CITY OF MINERAL POINT, WISCONSIN

August 2019

400,000 Gallon Capacity
Tower Number One - Hydropillar

Elevated Water Tank Inspection Report

KLM Project MN3961

1976 Wooddale Drive, Suite 4 | Woodbury, MN 55125
(651) 773-5111 | Fax (651) 773-5222

Table of Contents

1.0|PROJECT INFORMATION

KLM Project No.: MN3961 **Customer P. O. Number:** N/A

Customer: City of Mineral Point, Wisconsin **Phone:** 608-987-3442

Street/City/State/Zip: 137 High Street, Mineral Point, WI 53565

Customer Contact: Pat O'Flahrity, Water and Wastewater Superintendent

Tank Owner: City of Mineral Point, Wisconsin **Phone:** 608-642-1698 (cell)

Tank Owner Contact: Bart Nies, P.E., City Engineer

Owner's Tank Designation: Tower Number One - Hydropillar

Tank Description: Hydropillar

Tank Street Location: Intersection of Ridge and Church Streets, Mineral Point, WI 53565

Purpose of Inspection: Condition Assessment

Date of Inspection: August 2, 2019

Inspected By: Devin Severson, NACE #78234 and Gabriel Roeder, NACE #63604

Type of Inspection: KLM Standard ROV Evaluation

Manufacturer: HydroStorage/PDM **Construction Date:** 1985

Serial No.: H4586 **Design Code:** AWWA D100-84

Capacity: 400,000 gallons

Type of Construction: Welded

Tank Diameter: ~49-feet

Height: Overall ~120-feet

Height to: HWL 126'-10" LWL 87'-6"

Type of Access to Tank Interior: Drywell tube to manway on roof

Tank Construction Drawings: Upon request from City

Previous Inspection Records: None available to KLM

EXISTING COATING INFORMATION

	Interior Wet	Interior Dry	Exterior
Date Last Coated	1985	1985	1985
Full or Spot Repair	Full	Full	Full
Coating Contractor	Larson Tank Company	Larson Tank Company	Larson Tank Company
Surface Preparation	Blast	Blast	Blast
Paint System	Unknown	Unknown	Unknown
Paint Manufacturer	Unknown	Unknown	Unknown
Lab Lead Test Paint Chips	Yes	Yes	Yes

City of Mineral Point, Wisconsin

400,000 GALLON CAPACITY
TOWER NUMBER ONE - HYDROPILLAR

2.0|EXECUTIVE SUMMARY

The tank was evaluated on the interior and exterior in conformance with the following:

a. KLM Engineering, Inc. Proposal.

b. General guidelines of AWWA Manual M42 Appendix C “Inspecting and Repairing Steel Water Tanks, and Elevated Tanks for Water Storage.”

c. KLM "Procedures and Guidelines for Inspecting Existing Steel and Concrete Water Storage Tanks."

d. Appendix D Inspection and Evaluation Methods.

2.1|Structural Examination Summary

Based on the inspection data, it appears that some miscellaneous structural modifications and repairs are required. These modifications and repairs serve to bring the tank into compliance with OSHA regulations, AWWA standards, as well as allow for better coating bonding, allow for safer access in and on the tank and, in some cases, removing unnecessary items.

2.2|Coating Evaluation Summary

2.2.1|Lead and Chromium Content Analysis

The total lead and chromium content of the interior and exterior coatings was analyzed. The results in Appendix D show a 0.0066 percent lead content for the interior wet coating, a 0.0058 percent lead content for the exterior dry coating, and a 0.0052 percent content for the interior dry coating. Current State regulations classify neither the interior nor the exterior coatings as lead-based paint. Chromium levels in the test samples indicate levels from 0.0019 to 0.0022 percent chromium. These chromium levels are not high enough to be a concern in the waste streams generated during reconditioning.

2.2.2|Interior Wet Coating

According to Owner provided information, the interior wet coating has not been reconditioned since the tower was originally coated by Larson Tank Company in 1985.

The interior wet coating above the high-water line (HWL) is in fair condition with approximately five (5) percent visible coating failures. The failures are located predominantly in difficult to coat locations such as along roof plate seams, where the roof rafters meet the roof plates, above the compression ring, and around the roof hatches and drywell tube welds. Staining from these failures is visible on many of the surfaces but doesn’t affect the coating performance.

Below the HWL, the condition of the interior wet coating is very difficult to assess. A significant amount of scale, staining, sediment, and deposits exist on the tank shell. The estimated coating failures is approximately five (5) percent. Visible failures consist of blistering around random weld seams, pinhole corrosion, and coating delamination. Sediment accumulation is estimated to be one (1) to two (2) yards.

Overall, the interior wet coating is in fair condition. Due to the age of the coating, it is not considered repairable and has far outlived a typical coating service life. Typical service life of a properly maintained coating is generally 20 to 25 years. Due to condition and age, the coating should be replaced within 12 months.

See photos in Appendix A.

2.2.3|Interior Dry Coating

The interior dry coating is also indicated to be original to the tower construction in 1985.

The condition of the interior dry coating is in two different categories. The coating on the interior of the fluted pedestal is in good condition with approximately one (1) percent visible failures. Typical damage due to maintenance activities is about the extent of the failures. While on the other hand, the coating in the drywell tube, on the bowl, and on the platforms is showing signs of significant failure.

The interior dry coating in the drywell tube, on the bowl, and on the platforms is in poor condition with fifteen (15) to twenty (20) percent visible failures. Moderate surface corrosion is occurring as a result of widespread coating cracking and delamination. Pinhole corrosion can also be found on many of these surfaces.

The coating in the drywell tube, on the bowl, and on the platforms should be replaced within the 12 months at the same time as the interior wet coating. The fluted pedestal should be spot repaired in localized areas but does not need replacement until the following reconditioning in twenty years.

See photos in Appendix A.

2.2.4|Exterior Coating

The exterior coating is also indicated to be original to the tower construction in 1985.

The tower pedestal is a unique material not commonly found in water tower construction. It is constructed of weathering steel, or commonly referred to as COR-TEN steel, that is intended to remain uncoated and create a self-developing protective layer of mild corrosion. The mild corrosion layer is what gives the pedestal its current rust coloration. The pedestal steel appears to be in good condition with no repairs required.

The exterior coating on the tank is in poor condition with over twenty percent (20) percent visible failures. Failures consist of top and base coat deterioration, exposed steel substrate in numerous locations resulting in spot corrosion, and widespread fade and chalking due to UV expose. A large amount of bird droppings is covering the roof as well. The original coating is assumed to be around 35 years old and surpassed its normal service life. Due to the coating age and condition, the exterior is not a candidate for repairs or an overcoat. The coating should be removed and replaced in its entirety at the same time as the interior wet and dry coatings, within 12 months.

See photos in Appendix A.

2.3|Repair and Reconditioning Cost Estimate

The costs for structural repairs and replacing the interior and exterior coatings, not including the interior pedestal which can remain, (including the containment) are estimated between $560,000 and $600,000. This estimate is based on current pricing and does not include costs for engineering and/or inspection services. For up-to-date competitive bids the project should be bid 9 to 12 months before the scheduled starting date.

An experienced tank-coating contractor with the proper crew and equipment should be able to complete the project in ten (10) weeks. At the time of reconditioning, the tower will need to be drained and remain off-line during interior

structural modifications, abrasive blasting and painting. However, most of the exterior structural modifications can be performed prior to draining, with the tank in-service.

2.4|Remaining Tank Life

Based on the inspection data, if the recommended structural repairs and coating replacement are completed within the next year, the tank will be satisfactory for continued service, provided that it is inspected and maintained regularly.

The tank and coating should first be inspected within the warranty period and every three (3) to five (5) years thereafter. New interior and exterior coatings, if applied and maintained properly, should last at least 20 years.

3.0|RECOMMENDATIONS

The photographs referred to in this section are in Appendix A. All drawings are found in Appendix B. The surface preparation requirements for all repairs as well as the requirements for welding are described in Appendix C. The exterior and interior paint chip lead tests are in Appendix E.

Based on an evaluation of the inspection data, the recommendations are:

3.1|Interior Wet Structural

3.1.1 Seal weld the following joints. Seal welding these joints will prevent rust streaking and corrosion in areas inaccessible to paint.

a. The overlap seam between the dollar plate and roof plates,
b. The inside joint between the drywell tube and the dollar plate,
c. The inside of the dollar plate butt joint,
d. The inside joint between the wet access manway and the dollar plate,
e. The inside joint between the roof vent and the dollar plate.

See photos 2 through 5.

3.1.2 Urethane/epoxy caulk the following joints. Seal welding these joints is too cost prohibitive, but the result is similar. Caulking will minimize rust streaking and corrosion in areas inaccessible to paint.

a. Both sides of the seam between the compression ring and the dollar plate,
b. Both sides of the intermittently welded seam of the roof rafters,
c. The roof plate lap joints (adjacent to the roof rafters).
d. The overlap joint where the roof plates overlap the shell.

See photos 2 through 4.

3.1.3 Weld all bolted roof-framing connections with 3/16-inch fillet weld all around to seal. After welding, remove all nuts and bolts. This will conform to AWWA D100-11. See photo 4.

3.1.4 Remove the existing cable safety climb device from the interior wet ladder. Install an anchor point and Self-Retracting Life-Line (SRL) to allow for safe access while ascending and descending the ladder. Refer to KLM Drawing No. 26. See photo 7.

3.1.5 Remove the existing cathodic protection system from inside the reservoir and in the base of the tower in its entirety. Remove all conduit, cables, junction boxes, etc. Patch any resulting holes according to Appendix C and AWWA D100-11. See photos 14, 19, and 44.

3.1.6 Seal weld the joint between the stiffener rings and the drywell tube to comply with AWWA D100-11. See photos 8 and 9.

3.1.7 Remove all weld spatter and scab marks below the HWL by air arc gouging, cutting torch, and/or grinding to comply with AWWA D100-11. Prepare the surface per Appendix C. It is estimated that there are 50 man-hours to perform the work. See photos 11 and 12.

3.1.8 Remove approximately ten (10) rigging tabs from the bowl stiffener ring and bowl and grind smooth the area as described in Appendix C. These tabs were required during the erection phase and are no longer needed. See photos 15 and 16.

3.1.9 Install a davit arm on the existing bowl pressure manway. See KLM Drawing No. 37a and photo 18.

3.1.10 Replace the gasket on the 24-inch diameter round bowl manway. See photo 18.

3.1.11 Install two (2) bars on top of the fill pipe to hinder materials from falling into the pipe. See photo 20.

3.1.12 Install a Grid-Bee GS-9 Submersible Mixer in the tower to provide mixing capabilities that reduce the likelihood and magnitude of ice formation in cold weather and prevent stratification in warm weather, improving water quality and reducing the necessity of chemical additives such as chlorine. Refer to KLM Drawing 63.

3.2|Interior Wet Coating

3.2.1 The interior wet coating above the high-water line (HWL) is in fair condition with approximately five (5) percent visible coating failures. The failures are located predominantly in difficult to coat locations such as along roof plate seams, where the roof rafters meet the roof plates, above the compression ring, and around the roof hatches and drywell tube welds. Staining from these failures is visible on many of the surfaces but doesn't affect the coating performance.

3.2.2 Below the HWL, the condition of the interior wet coating is very difficult to assess. A significant amount of scale, staining, sediment, and deposits exist on the tank shell. The estimated coating failures is approximately five (5) percent. Visible failures consist of blistering around random weld seams, pinhole corrosion, and coating delamination. Sediment accumulation is estimated to be one (1) to two (2) yards.

3.2.3 Overall, the interior wet coating is in fair condition. Due to the age of the coating, it is not considered repairable and has far outlived a typical coating service life. Typical service life of a properly maintained coating is generally 20 to 25 years. The coating should be replaced within the next year. See photos 2 through 13, 15, 16, and 18 through 20.

3.2.4 After structural repairs are completed, all the reservoir surfaces should be abrasive blasted to an SSPC-SP-10 Near White Metal Blast and coated with a zinc/epoxy system (similar to the Tnemec Series 91-H20 Hydro-Zinc/Series N140 Pota-Pox Plus Epoxy coatings or Sherwin Williams epoxy equivalent).

3.3|Cathodic Protection System (C.P.)

3.3.1 The reservoir has a submerged C. P. system that is not in working condition and should be removed, see 3.1.5. Although it is considered an inexpensive form of interior corrosion protection, it most likely is not required if the coating is applied and maintained properly. The cost of a new Cathodic Protection System is not included in the Engineer's Cost Estimate.

3.4|Interior Dry Structural

3.4.1 Replace approximately five (5) existing light fixtures with new LED fixtures similar to the Lithonia Lighting OLVTWM. See photo 22.

3.4.2 Replace the cable style safety climb device on the drywell tube ladder with a new OSHA approved cable style climb device. The climb device is currently painted, which does not meet OSHA regulations. See photos 22 through 24, 27, 29, and 36.

3.4.3 Install cable style safety climb devices on all remaining ladders in the pedestal to comply with OSHA regulations. See photos 31, 35, 37 through 40, and 46.

3.4.4 Install approximately eight (8) half-moon cable brackets inside the drywell tube, equally spaced, for the attachment of electrical and coaxial cables. Remove all unused clamps, brackets, etc. Move cables and conduit from the side of the ladder to the cable brackets to bring the ladder into OSHA compliance. See KLM Drawing No. 4a and photos 21 through 29.

3.4.5 Install a new 24-inch diameter, pressure style manway and step-off platform in the drywell tube, approximately 90-degrees from the bowl manway. This will improve the ventilation during reconditioning and bring the tank into compliance with OSHA Confined Space Entry requirements. Refer to KLM Drawing No. 37a and 37c and photo 29.

3.4.6 Install a new stainless-steel bowl drain valve similar to those designed by General Construction or Babco Valves. Include a clear, rigid, high pressure hose connected to the overflow pipe. Include the installation of a new heavy-walled coupling in the bowl. This will facilitate cleaning and draining the bowl below the inlet pipe level. Install a hand hole in the drywell tube for access to the new valve from the drywell tube ladder. See KLM Drawing No. 33 and photo 35.

3.4.7 Install approximately ten (10) pedestal stand-off brackets in the pedestal at 8-foot maximum spacing for the mounting of the electrical and coaxial cables. Move the electrical conduits along the ladders to the stand-off bracket to bring the ladders into OSHA compliance. See KLM Drawing No. 4b and photos 39, 40, 44, and 46.

3.4.8 Seal weld approximately five (5) lap seams on the dry side of the drywell tube. Refer to photos 24 and 29.

3.4.9 Seal weld the top side seams of the plates making up the condensate ceiling floor and remove rigging tab. See photos 39 and 41.

3.4.10 Install a port in the center of the condensate platform floor and bottom of the drywell tube to facilitate containment during the next reconditioning. See KLM Drawing No. 45 and photos 36, 41 and 46.

3.4.11 Verify the condensate platform drain is free from obstruction. Replace the drainpipe if necessary. See photos 41 and 42.

3.4.12 Replace the existing foil wrap around the fill pipe insulation with a protective aluminum jacket. Replace any insulation damaged in the process. See photos 38 through 41, 43 through 46, and 49 and 50.

3.4.13 Replace the non-functioning sample taps in the valve pit and pump house with new taps per WIDNR requirements. See photos 49 and 50.

3.4.14 Replace the light fixture in the valve pit with a new LED fixture similar to the Lithonia Lighting OVTWM.

3.4.15 The sump pump in the valve pit does not appear to be functional. Replace the pump with a new commercial grade sump pump. See photo 51.

3.5|Interior Dry Coating

3.5.1 The condition of the interior dry coating is in two different categories. The coating on the interior of the fluted pedestal is in good condition with approximately one (1) percent visible failures. Typical damage due to maintenance activities is about the extent of the failures. While on the other hand, the coating in the drywell tube, on the bowl, and on the platforms is showing signs of significant failure.

3.5.2 The interior dry coating in the drywell tube, on the bowl, and on the platforms is in poor condition with fifteen (15) to twenty (20) percent visible failures. Moderate surface corrosion is occurring as a result of widespread coating cracking and delamination. Pinhole corrosion can also be found on many of these surfaces.

3.5.3 The coating in the drywell tube, on the bowl, and on the platforms should be replaced within the next year. The fluted pedestal should be spot repaired in localized areas but does not need replacement until the following reconditioning in twenty years. See photos 21 through 48.

3.5.4 After structural repairs are completed, the surfaces described should be abrasive blasted to an SSPC-SP-6 Commercial Blast Clean and replaced with a zinc/epoxy coating system similar to the Tnemec Series 91-H20 Hydro-Zinc/Tnemec Series N140 Pota-Pox Plus or Sherwin Williams epoxy equivalent.

3.6|Exterior Structural

3.6.1 Replace the drywell tube manway lid with an aluminum style lid. The existing lid is oversized and can be a hinderance to open. Install a stop chain connecting the manway cover at the top of the drywell tube to the manway curb and locking mechanism on the dry side. This will limit the angle of travel of the cover, (prevent the cover from opening 180 degrees), support it while open, and assist climbers in opening and closing the cover. See KLM Drawing No. 11 and photos 52 through 54.

3.6.2 To prevent trespassing, install a padlock on the roof access manway. Replace the handle on the roof access manway cover to accept a lock. See photos 21 and 22. The cost of a new lock is not included in the Engineering Cost Estimate.

3.6.3 Install an anchor point on the exterior (roof side) of the drywell tube for securing safety harnesses with lanyards during egress and transitioning from the drywell tube safety climb device to the tower roof. Refer to KLM Drawing No. 25 and photo 52.

3.6.4 Replace the tank vent/finial with a 24-inch diameter aluminum pressure pallet style vent, similar to the one shown on KLM Drawing No. 8a. See photos 52 and 53. The new vent and vent screen design should meet AWWA D100-11 and local Health Department Regulations. The removable top will improve ventilation, provide access to the tank interior during reconditioning, and aid in compliance with OSHA Confined Space Entry Requirements.

3.6.5 Install two (2) 24-inch diameter, hinge covered, roof ventilation manways, approximately 120 degrees from the existing roof manway, set outside the new handrail. See photos 52 and 55. This will provide additional ventilation during the interior surface preparation and coating and aid in compliance with OSHA Confined Space Entry requirements. See KLM Drawing No. 10a.

3.6.6 Install an 18-foot (diameter) roof handrail conforming to OSHA regulations to enclose the existing roof manway(s) and the vent/finial. See KLM Drawing No. 15b and photos 52 through 56. Install a non-skid walkway within the area of the new hand railing.

3.6.7 Relocate the antennas to the new handrail and remove all existing antenna mounts. Grind off bracket welds and seal weld any holes remaining per Appendix C. See photos 52 through 55.

3.6.8 Remove the non-functional bird deterrent devices from the roof. See photo 55.

3.6.9 Replace the double aviation light with a new double LED style aviation light similar to Hughey & Phillips L-810 and relocate to a mount on the newly installed handrail. Remove the existing mount and repair surface as required. Modify/replace electrical conduits and wiring as necessary. See photos 52 through 54.

3.6.10 Install four (4) 4-inch diameter couplings at the top of the drywell tube. Relocate existing coaxes upon completion of painting. Install cover plates and seal weld over all unused and abandoned coaxial cable penetrations. See KLM Drawing No. 5a and photos 52 and 53. Remove all unused cables, brackets, etc.

3.6.11 Replace the steel double doors in the base of the pedestal. The doors have corroded through in the corners and need to be replaced. See photos 47 and 61.

3.6.12 Install an overflow pipe screen retainer and screen meeting Health Department regulations. Use a corrosion resistant, heavy-gauge, No. 4 mesh screen. See KLM Drawing No. 54 and photos 62 and 63.

3.7|Exterior Coating

3.7.1 The tower pedestal is a unique material not commonly found in water tower construction. It is constructed of weathering steel, or commonly referred to as COR-TEN steel, that is intended to remain uncoated and create a self-developing protective layer of mild corrosion. The mild corrosion layer is what gives the pedestal its current rust coloration. The pedestal steel appears to be in good condition with no repairs required.

3.7.2 The exterior coating on the tank is in poor condition with over twenty percent (20) percent visible failures. Failures consist of top and base coat deterioration, exposed steel substrate in numerous locations resulting in spot corrosion, and widespread fade and chalking due to UV expose. A large amount of bird droppings is covering the roof as well. The original coating is assumed to be around 35 years old and surpassed its normal service life. Due to the coating age and condition, the exterior is not a candidate for repairs or an overcoat. The coating should be removed and replaced in its entirety at the same time as the interior wet and dry coatings, within the next year. See photos 52 through 59, 61, and 65.

3.7.2 After structural repairs are completed, the exterior coated surfaces should be abrasive blasted to an SSPC-SP6 Commercial Blast Clean and replaced with a zinc/epoxy/urethane/fluoropolymer coating system (similar to the Tnemec Series 91-H20 Hydro-Zinc/Series N140 Pota-Pox Plus Epoxy/Series 73 Endurashield/Series 701 Hydroflon coatings).

3.7.3 The COR-TEN column should be pressure washed after reconditioning the tank above to remove the organic growth accumulated on its various surfaces. See photos 57 through 64.

3.8|Site and Environmental Considerations

3.8.1 The tower is located in Watertower Park at the intersection of Ridge Street and High Street. The brick well house is approximately 30 feet to the south of the tower. Being located in a park, the area surrounding the tower is well kept with some manicured shrubbery around the base and no perimeter fencing. Ridge Street is only 30 to 40 feet to the west and some larger trees are located approximately 20 feet to the east. Most of the playground equipment is located to the east of the tower.

3.8.2 Soil grading around the tower seems to shed water away from the base of the tower adequately. See photos 61 through 64.

3.8.3 A hydrant is located near the tower that can be used for tower maintenance and appears to have valving that would allow it to be taken out of service. See photo 64.

3.9|Telecommunications Considerations

3.9.1 The tower has some telecommunications equipment, including antennas, coaxial cables, support brackets and other miscellaneous equipment. The Owner is advised to maintain accurate records of each of the antenna sites on the tower, including As-Built Drawings, site manager and owner contact information, upgrades performed, and future plans for antenna installations or upgrades. These records will help facilitate the future reconditioning with a minimal amount of effort on the Owner's part.

3.9.2 Working around and protecting the telecommunications equipment, including antennas, coaxial cables, support brackets, and other miscellaneous equipment during future reconditioning will incur additional costs. The antenna owner(s) should be responsible for these expenses under clause(s) in the antenna lease agreements. These costs are not included in the Engineer's Cost Estimate, as they vary considerably from tower to tower.

3.9.3 Prior to reconditioning, in accordance with the lease requirements of each antenna owner, the City of Mineral Point should notify the telecommunications owners or manager of the work to be performed. The City should also determine whether: a) the antenna owners will pay the additional costs to work around and protect the antennas; b) the antenna owners will temporarily remove their antennas and associated equipment to facilitate reconditioning; or c) the City of Mineral Point will have to pay for these costs themselves.

4.0|REPAIR AND RECONDITIONING OVERVIEW

KLM recommends repairs be completed within 12 months. An experienced tank-coating contractor with the proper crew and equipment should be able to complete the project in ten (10) weeks.

KLM ENGINEERING, INC.

Report prepared by:

Ben J Feldman

Ben Feldman, P.E.
Project Engineer
MN License No. 49598

Report reviewed and certified by:

Rodney Ellis

Rodney Ellis
Vice President/COO
NACE Certified Coatings Inspector No. 1686
AWS/CWI 04040311

August 6, 2019

APPENDIX A

PHOTOGRAPHS

Photo No. 1
Overall view of tower

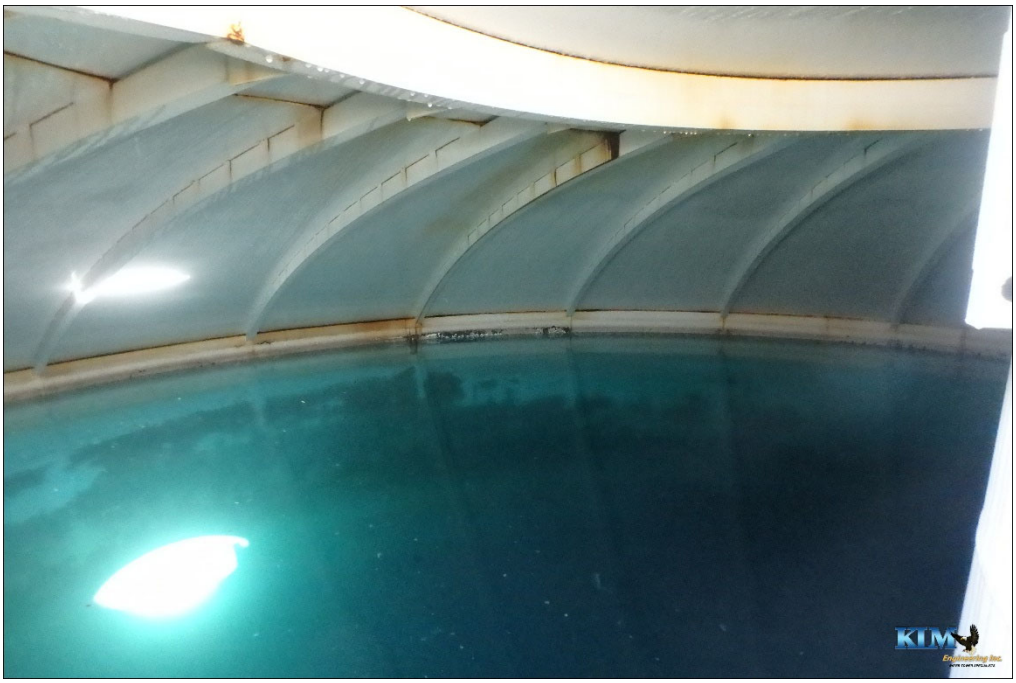


Photo No. 2
Overall condition of interior wet coating above HWL

Photo No. 3
Condition of interior wet coating on roof around compression ring

Photo No. 4
Condition of bolted rafter connections on compression ring

Photo No. 5
Condition of interior wet coating around drywell tube and manway access

Photo No. 6
Condition of top of overflow pipe; view from below HWL

Photo No. 7
Condition of interior wet coating on drywell tube below HWL

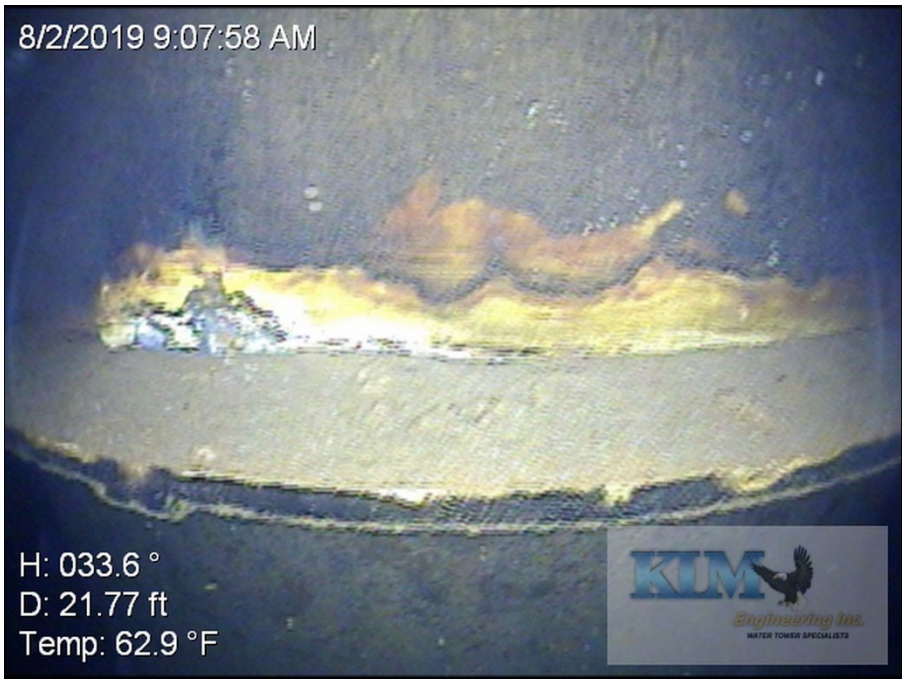


Photo No. 8
Condition of interior wet coating on drywell tube at stiffener ring
Rust coloration due to corrosion

Photo No. 9
Condition of interior wet coating on drywell tube at a stiffener ring

Photo No. 10
Condition of interior wet coating just below HWL
Dark scale formation on shell

Photo No. 11
Condition of interior wet coating on shell wall
Heavy scale and staining visible; coating blistering and pinhole corrosion along welds

Photo No. 12
Condition of interior wet coating on shell wall
Heavy scale and staining visible; coating blistering and pinhole corrosion along welds

Photo No. 13
Condition of interior wet coating on shell wall
Heavy staining and scale development

Photo No. 14
Submerged cathodic protection system

Photo No. 15
Condition of interior wet coating near tension ring
Sediment accumulation and scale formation visible

Photo No. 16
Condition of interior wet coating near tension ring
Heavy sediment accumulation visible

Photo No. 17
Heavy sediment accumulation and scale deposits in bowl

Photo No. 18
Heavy sediment accumulation and scale deposits in bowl
Bowl manway visible

Photo No. 19
Condition of interior wet coating at base of drywell tube
Cathodic protection cables visible

Photo No. 20
Condition of fill pipe in bowl
Sediment accumulation visible around pipe

Photo No. 21
Condition of interior dry coating at top of drywell tube
Significant peeling and surface corrosion occurring

Photo No. 22
Condition of interior dry coating at top of drywell tube
Significant peeling and surface corrosion occurring

Photo No. 23
Condition of interior dry coating inside drywell tube; view looking down tube

Photo No. 24
Condition of interior wet coating inside drywell tube

Photo No. 25
Condition of interior dry coating inside drywell tube
Significant coating peeling and surface corrosion

Photo No. 26
Condition of interior dry coating inside drywell tube
Significant coating peeling and surface corrosion

Photo No. 27
Condition of interior dry coating inside drywell tube
Significant coating peeling and surface corrosion

Photo No. 28
Condition of interior dry coating inside drywell tube
Significant coating peeling and surface corrosion

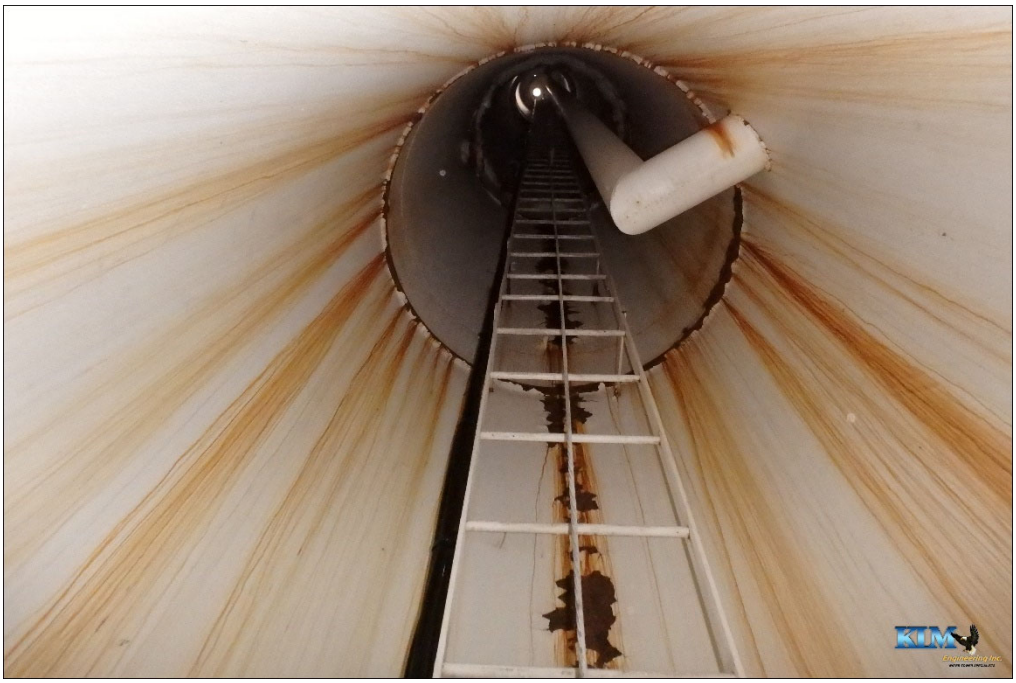


Photo No. 29
Condition of interior dry coating inside drywell tube
Significant coating peeling and surface corrosion; staining from corrosion areas

Photo No. 30
Condition of interior dry coating on bowl and drywell tube
Random locations of heavy coating peeling and surface corrosion

Photo No. 31
Condition of interior dry coating on bowl at bowl manway
Random locations of heavy coating peeling and surface corrosion

Photo No. 32
Condition of interior dry coating on bowl, drywell tube, fill pipe connection, and upper wall
Random locations of heavy coating peeling and surface corrosion

Photo No. 33
Condition of interior dry coating on bowl to wall connections

Photo No. 34
Condition of interior dry coating on drywell tube
Cathodic protection system conduit and junction box visible

Photo No. 35
Overall condition of interior dry coating at bowl platform

Photo No. 36
Condition of interior dry coating on drywell tube platform

Photo No. 37
Condition of interior dry coating on drywell tube platform

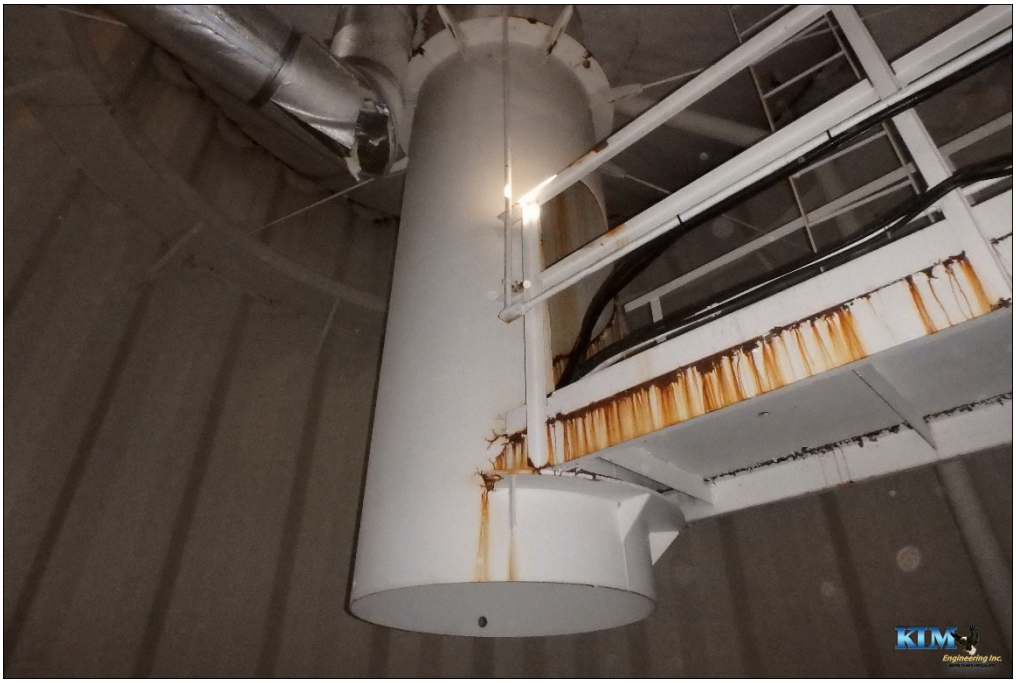


Photo No. 38
Condition of interior dry coating on drywell tube and platform

Photo No. 39
Condition of interior dry coating inside pedestal
View looking down pedestal to condensate ceiling below

Photo No. 40
Condition of access ladders and wall coating inside pedestal

Photo No. 41
Condition of interior dry coating on condensate platform

Photo No. 42
Condition of condensate platform drain-pipe connection

Photo No. 43
Overall view of conditions inside base of pedestal

Photo No. 44
Condition of pedestal interior at base
Some missing foil wrap visible

Photo No. 45
Condition of insulation and wrap on fill pipe at base of pedestal
Hatch to valve pit visible

Photo No. 46
Condition of interior dry coating on bottom of condensate platform

Photo No. 47
Condition of double access doors at base of pedestal
Doors are severely corroded in bottom corners

Photo No. 48
Condition of interior wet coating at base pedestal at double access doors
Severe corrosion occurring on doors and on door frame

Photo No. 49
Condition of piping, valves, and fittings inside valve pit

Photo No. 50
Sample tap located in valve pit

Photo No. 51
Condition of sump pump in valve pit

Photo No. 52
Overall view exterior roof condition

Photo No. 53
Condition of existing tank vent

Photo No. 54
Condition of antenna mounts, drywell tube access hatch, and double aviation beacon

Photo No. 55
Condition of exterior coating on roof
Bird droppings covering roof; non-functional bird deterrent visible

Photo No. 56
Condition of exterior coating on roof
Bird droppings covering roof

Photo No. 57
Overall condition of exterior coating on side of tank
Heavy organic growth on lower half of tank

Photo No. 58
Condition of exterior coating near base of tank
Spot and surface corrosion visible

Photo No. 59
Condition of exterior coating near base of tank
Spot and surface corrosion visible

Photo No. 60
Condition of uncoated COR-TEN steel pedestal

Photo No. 61
Condition of uncoated COR-TEN steel pedestal at base
Double access doors significantly corroded at bottom corners

Photo No. 62
Condition of overflow pipe and splash pad at base of tower

Photo No. 63
Site conditions around base of tower

Photo No. 64
Site conditions near base of tower
Hydrant for maintenance needs visible

Photo No. 65
Condition of City logo

APPENDIX B

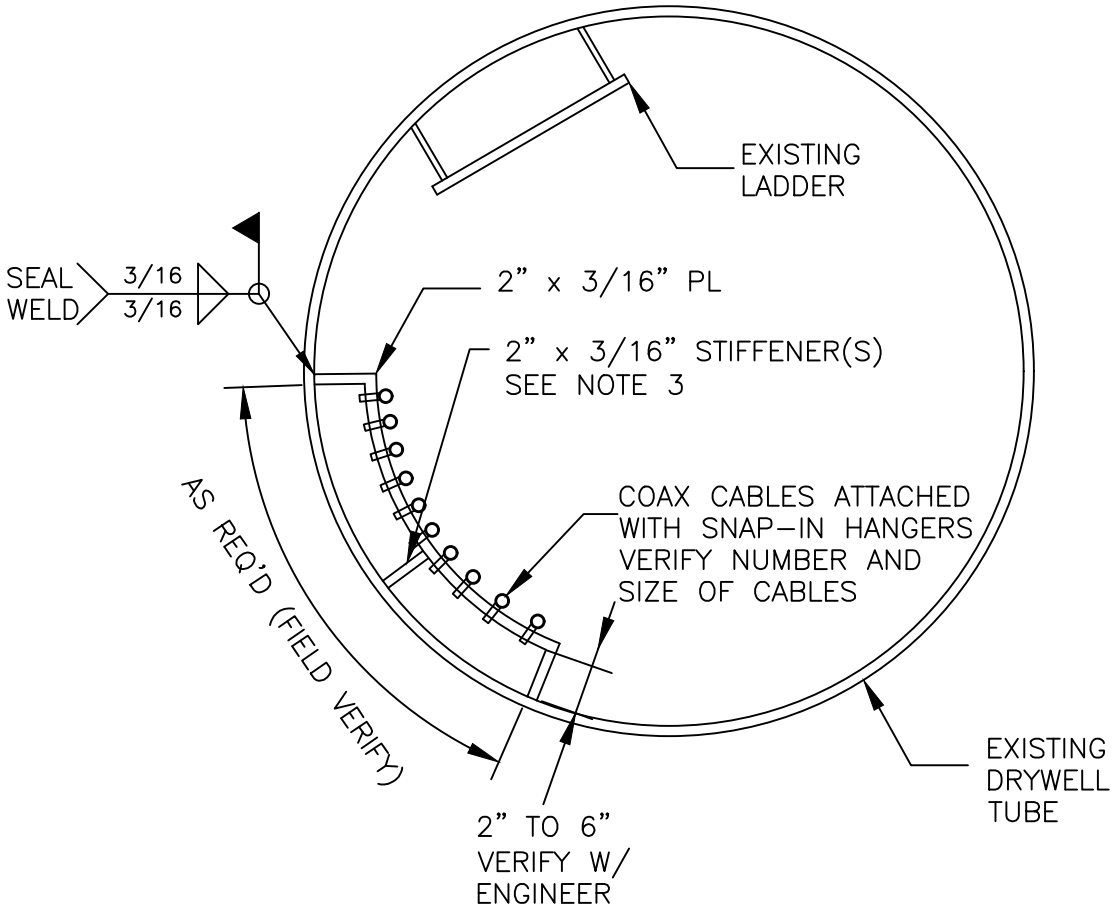
DRAWINGS

KLM ENGINEERING, INC.
1976 Wooddale Drive
Suite 4
Woodbury, MN 55125
(651) 773-5111
Fax (651) 773-5222

KLM PROJECT NO.	KLM DRAWING NO. 4a
SUBJECT DRYWELL TUBE CABLE BRACKET	
DRAWN BY MCE	DATE
CHECKED BY JJT	DATE JULY 2017

NOTES:

1. ALL WELDING SHALL BE PER AWS D1.1 LATEST EDITION.
2. ALL WELDING SHOWN IS TO BE DONE BY CONTRACTOR.
3. PROVIDE A STIFFENER AT CENTER FOR 3' TO 4' LONG BRACKETS AND PROVIDE STIFFENERS ON 2' CENTERS MAXIMUM ON LONGER BRACKETS.

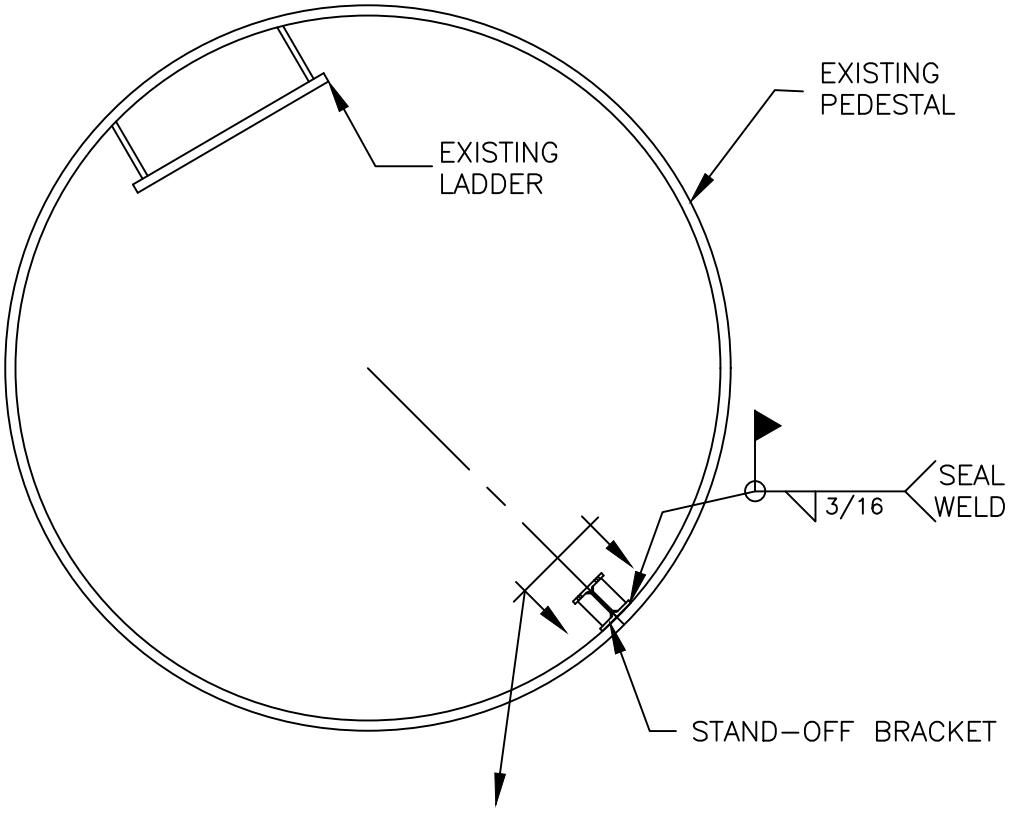


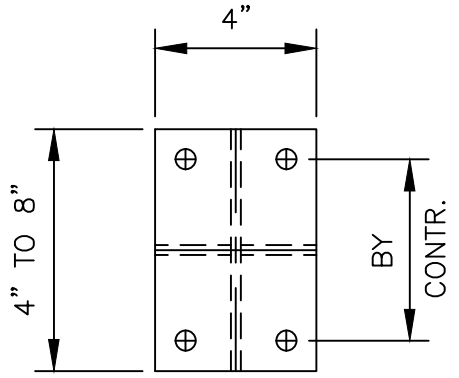
KLM ENGINEERING, INC.
1976 Wooddale Drive
Suite 4
Woodbury, MN 55125
(651) 773-5111
Fax (651) 773-5222

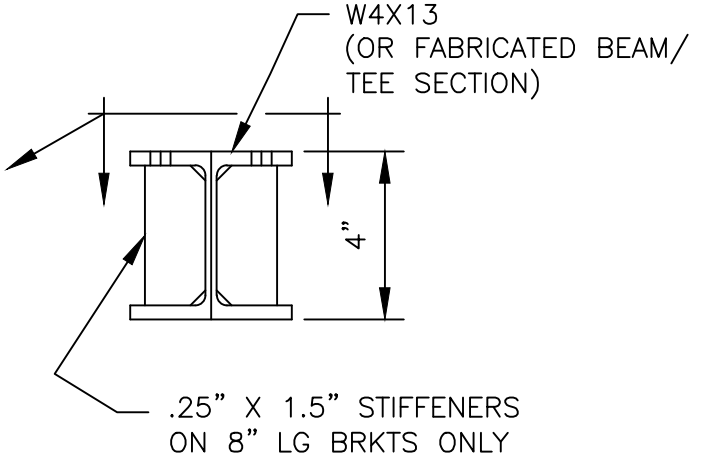
KLM PROJECT NO.	KLM DRAWING NO. 4b
SUBJECT PEDESTAL STAND-OFF BRACKET	
DRAWN BY JJT	DATE JULY 2017
CHECKED BY	DATE

NOTES:

1. ALL WELDING SHALL BE PER AWS D1.1 LATEST EDITION.
2. ALL WELDING SHOWN IS TO BE DONE BY CONTRACTOR.
3. LOCATION OF STAND-OFF BRACKETS BY CONTRACTOR WITH APPROVAL OF ENGINEER.
4. HOLE SIZE AND LOCATION BY CONTRACTOR.
5. BRACKETS 4" LONG ARE FOR ONE (1) SET OF HOLES.
6. BRACKET SPACING 8' MAXIMUM.





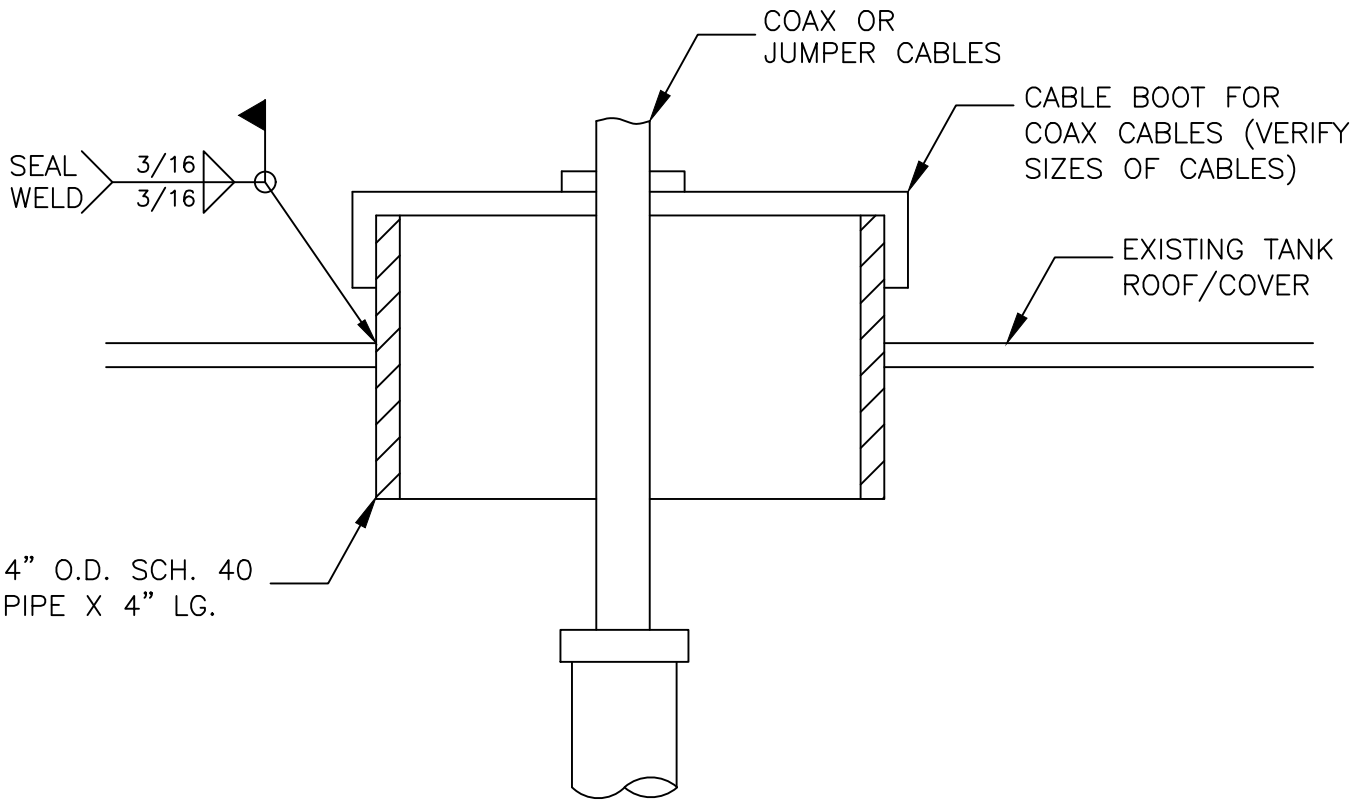


KLM ENGINEERING, INC.
1976 Wooddale Drive
Suite 4
Woodbury, MN 55125
(651) 773-5111
Fax (651) 773-5222

KLM PROJECT NO.	KLM DRAWING NO. 5a
SUBJECT ROOF CABLE PENETRATION	
DRAWN BY MCE	DATE
CHECKED BY JJT	DATE JANUARY 2018

NOTES:

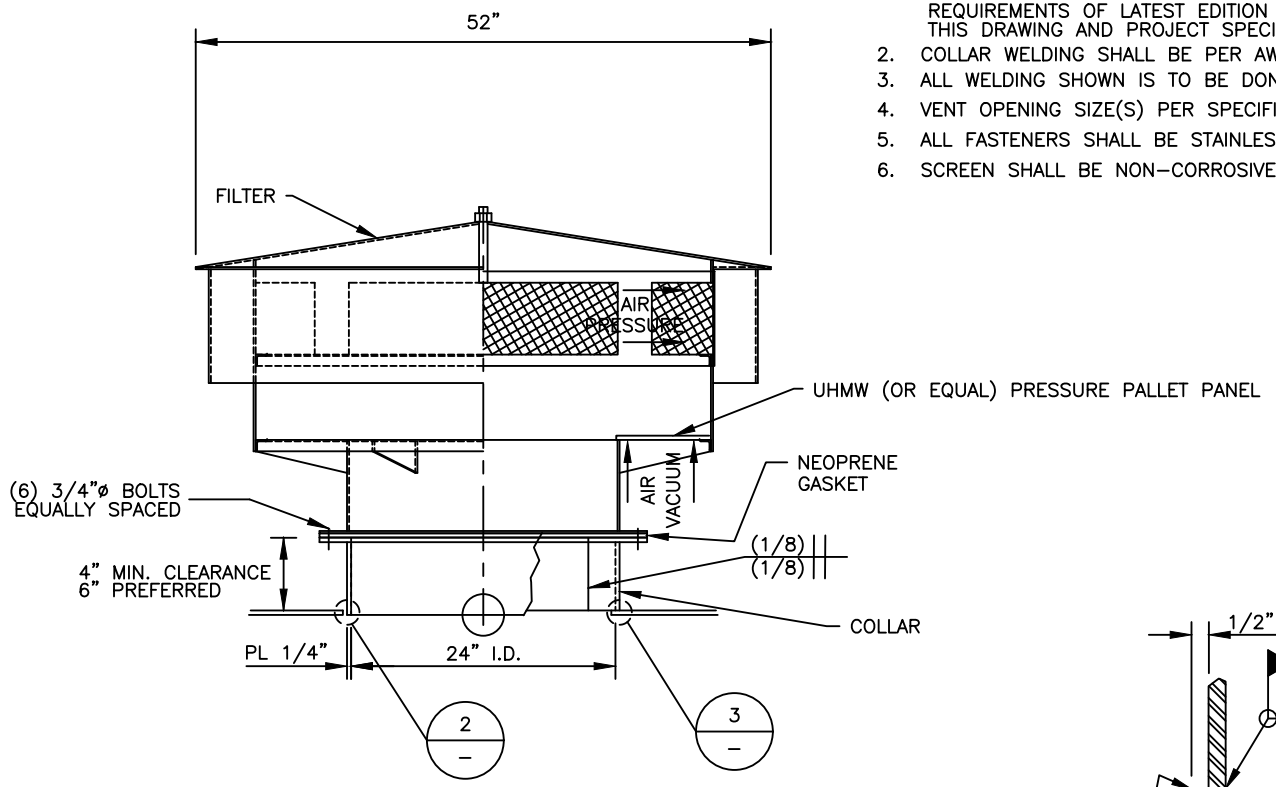
1. ALL WELDING SHALL BE PER AWS D1.1 LATEST EDITION.
2. ALL WELDING SHOWN IS TO BE DONE BY CONTRACTOR.



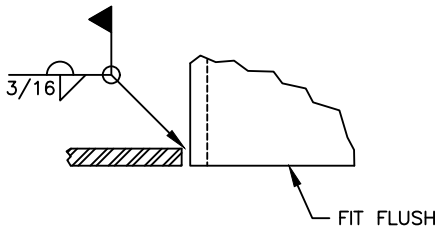
VENT SIZE	COVER DIA
24	52
20	43
18	39
16	35
12	26

NOTES:

1. FILTER MATERIAL SHALL BE ALUMINUM AND FABRICATED PER FABRICATORS OPTION BUT MUST MEET REQUIREMENTS OF LATEST EDITION OF AWWA, THIS DRAWING AND PROJECT SPECIFICATION.
2. COLLAR WELDING SHALL BE PER AWS D1.1.
3. ALL WELDING SHOWN IS TO BE DONE BY CONTRACTOR.
4. VENT OPENING SIZE(S) PER SPECIFICATIONS
5. ALL FASTENERS SHALL BE STAINLESS STEEL.
6. SCREEN SHALL BE NON–CORROSIVE #4 MESH.



1 ELEVATION



2 DETAIL–OPTION 1

3 DETAIL–OPTION 2

KLM ENGINEERING, INC.
1976 Wooddale Drive
Suite 4
Woodbury, MN 55125
(651) 773–5111
Fax (651) 773–5222

ALUMINUM

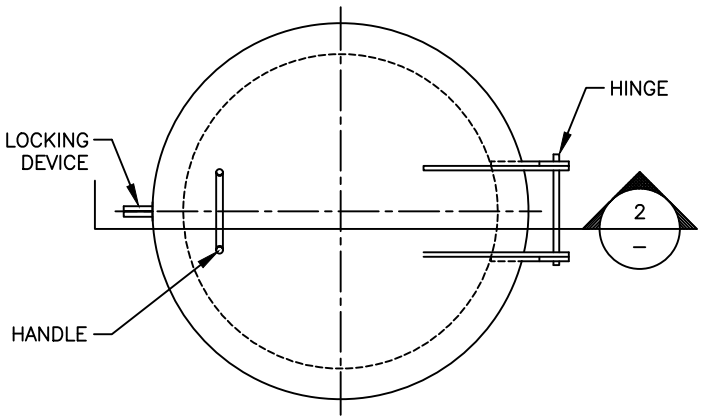
PRESSURE PALLET FINIAL VENT

DATE JULY 2018

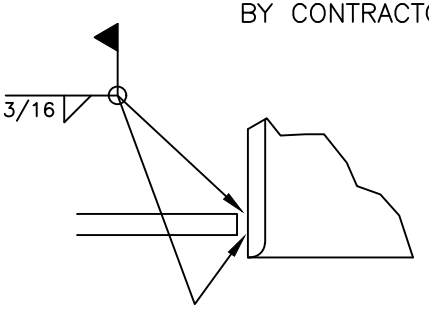
KLM DRAWING NO. 8a

NOTES:

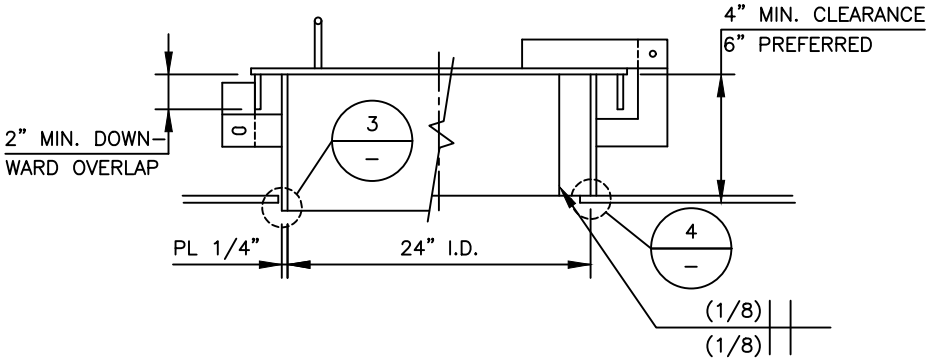
1. METHOD AND MATERIALS OF CONSTRUCTION ARE AT FABRICATOR'S OPTION, BUT MUST MEET REQUIREMENTS OF LATEST EDITION OF AWWA.
2. ALL WELDING SHALL BE PER AWS D1.1 LATEST EDITION.
3. ALL WELDING SHOWN IS TO BE DONE BY CONTRACTOR.



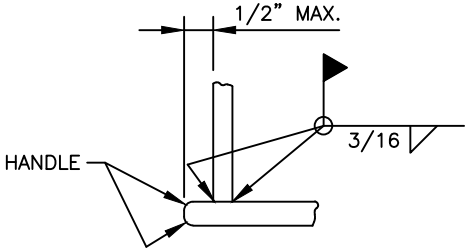
1 PLAN VIEW



3 DETAIL–OPTION 1



2 SECTIONAL ELEVATION



4 DETAIL–OPTION 2

KLM ENGINEERING, INC.
1976 Wooddale Drive
Suite 4
Woodbury, MN 55125
(651) 773-5111
Fax (651) 773-5222

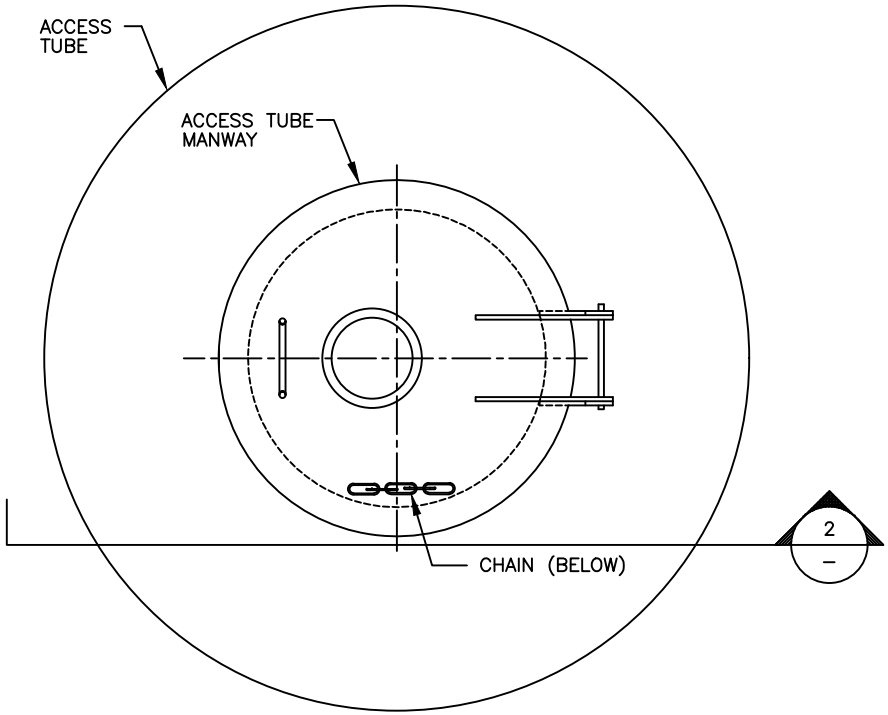
24"ø VENTILATION ROOF MANWAY

DATE
JANUARY 2018

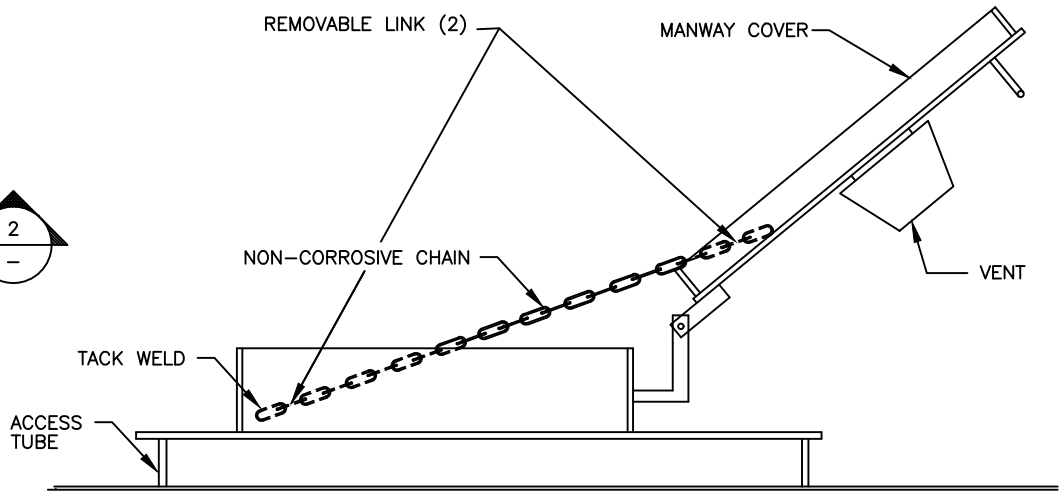
KLM DRAWING NO.
10a

NOTES:

1. ALL WELDING SHALL BE PER AWS D1.1 LATEST EDITION.
2. ALL WELDING SHOWN IS TO BE DONE BY CONTRACTOR.



1 PLAN VIEW



2 SECTIONAL ELEVATION

KLM ENGINEERING, INC.
1976 Wooddale Drive
Suite 4
Woodbury, MN 55125
(651) 773-5111
Fax (651) 773-5222

MANWAY COVER CHAIN STOP

DATE JANUARY 2018

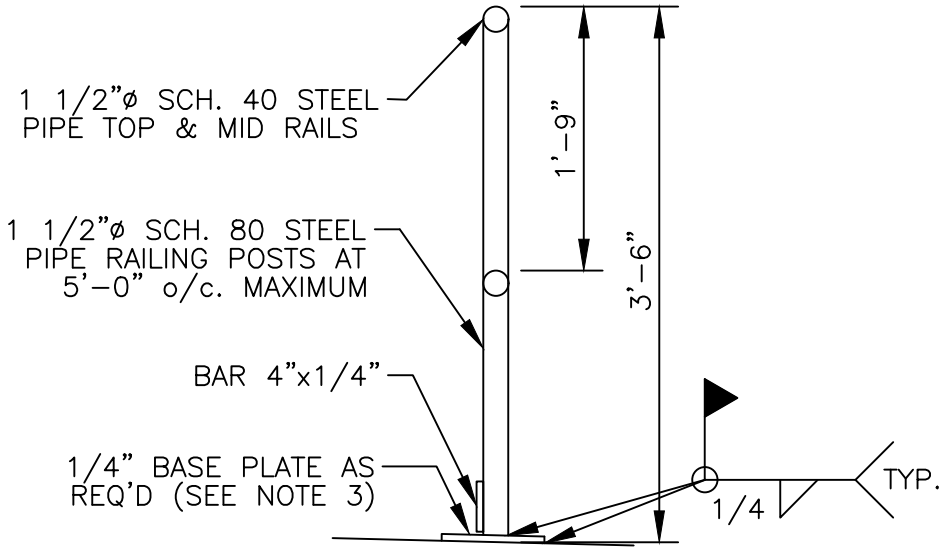
KLM DRAWING NO. 11

KLM ENGINEERING, INC.
1976 Wooddale Drive
Suite 4
Woodbury, MN 55125
(651) 773-5111
Fax (651) 773-5222

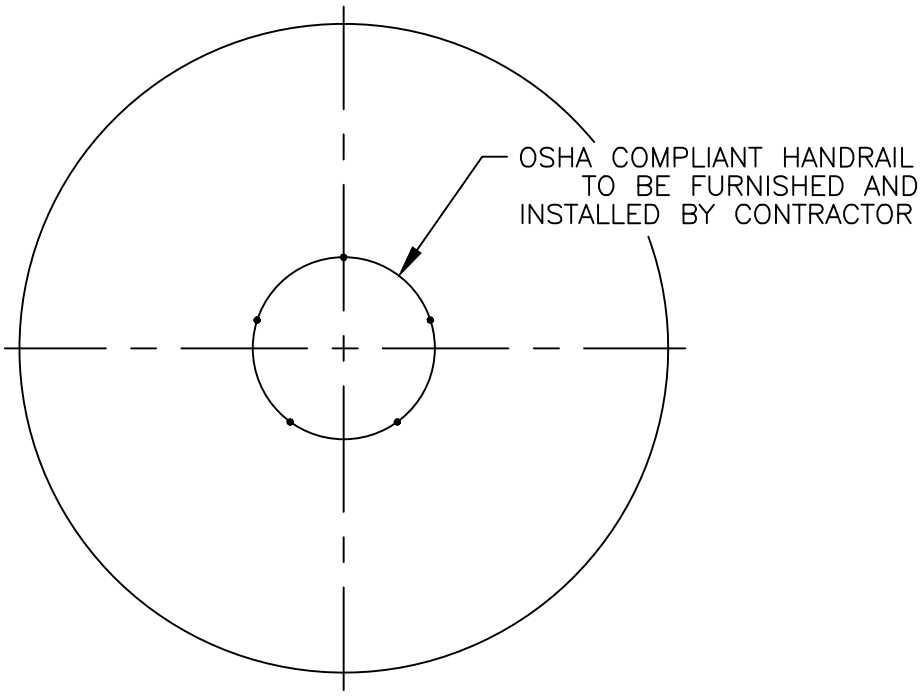
KLM PROJECT NO.	KLM DRAWING NO. 15b
SUBJECT PIPE STYLE ROOF HANDRAIL CENTER DRYWELL	
DRAWN BY	DATE JANUARY 2018
CHECKED BY	DATE

NOTES:

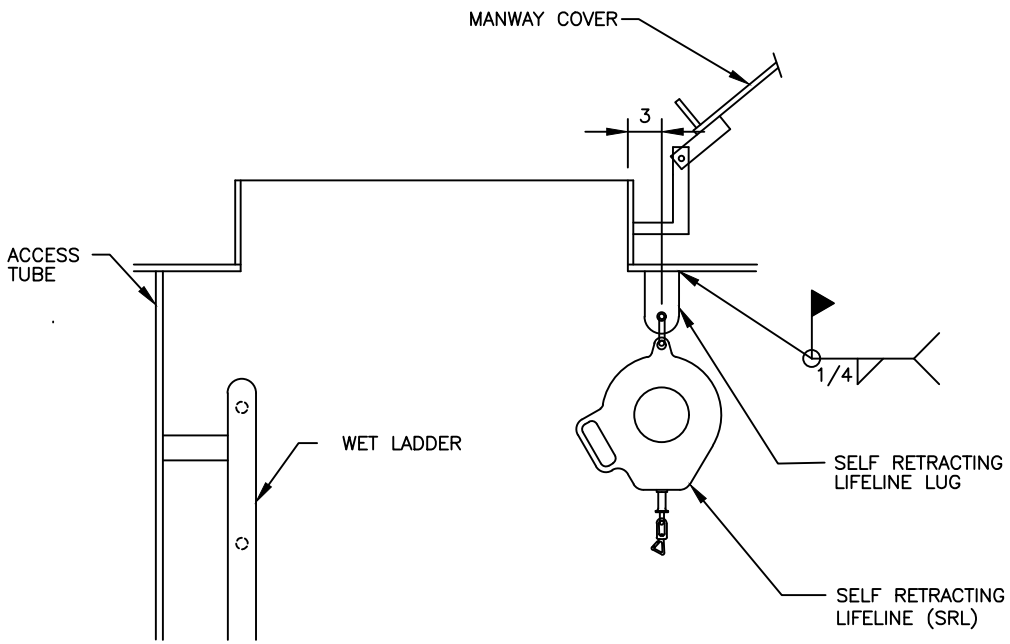
1. ALL WELDING SHALL BE PER AWS D1.1 LATEST EDITION.
2. ALL WELDING SHOWN IS TO BE DONE BY CONTRACTOR.
3. THE 1/4" BASE PLATES FOR THE HANDRAIL POSTS ARE ONLY REQUIRED WHEN SPECIFIED OR UNDER THE DIRECTION OF THE ENGINEER.



SECTION THRU HANDRAIL

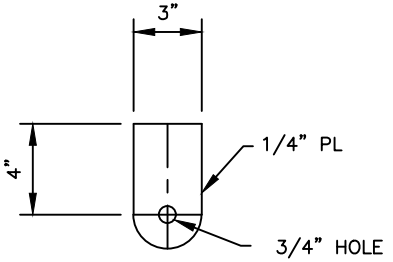


ROOF PLAN VIEW



NOTES:

1. ALL WELDING SHALL BE PER AWS D1.1 LATEST EDITION.
2. ALL WELDING SHOWN IS TO BE DONE BY CONTRACTOR.
3. INSTALL PRIOR TO RECOATING.
4. FIELD VERIFY LOCATION.
5. SELF RETRACTING LIFELINE (SRL) SHALL BE SALA SEALED BLOCK HEAVY DUTY OR EQUAL.



1 — SECTIONAL ELEVATION

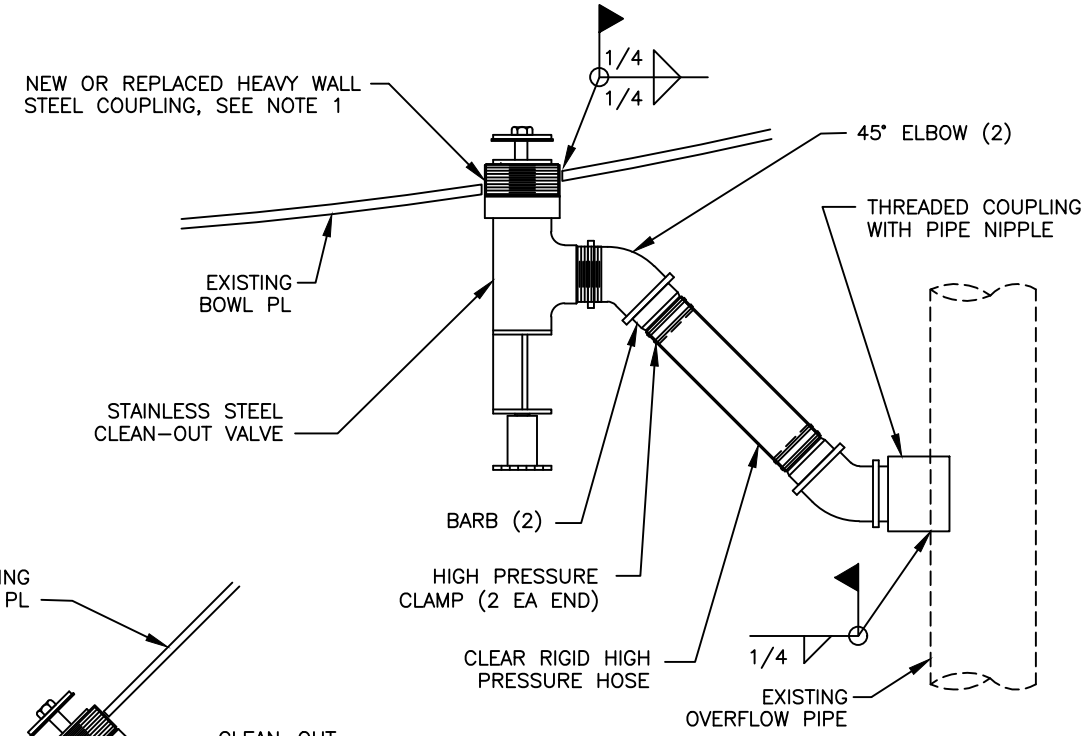
2 — LUG DETAIL

KLM ENGINEERING, INC.
1976 Wooddale Drive
Suite 4
Woodbury, MN 55125
(651) 773-5111
Fax (651) 773-5222

SELF RETRACTING LIFELINE AND LUG

DATE: MARCH 2019

KLM DRAWING NO.: 26



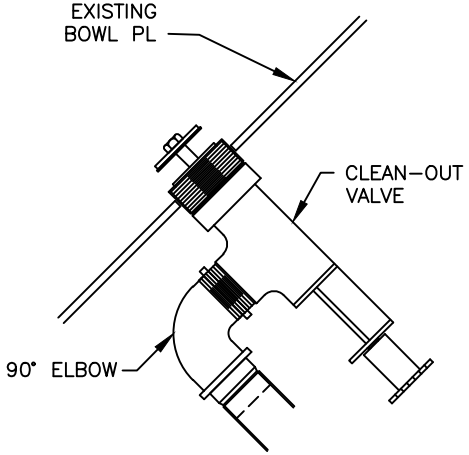
CLEAN–OUT VALVE MOUNTING

INSTALLATION PROCEDURE:

1. CUT–OUT AROUND EXISTING DRAIN. IF NO DRAIN EXISTS CUT A NEW HOLE AT A LOCATION APPROVED BY THE ENGINEER.
2. INSTALL NEW HEAVY WALL STEEL COUPLING.
3. WELD, SANDBLAST AND PAINT ASSEMBLY WITH A CARBON STEEL PLUG IN PLACE.
4. UPON APPROVAL AND ACCEPTANCE OF THE COATING, REMOVE THE CARBON STEEL PLUG AND REPLACE IT WITH THE GENERAL CONSTRUCTION STAINLESS STEEL CLEAN–OUT VALVE, OR AN APPROVED EQUAL.
5. INSTALL THE REMAINING PIPING AND COMPONENTS CONNECTING TO THE EXISTING OVERFLOW PIPE AS SHOWN.

NOTES:

1. ALL WELDING SHALL BE DONE PER AWS D1.1 LATEST EDITION.
2. ALL WELDING SHOWN IS TO BE DONE BY CONTRACTOR.
3. ALL COMPONENTS SHOWN ARE PROVIDED BY CONTRACTOR.
4. THE SIZE OF NEW DRAIN TO BE 4 INCH NOMINAL UNLESS APPROVED BY THE ENGINEER.



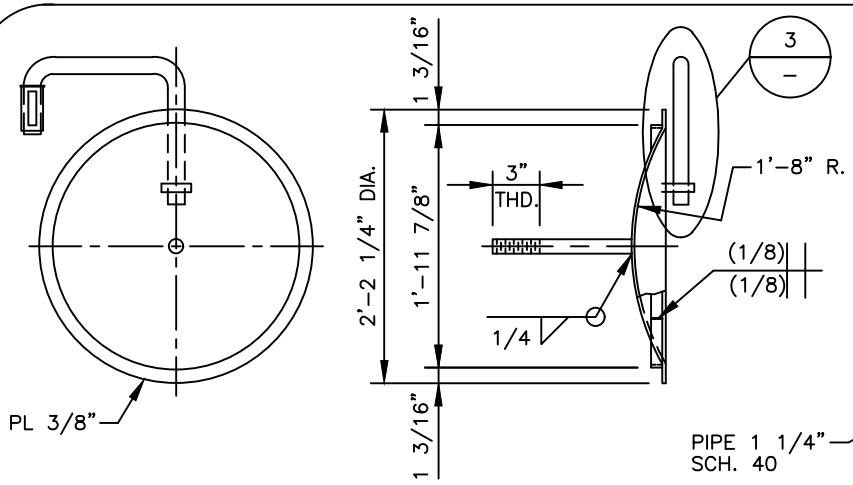
ALTERNATE MOUNTING

KLM ENGINEERING, INC.
1976 Wooddale Drive
Suite 4
Woodbury, MN 55125
(651) 773–5111
Fax (651) 773–5222

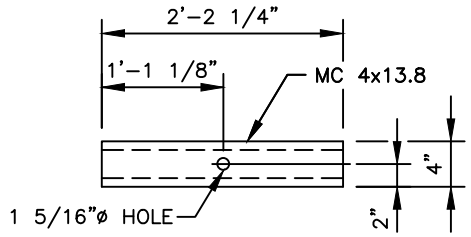
STAINLESS STEEL BOWL DRAIN VALVE

DATE
OCTOBER 2018

KLM DRAWING NO.
33



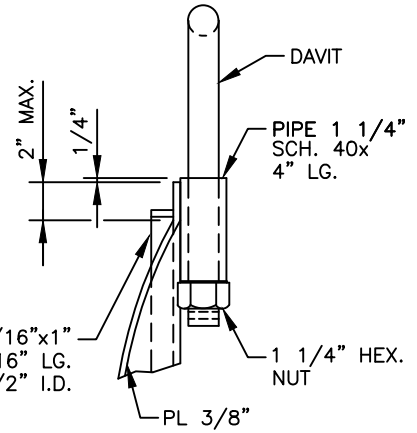
1 — COVER DETAIL



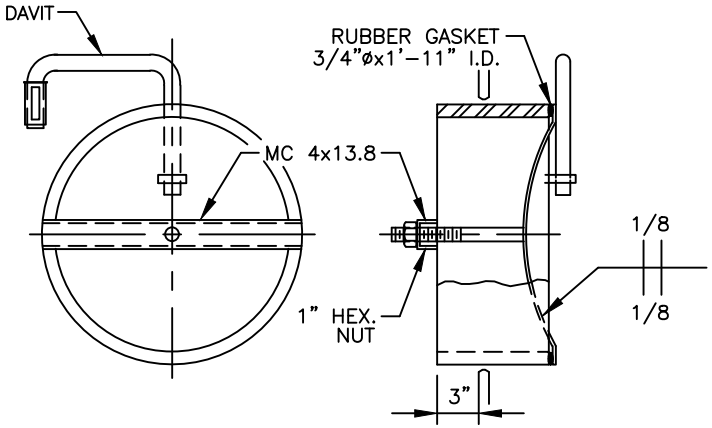
2 — COVER DETAIL

NOTES:

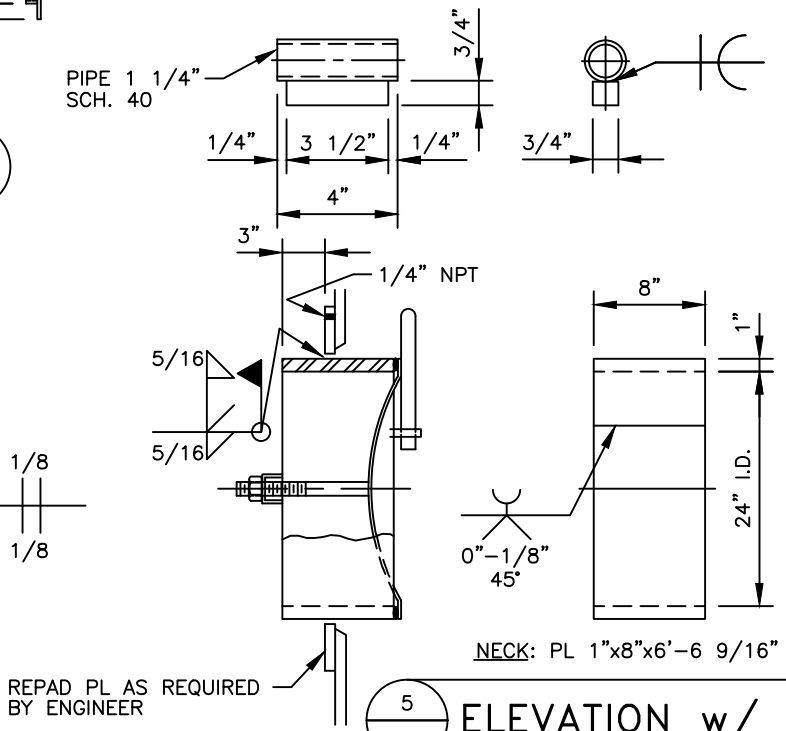
1. ALL WELDING SHALL BE PER AWS D1.1 LATEST EDITION.
2. CONTRACTOR TO PROVIDE CERTIFIED CALCULATIONS IF NO REPAD IS INSTALLED.



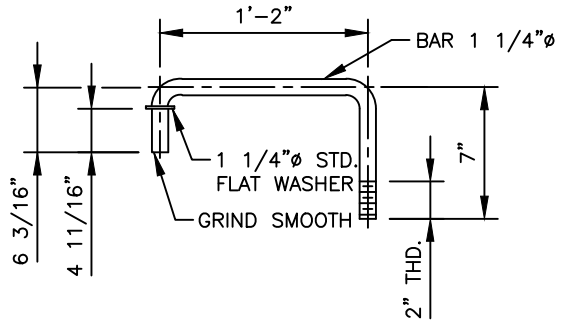
3 — DAVIT CONN. DETAIL



4 — ELEVATION w/o REPAD



5 — ELEVATION w/ REPAD



6 — DAVIT

KLM ENGINEERING, INC.
1976 Wooddale Drive
Suite 4
Woodbury, MN 55042
(651) 773-5111
Fax (651) 773-5222

24" SHELL MANWAY PRESSURE TYPE

DATE
JANUARY 2018

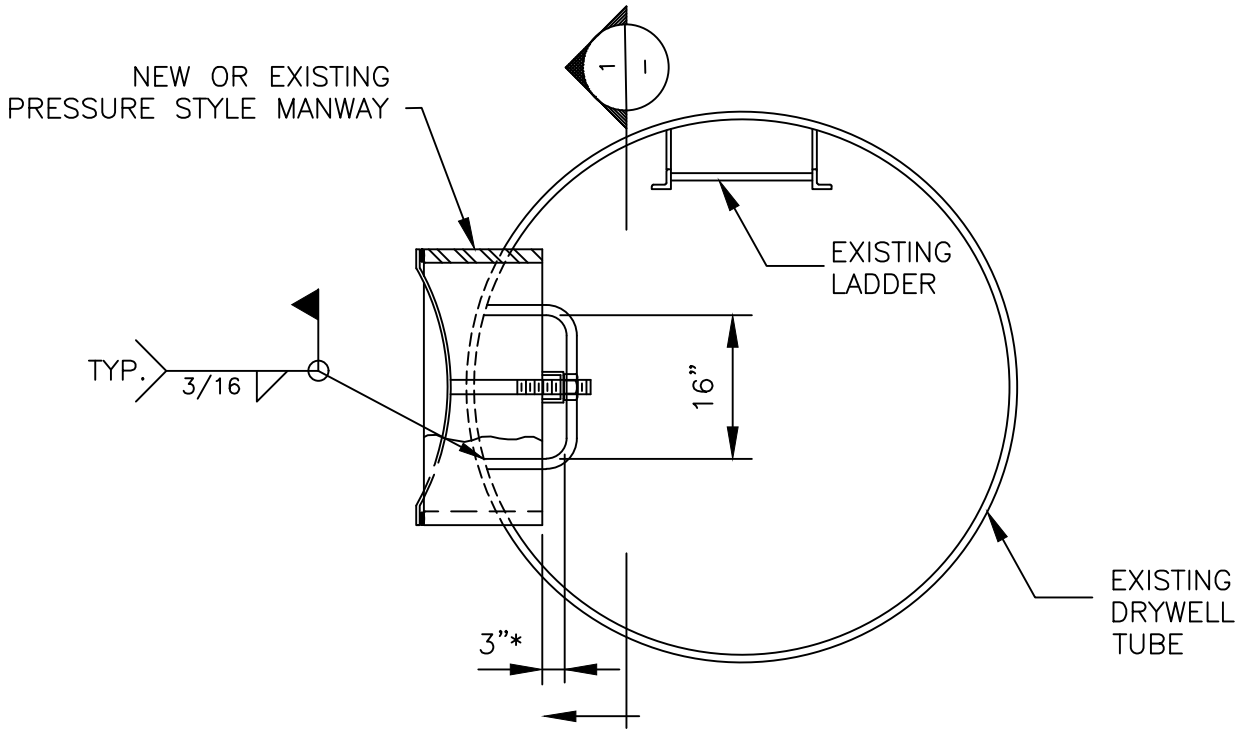
KLM DRAWING NO.
37a

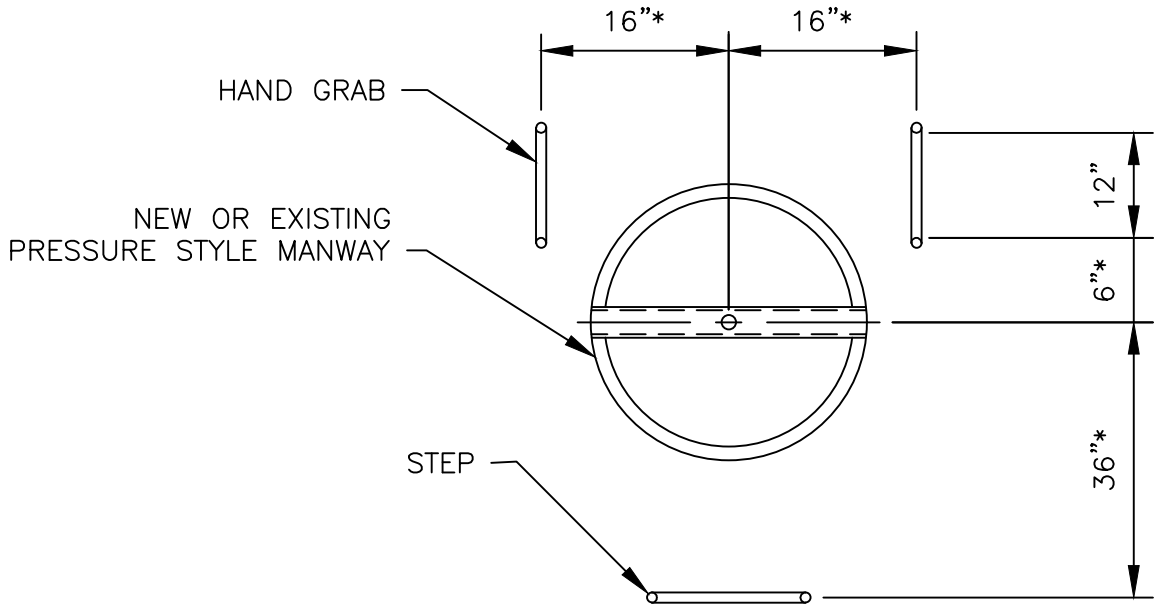
KLM ENGINEERING, INC.
1976 Wooddale Drive
Suite 4
Woodbury, MN 55042
(651) 773-5111
Fax (651) 773-5222

KLM PROJECT NO.	KLM DRAWING NO. 37c
SUBJECT DRYWELL TUBE MANWAY STEP-OFF PLATFORM	
DRAWN BY JJT	DATE DECEMBER 2017
CHECKED BY	DATE

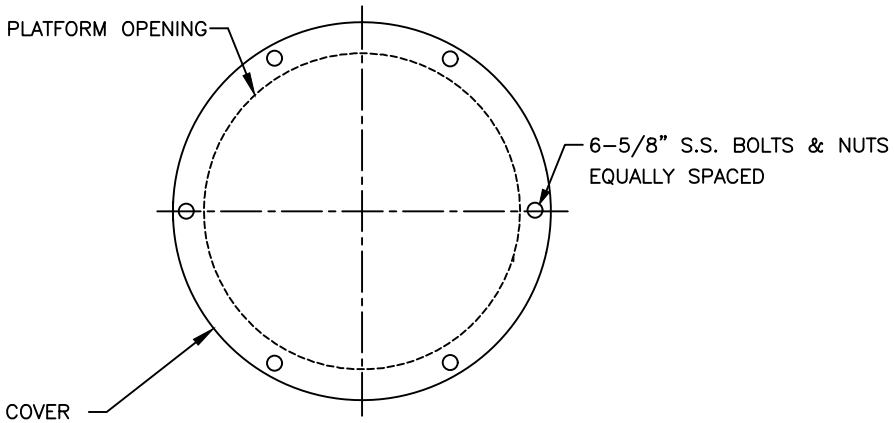
NOTES:

1. ALL WELDING SHALL BE PER AWS D1.1 LATEST EDITION.
2. ALL WELDING SHOWN IS TO BE DONE BY CONTRACTOR.
3. STEP AND HAND GRABS SHALL BE FABRICATED FROM 3/4" DIAMETER BENT BARS WITH A 1.5" MINIMUM INSIDE BEND RADIUS.
4. DIMENSIONS WITH AN ASTERISK (*) ARE APPROXIMATE; THE EXACT LOCATION TO BE APPROVED BY THE ENGINEER.





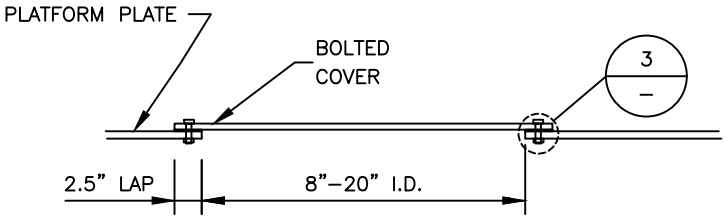
1 — ELEVATION AT MANWAY



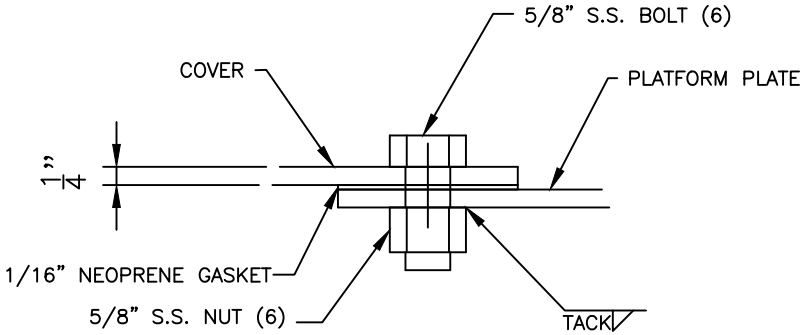
1 — PLAN VIEW

NOTES:

1. COVER PLATE TO BE 1/4" MINIMUM A36 STEEL WITH A DIAMETER 5" LARGER THAN THE DIAMETER OF THE FLOOR OPENING.
2. ALL WELDING SHALL BE PER AWS D1.1 LATEST EDITION.
3. ALL WELDING SHOWN IS TO BE DONE BY CONTRACTOR.



2 — SECTIONAL ELEVATION



3 — CONNECTION DETAIL

KLM ENGINEERING, INC.
1976 Wooddale Drive
Suite 4
Woodbury, MN 55125
(651) 773–5111
Fax (651) 773–5222

PLATFORM FLOOR CONTAINMENT PLATE

DATE
JANUARY 2018

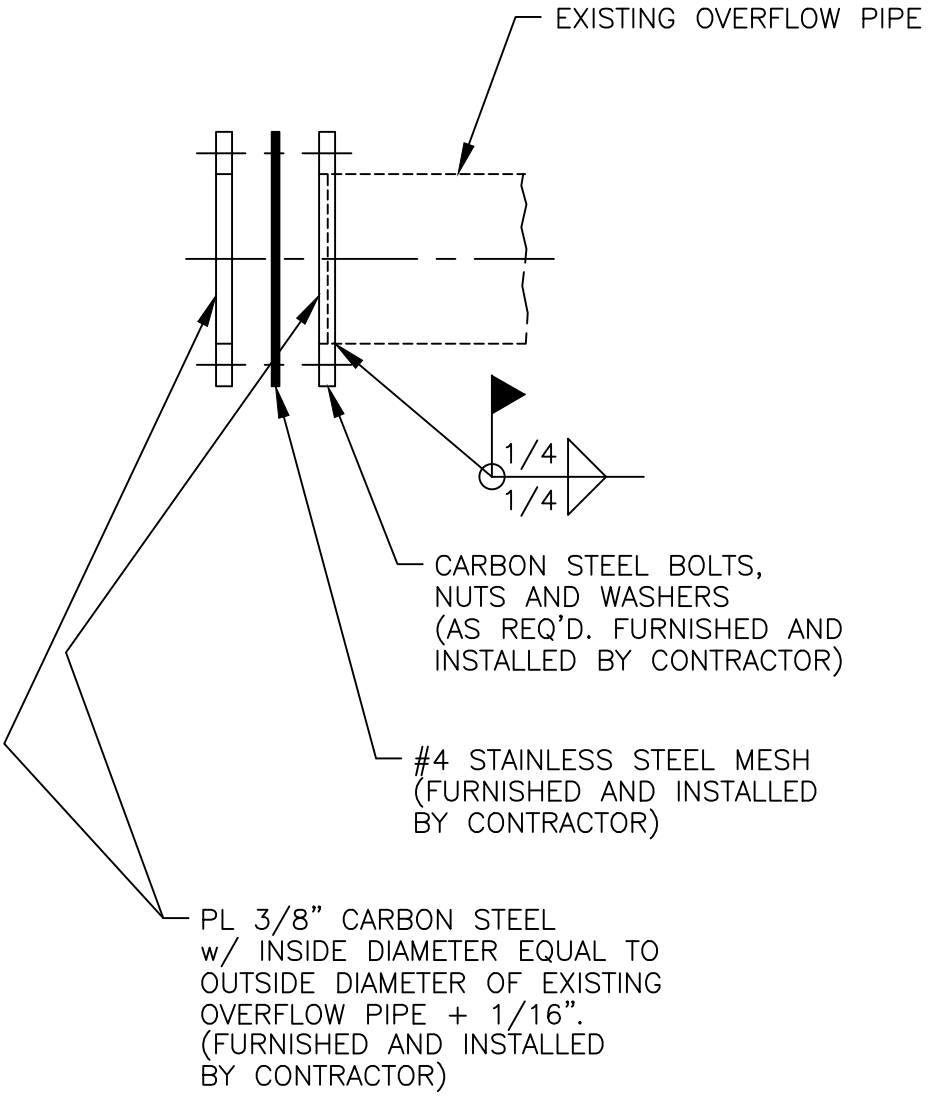
KLM DRAWING NO.
45

KLM ENGINEERING, INC.
1976 Wooddale Drive
Suite 4
Woodbury, MN 55125
(651) 773-5111
Fax (651) 773-5222

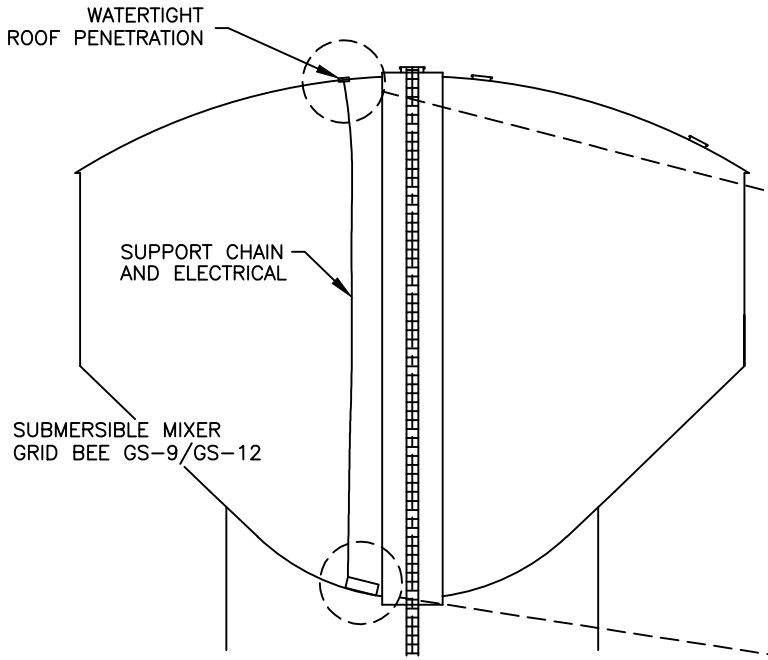
KLM PROJECT NO.	KLM DRAWING NO. 54
SUBJECT OVERFLOW PIPE SCREEN RETAINER	
DRAWN BY	DATE JANUARY 2018
CHECKED BY	DATE

NOTES:

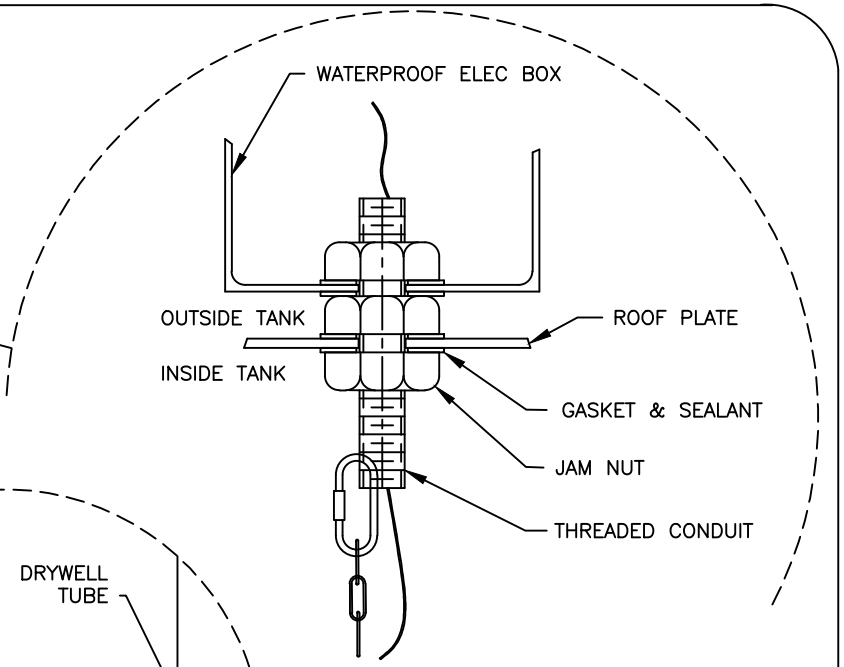
1. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING SIZE REQUIREMENTS.
2. ALL WELDING SHALL BE PER AWS D1.1 LATEST EDITION.
3. ALL WELDING AS SHOWN TO BE DONE BY CONTRACTOR.



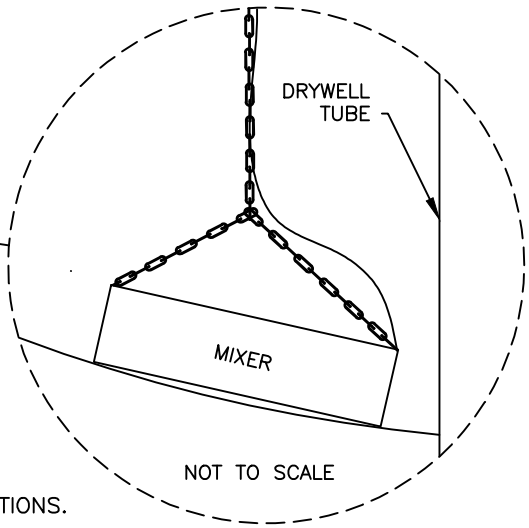
ELEVATION



SECTION VIEW



DETAIL VIEW



DETAIL VIEW

INSTALLER NOTES:

1. INSTALL MIXER IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
2. INSTALL IN ACCORDANCE WITH STATE ELECTRICAL CODES AND STATE REGULATIONS.
3. INSTALLER PROVIDE ALL WIRING, CONDUIT, DEVICES, BREAKERS, AND SWITCHES.
4. WATERTIGHT PENETRATION IN ROOF AT THE DIRECTION OF THE ENGINEER.
5. COORDINATE WITH ENGINEER FOR DESIGN OF PERMANENT SUPPORT BRACKETS, IF REQUIRED.

KLM ENGINEERING, INC.
1976 Wooddale Drive
Suite 4
Woodbury, MN 55125
(651) 773-5111
Fax (651) 773-5222

GridBee MIXER INSTALLATION HYDROPILLAR

DATE
JANUARY 2018

KLM DRAWING NO.
63

APPENDIX C

SURFACE PREPARATION REQUIREMENTS

NACE SP0178-2007
(formerly RP0178-2003)
Item No. 21022

Standard Practice

Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service

Revised 2007-03-10
Reaffirmed 2003-03-17
Reaffirmed September 1995
Reaffirmed March 1991
Revised 1989
Approved 1978
NACE International
1440 South Creek Drive
Houston, Texas 77084-4906
+1 281/228-6200
ISBN 1-57590-167-6

Foreword

When specifying tanks and vessels that are to be internally lined to control corrosion and prevent product contamination, special design, fabrication, and surface finishing practices must be considered to obtain the desired performance of these linings for immersion service. As the corrosiveness of the product increases, the design and fabrication of the tank or vessel becomes more critical relative to the performance of the lining.

This standard presents standard practices for the design, fabrication, and surface finish of metal tanks and vessels that are to be lined for corrosion resistance and to prevent product contamination. The standard explains how the standard practices govern the quality of lining applications. Appendix A contains illustrations depicting both good and bad practices for tanks and vessels to be lined, and Appendix B contains a list of recommended responsibilities to ensure that an acceptable lining application is achieved. Appendix C contains written and graphic descriptions of five degrees of surface preparation of welds in tanks and vessels that may be specified prior to lining.[1]

This standard is intended for use or reference by end users, lining specifiers, lining applicators, lining manufacturers, and contracting authorities involved in the surface preparation or lining installation in tanks and vessels intended for chemical immersion service.

This standard practice was originally prepared in 1978 by NACE International Task Group (TG) T-6A-29, a component of Unit Committee T-6A on Coating and Lining Materials for Immersion Service, in collaboration with Unit Committee T-6H on Application and Use of Coatings for Atmospheric Service. The standard was revised in 1989 by TG T-6G-27, a component of Unit Committee T-6G on Surface Preparation for Protective Coatings, and was reaffirmed in 1991 and 1995. It was reaffirmed in 2003 by Specific Technology Group (STG) 04 on Coatings and Linings, Protective: Surface Preparation. The standard was revised in 2007 by TG 295 on Lining, Tanks and Vessels for Immersion Service: Fabrication Details, Surface Finish Requirements, and Proper Design Considerations—Review of NACE Standard RP0178-2003. This TG is administered by STG 04. It is also sponsored by STG 02 on Coatings and Linings, Protective: Atmospheric; STG 03 on Coatings and Linings, Protective: Immersion and Buried Service; and STG 43 on Transportation, Land. This standard is issued by NACE International under the auspices of STG 04.

[1] The visual comparator mentioned in Appendix C is a molded plastic replica that illustrates various degrees of surface finishing for welds prior to coating or lining. Full-seam welds, skip welds, butt welds, lap welds, and others are depicted. For more information contact the NACE FirstService Department, 1440 South Creek Drive, Houston, TX 77084-4906.

NACE International gratefully acknowledges the contributions of the following companies in the preparation of the welding samples and the fabrication of the die from which the plastic replicas have been molded:

Ausimont USA, Inc.,[2] Thorofare, NJ
CenterPoint Energy,[3] Houston, TX
S.G. Pinney & Associates, Inc.,[4] Port St. Lucie, FL
The Sherwin-Williams Company,[5] Cleveland, OH

NACE also gratefully acknowledges the assistance of KTA-Tator Inc.,[6] Pittsburgh, PA, in developing the weld pattern that was used to mold the plastic replica of weld samples.

In NACE standards, the terms *shall*, *must*, *should*, and *may* are used in accordance with the definitions of these terms in the *NACE Publications Style Manual*, 4th ed., Paragraph 7.4.1.9. *Shall* and *must* are used to state mandatory requirements. *Should* is used to state something considered good and is recommended but is not mandatory. *May* is used to state something considered optional.

[2] Ausimont USA, Inc., 10 Leonards Lane, Thorofare, NJ 08086.
[3] CenterPoint Energy, P.O. Box 1325, Houston, TX 77251-1325.
[4] S.G. Pinney & Associates, Inc., Corporate Office, 1326 S.W. Biltmore St., Port St. Lucie, FL 34983.
[5] The Sherwin-Williams Company, 101 Prospect Avenue N.W., Cleveland, OH 44115.
[6] KTA-Tator, Inc., 115 Technology Drive, Pittsburgh, PA 15275.

NACE International
Standard Practice

Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service

Contents

Section 1: General

1.1 This standard presents standard practices for the design, fabrication, and surface finish of tanks and vessels to be lined for immersion service. Tanks and vessels may be lined for corrosion control or to prevent product contamination.

1.1.1 Appendix A (mandatory) contains illustrations depicting both good and bad practices for tanks and vessels to be lined for immersion service.

1.1.2 Appendix B (nonmandatory) contains a list of recommended responsibilities of the purchaser (user), designer, fabricator, lining applicator, and inspector to ensure that an acceptable lining application is achieved.

1.1.3 Appendix C (nonmandatory) contains written and graphic descriptions of five degrees of surface preparation of welds in tanks and vessels that may be specified prior to lining. The written descriptions of the five degrees of surface preparation of welds in Appendix C take precedence over the graphics and the companion visual comparator. The graphics are only pictorial representations of welds and grinding finishes and are not intended to be representative of the integrity of the welds. The "weld condition prior to finishing" is not a typical weld; it is only intended to illustrate defects in welds that must be corrected prior to lining.

1.2 Good welding practices and welding codes govern the integrity of the tank and vessel welds; this standard only addresses surface preparation of the welds for the purpose of lining the tank or vessel for immersion service.

1.3 Other design and construction codes or standards may be used to complement the details given here. When applicable, the requirements of such other codes or standards shall be considered. A partial list of such codes and standards can be found in the Bibliography.

1.4 These standard practices may be used in the design, fabrication, and surface finish of tanks and vessels for services other than immersion, such as dry bulk storage of solid materials.

Section 2: Definitions

Lining: A coating or layer of sheet material adhered to or in intimate contact with the interior surface of a container used to protect the container against corrosion by its contents and/or to protect the contents of the container from contamination by the container material. For the purposes of this standard, *lining* refers to a surface barrier, usually a thin film less than 500 µm (20 mil) thick applied as either a lining or a coating. In common usage, the terms *coating* and *lining* are interchangeable, but in this standard, only the term *lining* is used. The requirements contained herein may or may not apply to heavier, thick-film linings, sheet linings, trowel-applied and pumped-into-place finishes, plasma, flame-sprayed linings, fiber-reinforced plastic linings, or similar lining materials.

Surface Finish: The degree of smoothness of a surface produced by the removal of sharp edges and the appropriate surface preparation of welds and other rough areas. The term *surface finish* is also used to characterize the degree of smoothness that is necessary to attain a surface to which the lining can be applied satisfactorily in accordance with the lining specification.

Section 3: Design Practices

3.1 Accessibility

3.1.1 All surfaces of the tank or vessel interior shall be readily accessible for surface preparation and lining application (see Figures A1 through A10, Appendix A).

3.1.2 The manway diameter for working entrance and safety reasons during the lining application shall be as large as practical for the tank or vessel being lined.

3.1.2.1 If possible, at least one manway shall be located near ground (working) level, except in tanks or vessels designed to be buried below grade.

3.1.3 Additional manways and openings should be provided as needed to facilitate ventilation. These must meet safety requirements.

3.2 Joints

3.2.1 Continuous butt-welded joints shall be used whenever possible (see Figure A5, Appendix A).

3.2.2 Rivets shall not be used.

3.2.3 The use of internal bolted connections should be avoided to the fullest extent possible.

3.2.4 Continuous lap-welded joints may be used but are not preferred. For sheet lining material, this type of construction may not be acceptable.

3.3 Connections

3.3.1 All connections to the tank or vessel shall be flanged.

3.3.2 Threaded connections should not be used in tanks and vessels operating in corrosive environments (see Figure A4, Appendix A). However, if threaded connections cannot be avoided in corrosive environments, these parts shall be fabricated of corrosion-resistant materials, or constructed as shown in Figure A10, Appendix A.

3.3.2.1 CAUTION: Dissimilar metal (galvanic) corrosion occurs when, for example, an alloy is used to replace the steel bottom of a tank, or in a similar circumstance when alloy appurtenances must be part of the construction of a vessel. If a lining is then applied to the steel and part of the alloy (usually 150 to 610 mm [5.9 to 24 in.]), any discontinuity in the lining exposes a small anode surface. Once corrosion starts, it progresses rapidly because of the large exposed alloy cathodic area to the much smaller anodic area. Without the lining, galvanic corrosion causes the steel to corrode at the weld area, but at a much slower rate. The recommended practice is to apply the lining to all of the alloy as well as the steel, thereby eliminating the possible occurrence of a large-cathode-to-small-anode surface.

3.3.3 Nozzle connections to be lined shall be as short as possible and be a minimum of 50 mm (2 in.) in diameter (see Figure A4, Appendix A). Connections less than 50 mm (2 in.) in diameter shall be suitably attached through a reducing flange (see Figure A10, Appendix A). When trowel-applied thick-film linings are required, additional nozzle inside diameter shall be allowed for lining thickness.

3.4 Appurtenances Inside the Tank or Vessel

3.4.1 The standard practices in Sections 3, 4, and 5 shall apply to any item to be installed inside a tank or vessel that is to be lined. Such appurtenances include, but are not limited to, agitators, anti-swirl baffles, outlet connections, gauging devices, vortex breakers, and internal piping.

3.4.2 If appurtenances inside the tank or vessel, including nuts and bolts, cannot be lined, they shall be made of corrosion-resistant materials. (CAUTION: See Paragraph 3.3.2.1.)

3.4.3 If bolted connections are necessary and cannot be made of corrosion-resistant materials, the mating surfaces shall be lined before assembly. Gaskets shall be used on mating surfaces and the sealing surfaces of nuts and bolts to protect the lining.

3.4.4 Dissimilar metals shall be electrically isolated from the steel tank or vessel surface whenever possible. Where dissimilar metals are used, selection shall be such that the galvanic effect is minimized. Other corrosion mitigation methods may be required (see Figure A8, Appendix A).

3.4.5 Heating elements shall be offset from the tank or vessel surface to provide access for surface preparation, application, inspection, and cleaning. Elements shall be positioned so as not to damage the lining system.

3.5 Structural Reinforcement Members

3.5.1 Structural support members should be installed on the exterior of the tank or vessel. However, if such members are installed internally, they shall be fabricated of simple shapes such as smooth, round bars or pipe for ease of applying the lining material.

3.5.2 The use of internal flanged connections, stiffening rings, reinforcement pads, angles, channels, I-beams, and other complex shapes should be avoided. If they must be installed internally, these members shall be fully welded and welds and sharp edges ground to a radius of at least 3.2 mm (0.13 in.) or as agreed between the tank or vessel fabricator, tank or vessel owner, and lining applicator (see Figures A1 and A6, Appendix A).

3.6 Heat Sinks

3.6.1 Heated, forced curing of lining systems is often preferred if not specifically required. During tank or vessel design and fabrication, especially with field-erected units, consideration must be given to avoiding or minimizing heat sink areas. Such areas might include opposite saddles or support lugs, flat bottoms on foundations, and stiffening rings.

3.6.2 These situations may be addressed either by tank or vessel design or by construction or insulation of the foundation or supports. Another possible solution is the use of temporary constructions, such as false floors or temporary shelters, to achieve uniform heating and curing.

Section 4: Fabrication Practices

4.1 All design practices in Section 3 shall apply to all fabrication.

4.2 All welding shall be continuous. Intermittent or spot welding shall not be allowed.

4.3 Fillets and corners must be accessible for grinding.

4.4 Field tanks fabricated for use with high-heat-cured linings (e.g., unmodified phenol formaldehyde thermosetting linings) should have bottoms suitably insulated and installed on properly drained foundations to facilitate proper cure of the lining on the floor of the tank. Because the sand-filled earthen foundation, concrete pad, or other similar foundation is a poor insulator, some means must be considered prior to the application of the lining either to override the heat sink or to distribute the heat uniformly. This may be accomplished in several ways:

(a) with the use of properly sized heaters;

(b) by placing the tank on a concrete pad topped with a 100-mm (4-in.) layer of vermiculite concrete;

(c) by insulating with a high-compressive-strength structural grade insulation between the tank bottom and foundation;

(d) by installing an internal temporary false bottom approximately 1.5 m (5.0 ft) above the floor of the tank prior to the final high-temperature bake; or

(e) by other suitable means that practically and effectively ensure a properly cured lining on the tank floor.

Section 5: Surface Finish Practices

5.1 Sharp edges shall be ground to a smooth radius of at least 3.2 mm (0.13 in.) or as agreed between the tank or vessel fabricator, tank or vessel owner, and lining applicator.

5.2 Tank and vessel internal surfaces to be lined shall not be marred by gouges, handling marks, deep scratches, metal stamp marks, slivered steel, or other surface flaws. Flaws shall be repaired by welding or grinding, as appropriate.

5.2.1 Limits on surface flaw depth and geometry shall be set by agreement between the tank or vessel fabricator, tank or vessel owner, and lining applicator.

5.2.2 All restorative welding shall be performed according to applicable tank or vessel design codes, approved job-specific procedures, or both.

5.3 All rough welds shall be ground to remove sharp edges and other such irregularities (see Figure A2, Appendix A). Chipping may be used to remove sharp edges if followed by grinding. See Appendix C for written and graphic descriptions of five degrees of surface finishing of welds that may be specified preparatory to the lining of tanks and vessels.

5.3.1 The amount of grinding performed shall be judicious and performed only to the extent necessary to prepare the weld surface and surrounding metal surfaces in accordance with the specification. Over-grinding, which would result in decreasing the wall thickness or the integrity of the weld beyond the limitations imposed by good welding practices, applicable welding codes, or tank or vessel ratings, shall be avoided.

5.4 Automatic machine welds may be acceptable as dictated by the specifications for film continuity.

5.5 All weld spatter and arc strikes must be removed. Chipping may be used if followed by grinding or the use of an abrasive disc.

5.6 If an anti-spatter material is applied adjacent to the weld area prior to welding, the anti-spatter material shall be one that is readily removable. Anti-spatter materials shall be removed prior to abrasive blasting.

5.7 When checking weld continuity, the tank or vessel fabricator shall avoid the use of oils, lubricants, or other foreign materials that would leave a contaminating residue not easily removed by abrasive blasting.

5.8 Surfaces shall be cleaned and decontaminated as required by the governing lining application specification(s).

Bibliography

API[7] Standard 650 (latest revision). "Welded Steel Tanks for Oil Storage." Washington, D.C.: American Petroleum Institute (API).

API RP 652 (latest revision). "Lining of Aboveground Petroleum Storage Tank Bottoms." Washington, D.C.: API.

ASME[8] Boiler and Pressure Vessel Code (latest revision). New York, NY: ASME.

Directive 97/23/EC (latest revision). "Pressure Equipment Directive (PED)." Brussels, Belgium: European Commission.[9]

NACE Standard SP0294 (latest revision). "Design, Fabrication, and Inspection of Storage Tank Systems for Concentrated Fresh and Process Sulfuric Acid and Oleum at Ambient Temperatures." Houston, TX: NACE.

[7] American Petroleum Institute (API), 1220 L Street, NW, Washington, D.C. 20005-4070.
[8] ASME International (ASME), Three Park Avenue, New York, NY 10016-5990.
[9] European Commission (EC), Rue de la Loi 200, B-1049 Brussels, Belgium.

APPENDIX A:
Illustrations of Design, Fabrication, and Surface Finish Practices for Metal Tanks and Vessels to Be Lined for Immersion Service

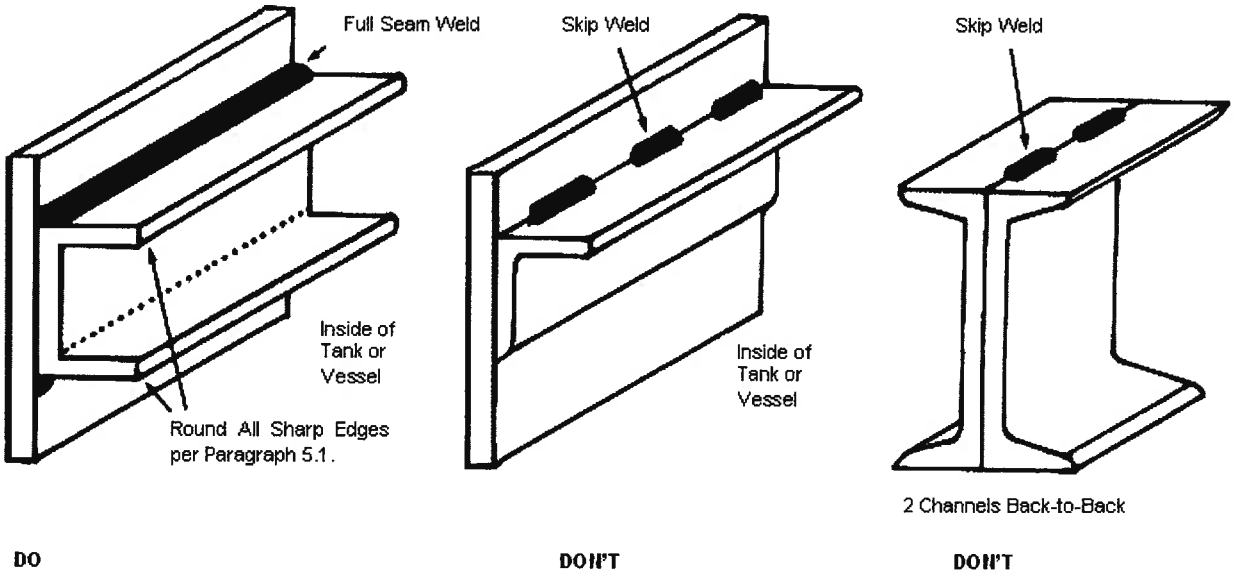


FIGURE A1

All construction involving pockets or crevices that do not drain or that cannot be properly abrasive blasted and lined shall be avoided.

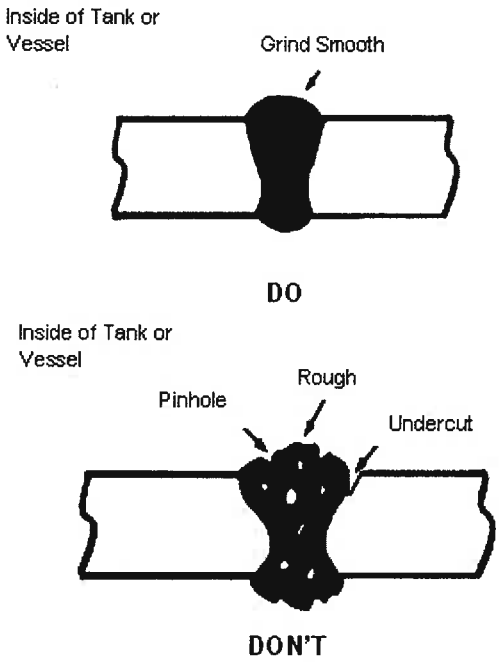


FIGURE A2

All joints shall be continuous full-penetration porosity-free welds. In tanks and vessels that require a 100% holiday-free lining, all welds must be smooth with no holes, high spots, lumps, or pockets. Grinding is required to eliminate sharp edges and high spots. Weld metal shall be used to fill in undercut or pits.

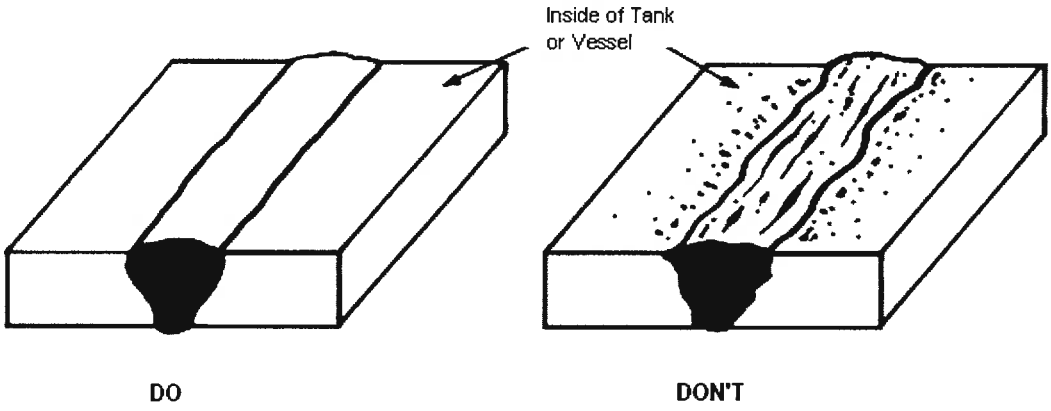


FIGURE A3

All weld spatter shall be removed.

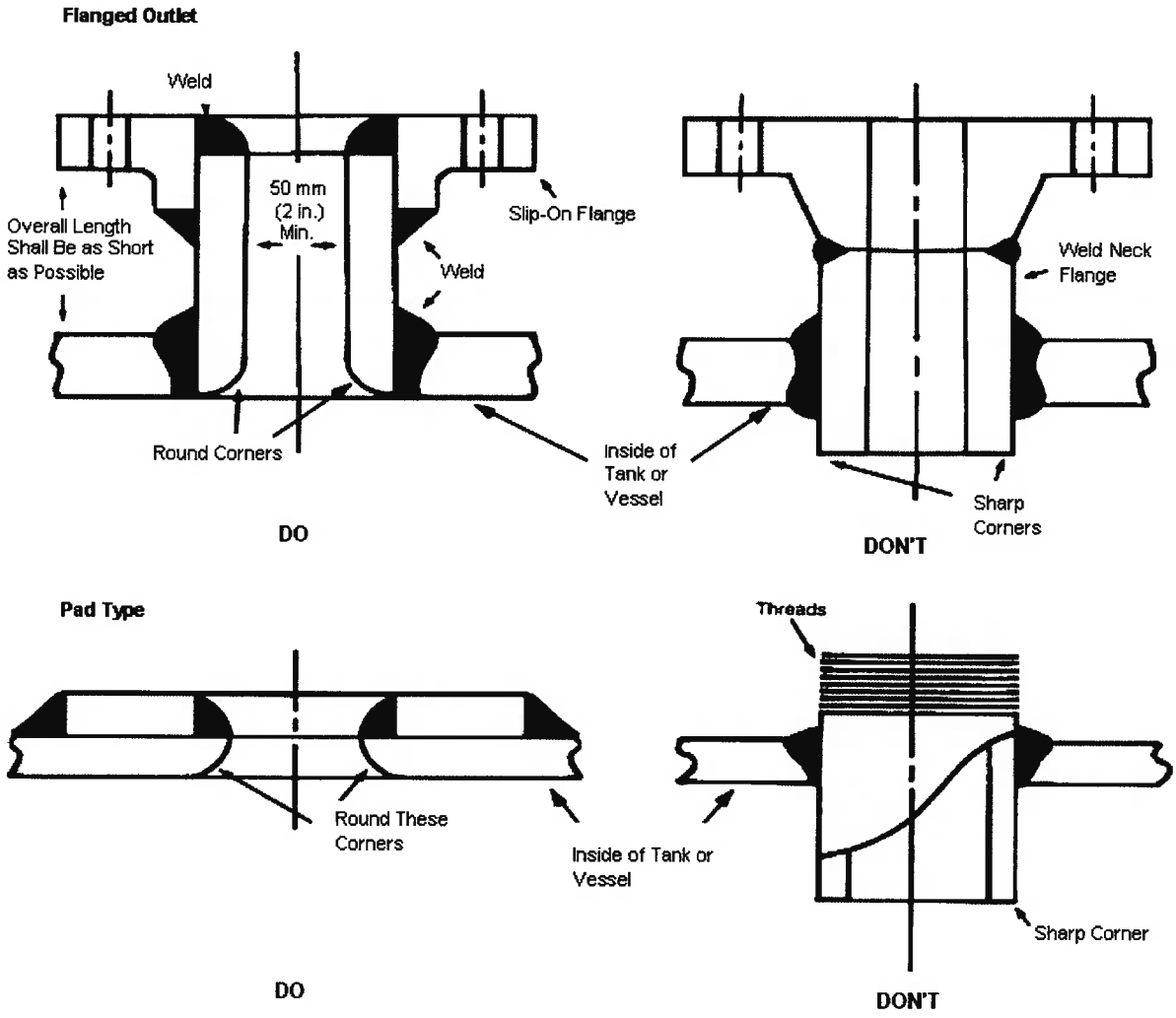


FIGURE A4

The outlets shall be flanged or pad-type rather than threaded. Within pressure limitations, slip-on flanges are preferred because the inside surface of the attaching weld is readily available for rounding edges and grinding. If operating pressure dictates the use of weld neck flanges, the inside surface of the attaching weld is in the throat of the nozzle, making repair of surface irregularities by grinding rather difficult.

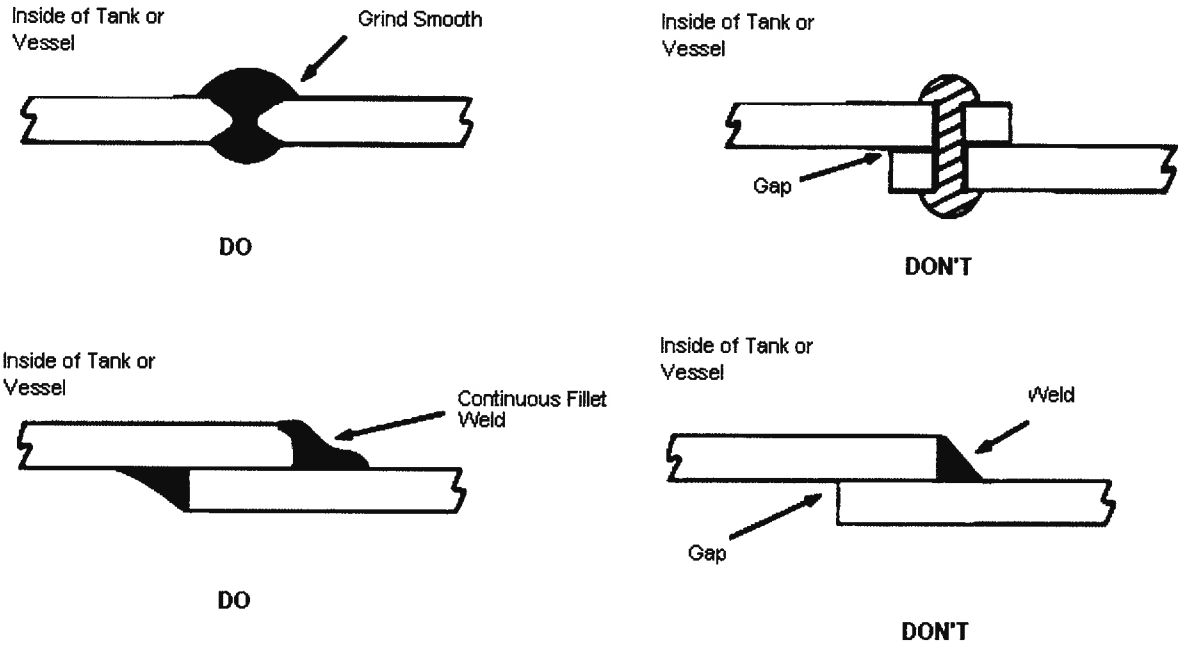


FIGURE A5
Butt welding shall be used whenever possible rather than lap welding or riveted construction.

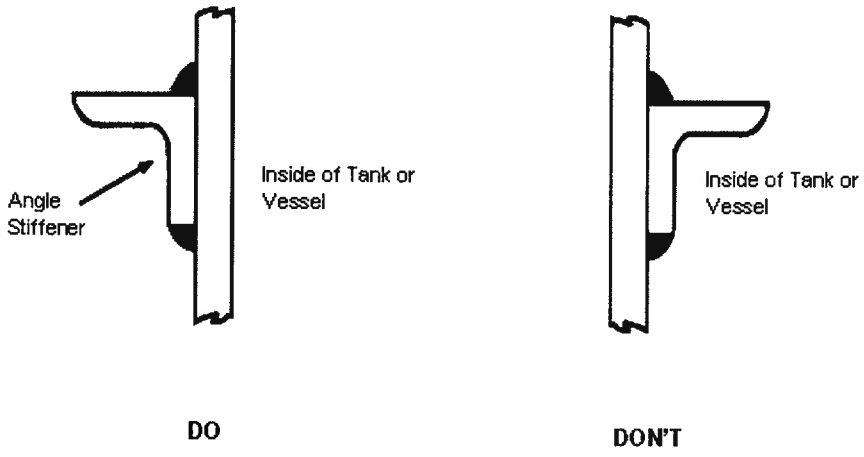


FIGURE A6
Stiffening members should be on the outside of the tank or vessel.

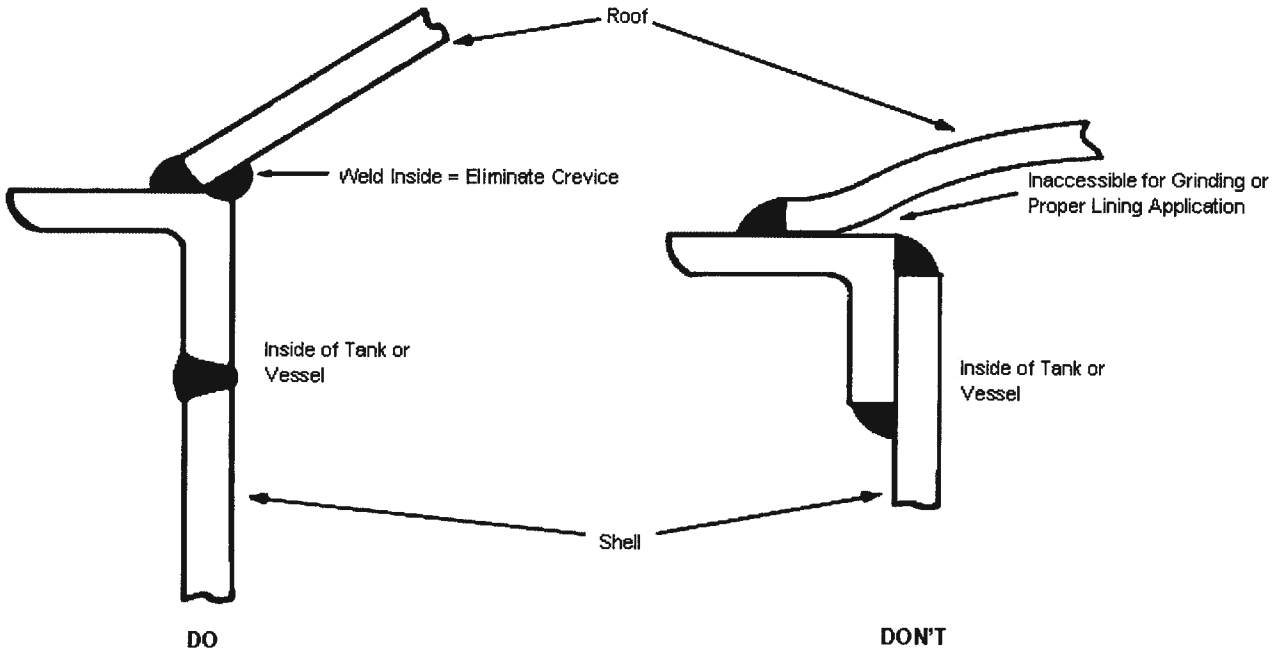


FIGURE A7
Roof-to-Shell Joint. Eliminate crevice and lap weld at roof-to-shell joint in a tank or nonpressure vessel.

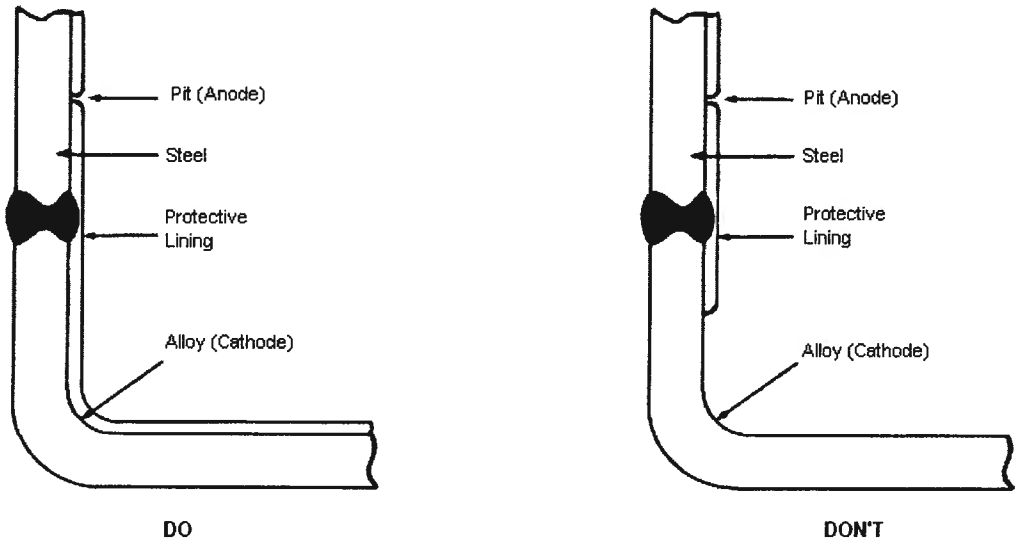


FIGURE A8
Dissimilar metal (galvanic) corrosion occurs when, for example, an alloy is used to replace the steel bottom of a tank, or, in a similar circumstance, when alloy appurtenances must be a part of the construction of a vessel. If a lining is then applied to the steel and part of the alloy (usually 150 to 610 mm [5.9 to 24 in.]), any discontinuity in the lining exposes a small anode surface. Once corrosion starts, it progresses rapidly because of the large exposed alloy cathodic area to the much smaller anodic area. Without the lining, galvanic corrosion causes the steel to corrode at the weld area, but at a much slower rate. The recommended practice is to apply lining to all of the alloy as well as the steel, thereby eliminating the possible occurrence of a large-cathode-to small-anode surface.

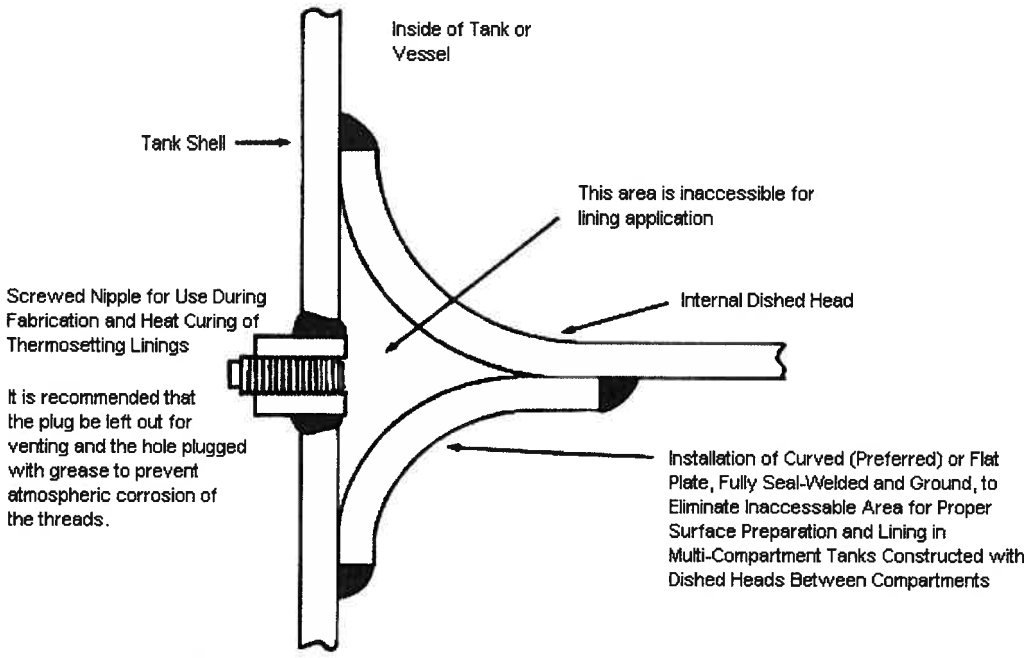


FIGURE A9

A technique (detail of fabrication) to allow for good continuity of lining application for inaccessible areas such as those in multicompartment tanks or vessels.

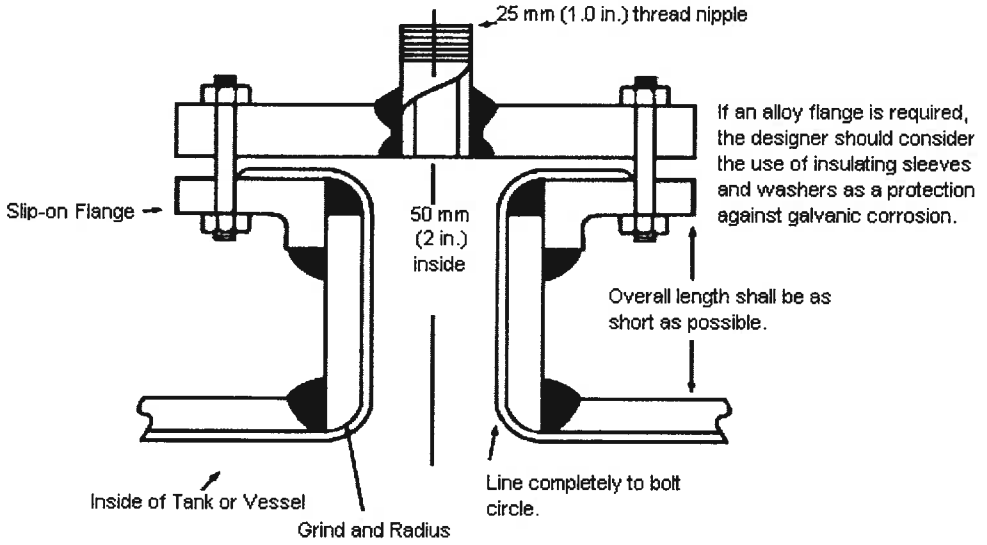


FIGURE A10

Minimum 50-mm (2-in.) diameter nozzle required for most thin-film linings. Thicker-film linings may require a larger-diameter nozzle. This diagram also illustrates fabrication practice where a threaded connection is required in a tank or vessel that requires a holiday-free lining.

APPENDIX B: Recommended Responsibilities

This appendix is a list of recommended responsibilities that should be assigned to the purchaser, designer, fabricator, lining applicator, and inspector in order to obtain a properly designed and fabricated tank or vessel for interior lining.

B1.1 Joint Responsibilities

B1.1.1 The purchaser, designer, fabricator, lining applicator, and inspector(s) should review and agree to the requirements involved before contractual agreements are made.

B1.1.2 The purchaser, in agreement with the fabricator and lining applicator, should assign responsibility for inspection of fabrication, surface finish, and lining application, and such responsibility should be defined in all contracts.

B1.2 Responsibilities of the Purchaser (Owner or User)

B1.2.1 The purchaser should be responsible for specifying and/or approving the detail requirements for design, fabrication, and surface finish to all parties concerned.

B1.2.1.1 The detailed requirements should be fully described in writing and include drawings of the tank or vessel to be fabricated and lined and service requirements.

B1.2.1.2 The purchaser should advise the designer, fabricator, lining applicator, and all inspectors of the detailed requirements, including time schedules, inspection, and acceptable requirements, in writing.

B1.3 Responsibilities of the Designer

B1.3.1 The designer should be responsible for including the required fabrication and surface details on all sketches and drawings related to the tank or vessel.

B1.4 Responsibilities of the Fabricator

B1.4.1 The fabricator should be responsible for adhering to the fabrication and surface finish details shown on the working drawings and described in the tank or vessel specifications.

B1.4.2 Responsibility for an inspection of the blast or any additional welding, grinding, or surface finishing that may be revealed by the surface preparation for lining, plus any subsequent reblasting, should be defined in the lining contract.

B1.4.3 The fabricator, when checking the quality of the weld, should use only those materials that can be readily and thoroughly removed by the fabricator after completion of the inspection procedure.

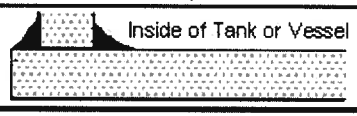
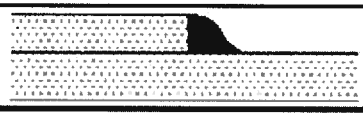
B1.5 Responsibilities of the Lining Applicator

B1.5.1 Responsibility for additional welding, grinding, or surface finishing that may be revealed by the surface preparation for lining, plus any subsequent reblasting, should be defined in the lining contract.

B1.6 Responsibilities of the Inspector(s)

B1.6.1 A qualified inspector whose qualifications and affiliation are acceptable to all parties should be responsible for the verification of fulfillment of design, fabrication, and surface finish requirements.

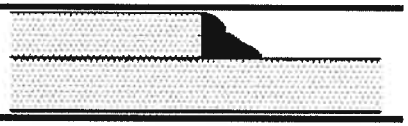
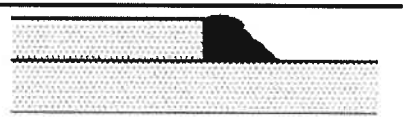
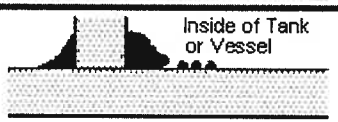
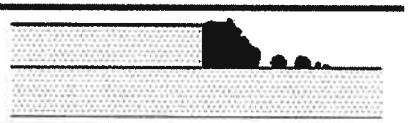
Appendix C—Written and Graphic Descriptions of Various Degrees of Surface Finishing of Welds That May Be Specified in Preparation for Lining of Tanks and Vessels [A]

NACE Weld Preparation Designation	Type of Grinding	Butt Weld	Fillet Welded Tee Joint	Lap Weld
A	Ground flush and smooth; free of all defects.[B]	Weld spatter is removed and all surface imperfections are repaired as necessary. The weld is ground flush with the plate surface.	Not Applicable	Not Applicable
			Not Applicable	Not Applicable
B	Ground flush	Minor imperfections such as porosity and undercutting exist. The weld is ground flush with the plate surface.	Not Applicable	Not Applicable
			Not Applicable	Not Applicable
C	Ground smooth; free of all defects.[B]	Weld spatter is removed and all surface imperfections are repaired as necessary. The weld is ground smooth and blended into the plate surfaces.	Weld spatter is removed and all surface imperfections are repaired as necessary. The weld is ground smooth and blended into the plate surfaces.	Fillet weld between the two plates. Weld spatter is removed and all surface imperfections are repaired as necessary. The weld is ground smooth and blended into the plate surfaces.
				

[A] The written descriptions of the various degrees of surface preparation of welds in the appendices of this standard take precedence over the graphics and the companion visual comparator. The graphics are only pictorial representations of welds and grinding finishes and are not intended to be representative of the integrity of the welds. The "weld condition prior to finishing" is not a typical weld; it is only intended to illustrate defects in welds that must be corrected prior to lining. Good welding practices and welding codes govern the integrity of the tank and vessel welds; this standard only addresses surface preparation of the welds for the purpose of lining the tank or vessel for immersion service.

The visual comparator mentioned in Appendix C is a molded plastic replica that illustrates various degrees of surface finishing for welds prior to coating or lining. Full-seam welds, skip welds, butt welds, lap welds, and others are depicted. For more information, contact the NACE International FirstService Department, 1440 South Creek Dr., Houston, Texas 77084-4906 (telephone +1 281/228-6200).

Appendix C (Continued)[1]

NACE Weld Preparation Design	Type of Grinding	Butt Weld	Fillet Welded Tee Joint	Lap Weld
D	Ground smooth and blended.[2]	Minor imperfections such as porosity and undercutting exist. Weld spatter is removed; welds are then ground smooth and blended into the plate surfaces.	Minor imperfections such as porosity and undercutting exist. Weld spatter is removed; welds are then ground smooth and blended into the plate surfaces.	Minor imperfections such as porosity and undercutting exist. Weld spatter is removed; welds are then ground smooth and blended into the plate surfaces.
				
E	Minimal	Sharp projections on the weld bead, slag, and weld spatter are removed.	Sharp projections on the weld bead, slag, and weld spatter are removed.	Sharp projections on the weld bead, slag, and weld spatter are removed.
				
Weld Condition Prior to Finishing				

[1] The written descriptions of the various degrees of surface preparation of welds in the appendix of this standard take precedence over the graphics and the companion visual comparator. The graphics are only pictorial representations of the welds and grinding finishes and are not intended to be representative of the integrity of the welds. The "as is" original weld is not a typical weld; it is only intended to illustrate defects in welds that must be corrected prior to coating and lining. Good welding practices and welding codes govern the integrity of the weld; this standard only addresses surface preparation of the welds for the purpose of coating and lining for immersion service.

[2] Abrasive blasting in preparation for coating may reveal additional porosity and undercutting. Some applicators request the fabrication to blast the welds to reveal these imperfections prior to requesting inspection of the grinding by the lining applicator. Responsibility for repair of imperfections so revealed should be resolved in the pre-job conference.

The visual comparator mentioned in Appendix C is a molded plastic replica that illustrates various degrees of surface finishing for welds prior to coating or lining. Full-seam welds, skip welds, butt welds, lap welds, and others are depicted. For more information, contact the NACE International FirstService Department, 1440 South Creek Dr., Houston, Texas 77084-4906 (telephone +1 281/228-6200).

APPENDIX D

INSPECTION & EVALUATION METHODS

1.0|INSPECTION AND EVALUATION METHODS

Some or all of the following procedures were performed as applicable.

1.1|Methods

1.1.1 The inspection of the base metal and coatings on interior and exterior surfaces included only areas accessible without scaffolding or special rigging. Where possible, the base metal and coating on the interior wet surfaces were examined from either a rubber raft while the tank was being drained, by a Remote Operated Vehicle (ROV) with the tower in service, or with both.

1.1.2 Tank plate thickness was measured at random locations on the liquid holding shell. The overall structural condition of the tank was visually examined.

1.1.3 No structural analysis was done to determine if the tank design complies with the AWWA D100-11 Standard for "Welded Carbon Steel Tanks for Water Storage." However, any observed non-conformance to the AWWA D100-11 standard is noted in this report.

1.1.4 Although compliance with OSHA regulations was not a part of this inspection, any unsafe conditions or violations of current OSHA regulation that were observed are noted in this report.

1.2|Examination and Evaluation Techniques

Some or all of the following procedures were performed as applicable.

1.2.1|Site

The tank site was evaluated for proper drainage conditions affecting access and lead paint abatement during reconditioning.

Also, the following site dimensions were obtained: distance to fence(s), power lines, owner buildings, public property, private property/buildings, school/playgrounds, public parks, and other property.

1.2.2|Foundations

The tank concrete foundation(s) were/was visually examined for cracks, spalling, conditions of grout, indications of distress/settlement, and elevation above grade.

1.2.3|Tank Plate Thickness

Plate thickness measurements were taken using ultrasonic methods (UTM). The readings were taken using a digital readout Nova D-100 Ultrasonic Thickness Gage that has a dual element probe (transducer). The probe's transmitter element sends a short ultrasonic pulse to the material. The pulse, reflected as an echo from the opposite side of the plate

returns to the probe's receiver element. The round-trip time is directly related to the material's thickness.

1.2.4|Coating Thickness

Interior and exterior coatings, where accessible, were tested in accordance with Steel Structures Painting Council SSPC-PA2-82 "Measurement of Dry Film Thickness with Magnetic Gages" using PosiTector-6000-F1 Type 2 magnet flux gages with a fixed probe.

1.2.5|Coating Adhesion

Adhesion testing of the coating to the steel was performed by ASTM D-3359: Shear Adhesion Test, Measuring Adhesion by Tape Test. In addition, subjective coating adhesion evaluation was performed using a penknife.

1.2.6|Coating Cure

The cure of the interior wet coating was evaluated by ASTM D-5402-93 Standard Practice for Assessing the Solvent Resistance of Organic Coatings Using Solvent Rubs and/or with the manufacturer's recommended field method/industry standard procedures.

1.2.7|Coating Serviceability

The estimated remaining coating life or serviceability evaluation was performed using a wide variety of inspection instruments such as dry film thickness gauge, pen knife, Tooke gauge, adhesion tester(s), 30x microscope and serviceability evaluation experience (minimum experience 10 years).

The instrument inspection was combined with a close visual inspection of all the interior coating's accessible areas. This was done to detect any holidays (misses), skips, runs, sags, surface containments, overspray, dry spray, poor coating cohesion, inter-coat delamination, loss of adhesion to the substrate, adverse conditions of the steel underneath the coating, or any other defects affecting the intended service.

1.2.8|Coating Lead and Chromium Content Analysis

Samples may have been taken of the various types of coatings present on the interior and exterior surfaces. Corrosion Control Consultants and Labs of Kentwood, Michigan tests these coatings in conformance with ASTM D-3335 Standard Test Methods for Concentrations of Lead and Chromium in Paint.

APPENDIX E

PAINT CHIP LEAD TEST RESULTS

ANALYTICAL LABORATORY REPORT

Tuesday, August 13, 2019

CUSTOMER: KLM Engineering, Inc.
1976 Wooddale Drive
Woodbury, MN 55125

DATE RECEIVED: Monday, August 12, 2019
PO/PROJECT #: MN3961
SUBMITTAL #: 2019-08-12-002

LAB NUMBER: AC84807

Sampled By: Devin Severson
Job Location: Mineral Point, WI
Sample Identification: 1 - Exterior Roof

Date Sampled: August 2, 2019
Sample Description: Paint Chips

Preparation Method: EPA 3050B-P-M (Acid Digestion for Paints)
Analysis Method: EPA 6010C-M (ICP-AES Method for Determination of Metals)
Date Analyzed: Monday, August 12, 2019

ELEMENT	RESULT (by dry weight)	REPORTING LIMIT (RL)
Cadmium	**< RL**	0.00075 %
Chromium	**0.0019 %**	0.0013 %
Lead	**0.0058 %**	0.0025 %

LAB NUMBER: AC84808

Sampled By: Devin Severson
Job Location: Mineral Point, WI
Sample Identification: 2 - Interior Dry Drywell

Date Sampled: August 2, 2019
Sample Description: Paint Chips

Preparation Method: EPA 3050B-P-M (Acid Digestion for Paints)
Analysis Method: EPA 6010C-M (ICP-AES Method for Determination of Metals)
Date Analyzed: Monday, August 12, 2019

ELEMENT	RESULT (by dry weight)	REPORTING LIMIT (RL)
Cadmium	**< RL**	0.00075 %
Chromium	**0.020 %**	0.0013 %
Lead	**0.0052 %**	0.0025 %

LAB NUMBER: AC84809

Sampled By: Devin Severson
Job Location: Mineral Point, WI
Sample Identification: 3 - Interior Wet Roof

Date Sampled: August 2, 2019
Sample Description: Paint Chips

Preparation Method: EPA 3050B-P-M (Acid Digestion for Paints)
Analysis Method: EPA 6010C-M (ICP-AES Method for Determination of Metals)
Date Analyzed: Monday, August 12, 2019

ELEMENT	RESULT (by dry weight)	REPORTING LIMIT (RL)
Cadmium	**< RL**	0.00075 %
Chromium	**0.0022 %**	0.0013 %
Lead	**0.0066 %**	0.0025 %

ANALYTICAL LABORATORY REPORT

Tuesday, August 13, 2019

CUSTOMER: KLM Engineering, Inc.
1976 Wooddale Drive
Woodbury, MN 55125

DATE RECEIVED: Monday, August 12, 2019
PO/PROJECT #: MN3961
SUBMITTAL #: 2019-08-12-002

Unless otherwise noted, the condition of each sample was acceptable upon receipt, all laboratory quality control requirements were met, and sample results have not been adjusted based on field blank or other analytical blank results. Individual sample results relate only to the sample as received by the laboratory.

Digitally signed by Katie Root
Date: 2019.08.13 13:18:18 -04'00'

Tests Reviewed By: Katie Root, QA/QC Manager

Reporting Limit (RL): The lowest concentration of analyte in a sample that can be reported with a defined, reproducible level of certainty. This value is based on the lowest standard used for instrument calibration and must be at least twice the MDL.

GPI Laboratories, Inc. has obtained accreditation under the following programs:

- **National Lead Laboratory Accreditation Program (NLLAP)**
  AIHA-LAP: Environmental Lead Laboratory Accreditation Program (ELLAP), Laboratory ID#101030 (www.aihaaccreditedlabs.org)
  A2LA: American Association for Laboratory Accreditation (Certificate 5033.01) (www.a2la.org)
- **OH:** Ohio Department of Health Lead Poisoning Prevention Program, Approval #E10013 (www.odh.ohio.gov)
- **AIHA-LAP:** Industrial Hygiene Laboratory Accreditation Program (IHLAP), Laboratory ID#101030 (www.aihaaccreditedlabs.org)
- **National Environmental Laboratory Accreditation Program (NELAP)**
  NY: State of New York Department of Health, Laboratory ID#11609 (Serial # 59716-59720) (518-485-5570)
  LA: State of Louisiana Department of Environmental Quality, Laboratory ID#180321 (Certificate 05036) (www.deq.louisiana.gov)
  OK: Oklahoma Department of Environmental Quality, Laboratory ID#9993 (Certificate 2018-062) (www.deq.state.ok.us)

Testing which is performed by GPI Laboratories, Inc. according to test methods, or for elements which are not included in the table below fall outside of the current scope of laboratory accreditation. Customers are encouraged to verify the current accreditation status with the individual accreditation programs by calling or visiting the appropriate website for the applicable program.

SCOPE OF ACCREDITATION

Air and Emissions

Element/Test	Method	Accreditation(s)
Suspended Particulates: PM10 / TSP	40 CFR 50 Appendix J / 40 CFR 50 Appendix B	NY, LA
Lead in Airborne Dust	40 CFR 50 Appendix G	A2LA, ELLAP, IHLAP, LA
Lead in Airborne Dust	NIOSH 7300	A2LA, ELLAP, OH, NY, LA
Metals in Airborne Dust	NIOSH 7300	A2LA, IHLAP

Solid Chemical Materials

Element/Test	Method	Accreditation(s)
TCLP	EPA 1311(Sample Preparation Method)	NY, LA, OK
Lead in Soil	EPA 3050B/ EPA 6010C	A2LA, ELLAP, OH, NY, LA, OK
Lead in Paint	EPA 3050B/ EPA 6010C	A2LA, ELLAP, OH, NY, LA
Lead in Paint	ASTM D 3335-85A/ EPA 6010C	NY
Lead in Dust Wipes	EPA 3050B/ EPA 6010C	A2LA, ELLAP, OH, NY, LA
Ignitability	EPA 1010A	NY
pH	EPA 9045D	NY

Non-Potable Water / Analysis by ICP			Solid Chemical Materials	
Element/Test	Method	Accreditation(s)	Method	Accreditation(s)
Arsenic	EPA 6010C/ EPA 200.7 Rev 4.4	NY, LA, OK	EPA 6010C	NY, LA, OK
Barium	EPA 6010C/ EPA 200.7 Rev 4.4	NY, LA, OK	EPA 6010C	NY, LA, OK
Cadmium	EPA 6010C/ EPA 200.7 Rev 4.4	NY, LA, OK	EPA 6010C	NY, LA, OK
Chromium	EPA 6010C/ EPA 200.7 Rev 4.4	NY, LA, OK	EPA 6010C	NY, LA, OK
Copper	EPA 6010C/ EPA 200.7 Rev 4.4	NY, LA, OK	EPA 6010C	NY, LA, OK
Lead	EPA 6010C/ EPA 200.7 Rev 4.4	NY, LA, OK	EPA 6010C	NY, LA, OK
Mercury	EPA 245.1 Rev.3/ EPA 7470A	NY, LA, OK	EPA 7471B	NY, LA, OK
Nickel	EPA 6010C/ EPA 200.7 Rev 4.4	NY, LA, OK	EPA 6010C	NY, LA, OK
Selenium	EPA 6010C/ EPA 200.7 Rev 4.4	NY, LA, OK	EPA 6010C	NY, LA, OK
Silver	EPA 6010C/ EPA 200.7 Rev 4.4	NY, LA, OK	EPA 6010C	NY, LA, OK
Zinc	EPA 6010C/ EPA 200.7 Rev 4.4	NY, LA, OK	EPA 6010C	NY, LA, OK
Cobalt	---	---	EPA 6010C	NY, LA, OK
Manganese	---	---	EPA 6010C	NY, LA, OK
Acid Digestion	EPA 3010A	NY, LA	EPA 3050B	NY, LA

CHAIN OF CUSTODY FORM

GPI

Send To:
GPI Laboratories, Inc.
4403 Donker Court, Grand Rapids MI 49512-4054
(616) 940-3112 | GRLabsInfo@gpinet.com | www.gpinet.com

FOR LAB USE ONLY			
Properly Contained	(YES)	NO	N/A
ASTM E1792 wipes	YES	NO	(N/A)
Adequate Ph Adjust	YES	NO	(N/A)
Lab acidified: By/Date:			NA

Company: KLM Engineering, Inc.	Address: 1976 Wooddale Drive, Suite 4, Woodbury, MN 55125	Company Contact: Laurie Sylte	P.O./Proj #: MN3961
		Telephone: 651-773-5111	Location: Mineral Point, WI
		E-Mail: lsylte@klmengineering.com	

Matrix	TCLP (Waste)	Metals Content	Other Tests	Turnaround Time	Comments:
☑ Paint Chips ☐ Wipe	☐ Lead	☐ Lead	☐ pH (Corrosivity)	☐ Same Day*	
☐ Soil ☐ Filter	☐ RCRA (8) Metals	☑ Lead, Cad., Chrome.	☐ Ignitability	☑ Rush*	
☐ Abrasive ☐ _____	☐ _____	☐ RCRA (8) Metals	☐ VOC (Method 24, etc)	☐ Standard	
☐ Wastewater		☐ _____	☐ _____	☐ _____	

GPI Labs accepts Visa, MasterCard, and American Express. *Accelerated Turnaround is not available for every test. Please call for information.

Laboratory ID	Sample Number	Date/Time Sampled	Sample Identification / Location:	Special Instructions:	Wipes: Area wiped (sq.ft.)	Air Sampling Filters: ☐ TSP ☐ PM10 ☐ 37 mm Cassette — Minutes	Flow Rate	UNITS
AC84807	1	8-2-19	Exterior Roof					
AC84808	2	8-2-19	Interior Dry Drywell					
AC84809	3	8-2-19	Interior Wet Roof					

Sampled By (Please print): Devin Severson Date Submitted: 8-8-19 Signature: Michelle Nelson

Received by: _____ Date/Time: _____ Relinquished Date/Time: _____

Received by: _____ Date/Time: _____ Relinquished Date/Time: _____

Method of Shipment: _____

Page 1 of 1

Received for Laboratory by: Tina Rist Date/Time: 8-12-19/9:10 Submittal #: 2019-08-12-002 1/18/17 Form #: 53-12

VTC 8/12/19