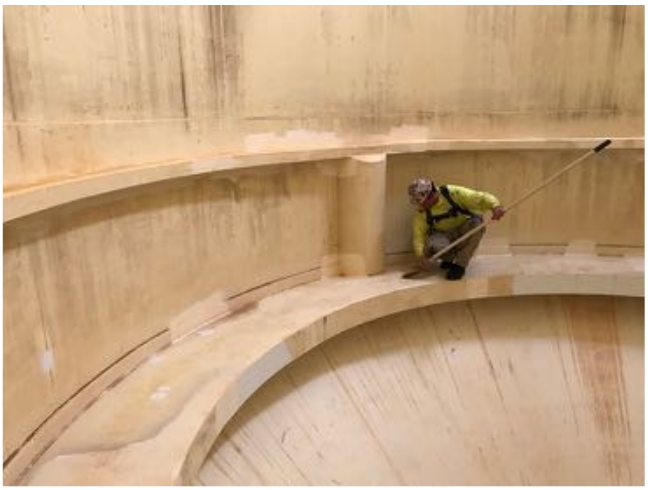


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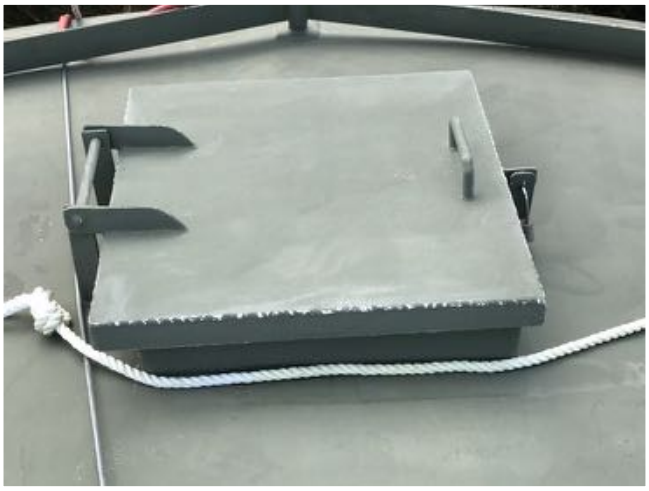

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