

**DEPARTMENT OF ENVIRONMENTAL PROTECTION**  
**Bureau of Environmental Cleanup and Brownfields**

**DOCUMENT NUMBER:** 263-3120-001

**TITLE:** Evaluation of Underground Storage Tank (UST) Liners

**EFFECTIVE DATE:** January 20, 2023

**AUTHORITY:** The Storage Tank and Spill Prevention Act, P.L. 169, No. 32 of 1989, as amended (Tank Act), and 25 Pa. Code, Chapter 245 (Storage Tank Regulations).

**POLICY:** It is the policy of the Department of Environmental Protection (DEP) to carry out the provisions of the Storage Tank and Spill Prevention Act of 1989 and related regulations.

**PURPOSE:** Steel USTs that have been internally lined in accordance with Chapter 245.422 and have not been upgraded with a cathodic protection system must be internally evaluated within ten years after lining installation. If the UST is determined to be structurally sound and the lining continues to perform in accordance with original design specifications an internal evaluation must be conducted every five years thereafter.

This document provides guidance for conducting periodic UST lining evaluations and provides for consistent documentation and reporting of the evaluation results.

**APPLICABILITY:** This guidance applies to owners and operators of internally lined USTs and industry professionals who conduct periodic evaluations of these USTs.

**DISCLAIMER:** The policies and procedures outlined in this guidance are intended to supplement existing requirements. Nothing in the policies or procedures shall affect regulatory requirements.

The policies and procedures herein are not an adjudication or a regulation. There is no intent on the part of DEP to give the rules in these policies that weight or deference. This document establishes the framework within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.

**PAGE LENGTH:** 14 pages

# UNDERGROUND STORAGE TANK LINING EVALUATION

## **General**

The initial ten-year and periodic five-year internal evaluation (inspection) of a lined UST requires a manual tank entry, an internal examination of the lined tank, and a thorough understanding of the tank lining process and applicable industry standards. For this reason, only DEP-certified storage tank installers holding (TL) certification or professional engineers, knowledgeable in tank lining and experienced in lining examinations, are qualified to conduct the tank lining evaluation (see §245.432(d)). Where a qualified professional engineer does not hold either the DEP storage tank installer (TL) certification or the DEP underground storage tank installer (UMX) certification, the tank handling activities, including digging to the tank top and opening the top of the tank, tank cleaning, and closing the tank top, must be done under the supervision of a DEP-certified storage tank installer holding either the (TL) or (UMX) certification(s).

A checklist is provided in Appendix A to aid the evaluator in completing and submitting the lining evaluation. Upon completion of the tank lining evaluation process, the findings must be documented on the UST Lining Evaluation Certification (Appendix B), and the tank lining evaluator must certify that the tank and lining passes, or fails, the required industry standards. The completed UST Lining Evaluation Certification documentation must be provided to the tank owner, to the DEP central office, and to the appropriate DEP regional office.

Equipment used for lining evaluations should be maintained, calibrated and operated in accordance with the manufacturer's technical instructions and guidance. Thickness-measuring instruments must be capable of measuring thickness to within 0.001 inch (1 mil, or 0.05 mm) at the expected thickness of the metal shell and lining. Measurements should be documented within this tolerance limit.

## **Reporting Suspected or Confirmed Contamination**

Any indication of a release, such as a hole in the tank, found during the lining evaluation requires the DEP certified individual to notify the appropriate DEP regional office on a form provided by the DEP within 48 hours. If the notification is being submitted because of a failed tank tightness test, provide a copy of the test results with the form.

## **UST Lining Evaluation Requirements**

When conducting a UST lining evaluation, use the latest edition of the American Petroleum Institute (API) Standard 1631, Interior Lining and Periodic Inspection of Underground Storage Tanks or the National Leak Prevention Association (NLPA) Standard 631, Entry, Cleaning, Interior Inspection, Repair, and Lining of Underground Storage Tanks, the 1991 version. Prior to tank entry, any excavation to gain entry into the tank must be accomplished by a DEP-certified storage tank installer, see Storage Tank Program guidance number 263-0900-011, "Modification and Maintenance Issues." Tank cleaning activities should follow all procedures in Storage Tank Program guidance number 263-0900-012, "Storage Tank Cleaning Activities." It is particularly important that all products and wastes removed from the tank during the cleaning process be properly handled and disposed of at a facility permitted to accept these wastes.

As a cost savings approach, a National Fire Protection Association (NFPA) approved, intrinsically safe video camera may be used by a qualified individual to identify obvious lining failures. The use of the video camera should adhere to safety and inspection procedures outlined in API 1631.

## **I. Tank Entry**

If no manway entry to the tank exists, an opening, at least 18 inches by 18 inches, shall be cut into the tank top using non-sparking equipment adhering to API 1631 specifications for preparing to open and opening a tank. The safety and tank entry requirements of NLPA 631 must be followed during all tank entries. The purging, air ventilation, and testing of the internal tank atmosphere must continue throughout the entire lining evaluation procedure to ensure that the atmosphere remains below ten percent (10%) of the lower flammable limit. The procedures in API Publications 2217 and 2015, ANSI Z117.1, NIOSH 80-106, applicable sections of 29 Code of Federal Regulations Part 1910, NFPA 326, and NFPA 77 must be followed to ensure safety.

## **II. Preparation of the Tank Interior**

The sludge accumulation on the bottom of the tank must be removed with non-sparking equipment and collected for disposal. Next, petroleum absorbent materials should be spread on the entire tank bottom to remove all traces of liquids. These steps must be completed in accordance with API 1631 or NLPA 631. The sludge and spent absorbent materials shall be reused, treated or disposed in accordance with applicable requirements in Chapters 91, 92a, 260a-270a and 287-299.

## **III. Tank Evaluation**

Begin by completing the tables labeled as “Facility Information,” “Qualified Tank Lining Evaluator,” and “Tank Information” in the “Underground Storage Tank Lining Evaluation Certification Form” found in Appendix B.

During the internal tank evaluation, the entire interior surface of the tank must be examined using a light fixture that meets the requirement of NFPA 70. Initially, the evaluator shall visually inspect the lining for evidence of peeling, blistering, wrinkled surface or surface roughening of the lining material. The evaluator shall look for pitting, rusting, physical damage, water leakage, cracks, streaking, discoloration or other signs of structural instability. These observations should be documented in the comment section.

The determination of passing or failing results for the lining material depends on the original manufacturer specifications. The manufacturer information should be recorded in the “Tank Information” section. If the manufacturer cannot be determined record the lining material’s color and note that the manufacturer is unknown.

After the initial survey, using the general layout of Appendix C as a guide, the internal cylinder wall shall be divided into three-foot by three-foot sections – starting at the bottom of the tank on the fill end (see Appendix B). Indicate on the center section drawing where the opening exists or was made for tank entry. Where one of the end designations falls in the middle of the tank, use the other designator to establish the report orientation. Each tank end (head) shall be divided into four equal quadrants and each quadrant should be further divided into three-foot by three-foot sections. Each remaining smaller tank end area shall be considered an additional section. The center of each section shall be identified, and the following tests shall be taken:

1. Lining Test. The lining shall be tested at all sections, as described below, adhering to “Lining Testing,” API 1631, and NLPA 631 to ensure that it meets the manufacturer’s original specifications for thickness and hardness. If the original lining material specification cannot be found, the lining must achieve a Barcol hardness of at least 40; note this as the specification used on the comment page.
  - a. Ultrasonically (or other approved industry method) measure the lining thickness at the center of each section and record measurements on the forms provided in Appendix B.

National standards specify a minimum lining thickness of 100 mils (0.100 inch, or 2.54 mm). Lining thickness is particularly difficult to control near the top of the tank. Close attention should be given to this area during a lining evaluation. When measuring lining thickness, averages are not acceptable; record the actual reading at each section center.
  - b. Use a Barcol Hardness Tester or other acceptable instrument to determine that the lining continues to meet the manufacturer’s specifications for hardness. All hardness readings should be taken in the lower half of the tank. At least two readings on each end (head), and one reading each five linear feet on the clockwise and counterclockwise sides of the bottom center line must be taken and recorded on the forms provided in Appendix A. Circle the hardness readings to distinguish them from thickness readings.
  - c. Check the entire tank lining with a holiday detector to ensure the absence of air pockets, leaks, and pinholes in the lining. Record the results of the holiday test in the comment section of the evaluation report contained in the guidance document. A detected anomaly is a lining failure.
  - d. Any lined tank that fails this part of the evaluation shall promptly be closed in accordance with §245.422(b)(1)(iii) following the Storage Tank Program guidance number 263-4500-601 “Closure Requirements for Underground Storage Tank Systems.”
2. Shell Thickness Test. Gauge the metallic tank shell thickness using ultrasonic or another approved industry method, as specified in API 1631 or NLPA 631, at all section centers on the interior cylinder wall and tank end areas. All thickness readings shall be documented on the forms provided in Appendix B. For comparison purposes, the original tank metal thickness shall be obtained either from the tank manufacturer or established in accordance with the requirements of UL Standard 58. Also record the 75%

and 85% shell thickness limits. Any section where a thickness reading is less than 75% of the original metal thickness is referred to as a “Thin Wall Area.” These “Thin Wall Areas” shall be further subdivided into nine (for a full three-foot by three-foot section) smaller one-foot by one-foot subsections. A thickness gauging measurement must be taken at the center of each subsection and documented in the evaluation report, on the form provided in Appendix B. Determine the average thickness for each “Thin Wall Area” section (average of the nine subsection measurements), and record on the provided form. The average tank metal thickness for all measured sections (interior cylinder wall and tank end areas), including the average thickness of designated Thin Wall Areas (computed from the subsection of nine measurements), must be at least 75% of the original tank metal thickness to meet required thickness standards.

- a. **Tanks not meeting the average wall thickness requirement of at least 75% shall immediately be taken out of service, and promptly closed.** Follow procedures in the Storage Tank Program guidance number 263-4500-601 “Closure Requirements for Underground Storage Tank Systems.”
  - b. If the average metal thickness is determined to be at least 75% and not greater than 85% of the original metal thickness, as per API 1631, and the tank shell has **not** been repaired with boiler plugs or fiberglass patches and the lining passed the tests in paragraph one above, a cathodic protection (CP) system shall be installed within six months of the evaluation. The tank shall remain empty and be placed into temporary out-of-service status until the CP system is installed. If not upgraded with CP within the six-month period, the tank must be permanently closed within one-year of the evaluation (see §245.451(g)).
  - c. If the average tank shell metal thickness is determined to be greater than 85% and the lining passes the evaluation in paragraph one, the tank may be returned to service following paragraph three and the lining evaluated within the next five years.
3. Tightness Testing. At the completion of the tank lining evaluation and before backfilling the excavation, a UST meeting standards for continued use shall have the tank manway entry or opening in the tank top resealed and the seal tested in accordance with NLPA 631 **or** a precision tightness test shall be performed in accordance with API 1631. A tightness test shall comply with DEP regulatory requirements at §245.31 (*relating to underground storage tank testing requirements*), which may require the test to be performed by a DEP certified individual certified in the UTT category, and test performance standards at §245.444(2) (*relating to methods of release detection for tanks*). The tank must pass the NLPA 631 specified seal test or a precision tightness test prior to return to service.

#### IV. Certification and Documentation of Results

At the completion of the tank lining evaluation, the “UST Lining Evaluation Certification Form” must be completed for each tank evaluated and signed by the qualified person that performed the evaluation. This certification must clearly document that the tank either **meets and complies with API Standard 1631, or NLPA Standard 631 following the invasive examination, or**

**fails to comply.** The owner should also sign the “UST Lining Evaluation Certification Form;” if the owner refuses to sign, note this in the comment section. A copy of the “UST Lining Evaluation Certification Form,” and all associated documentation including the tank tightness testing documentation, shall be provided to the appropriate DEP regional office and the storage tank facility. The original shall be submitted to the Division of Storage Tanks, Rachel Carson State Office Building, P.O. Box 8762, Harrisburg, PA 17105-8762. The qualified evaluator should also retain a copy for at least ten years.

V. **Next Lining Evaluation (Periodic re-evaluation)**

Tanks passing a lining evaluation, including average shell thickness (greater than 85% of original metal thickness) must have the lining re-evaluated within five years of the current evaluation. If the next evaluation is not conducted within the required time frame, the tank must be properly closed.

VI. **Tanks that Fail**

In cases where a signed certification cannot be produced to show the tank passed and met the API Standard 1631 or NLPA Standard 631 for tank lining evaluations, at the frequency required by the storage tank regulations, including the tank shell wall thickness standard, **the tank should remain empty and be placed into temporary out-of-service status until the tank system is properly closed.** Permanent closure should be completed within one year of the evaluation and should follow the Storage Tank Program guidance number 263-4500-601 “Closure Requirements for Underground Storage Tank Systems.”

## Appendix A Tank Lining Inspection Checklist

- DEP (TL) certified individual or qualified Professional Engineer with a DEP (TL) or (UMX) certified individual on-site.
- Lining tested for holidays and results documented.
- Original lining material and shell thickness specifications obtained.
- Lining hardness test performed and documented.
- Lining Thickness Readings taken at all section centers and documented.
- Tank metal thickness readings taken at all section centers and documented.
- Thin wall areas (less than 75%) found, further subdivided and measured.
- Tank opening sealed and seal tested satisfactory.
- Excavation backfilled.
- Completed report compiled, including:
  - Underground Storage Tank (UST) Lining Evaluation Certification
  - Comment page
  - Tank metal thickness data
  - Lining material thickness and hardness data
  - Tank tightness testing documentation
- Completed evaluation provided to facility owner, the appropriate DEP Regional Office, and DEP Central Office:

<b>Northwest Region</b> 230 Chestnut Street Meadville, PA 16335-3481	<b>Northcentral Region</b> 208 West Third Street, Ste. 101 Williamsport, PA 17701-6448	<b>Northeast Region</b> 2 Public Square Wilkes-Barre, PA 18701-1915
<b>Southwest Region</b> 400 Waterfront Drive Pittsburgh, PA 15222-4745 412-442-4091	<b>Southcentral Region</b> 909 Elmerton Avenue Harrisburg, PA 17110-8200	<b>Southeast Region</b> 2 East Main Street Norristown, PA 19401-4915
<b>DEP Central Office:</b> Pennsylvania Department of Environmental Protection Rachel Carson State Office Building Division of Storage Tanks P.O. Box 8762 Harrisburg, PA 17105-8762		
For additional information on DEP regional offices, or to determine which regional office is responsible for the county in which a facility is located, please visit <a href="http://www.dep.pa.gov">www.dep.pa.gov</a> and search "Regional Resources."		

**Appendix B**  
**DEPARTMENT OF ENVIRONMENTAL PROTECTION**  
**BUREAU OF ENVIRONMENTAL CLEANUP AND BROWNFIELDS**  
**UNDERGROUND STORAGE TANK (UST) LINING EVALUATION CERTIFICATION FORM**

FACILITY INFORMATION	QUALIFIED TANK LINING EVALUATOR
<b>Facility ID #</b> _____ - _____ <b>Facility Name:</b> _____ <b>Address:</b> _____ _____ _____ <b>Representative Present During Inspection</b> <b>Name:</b> _____ <b>Phone:</b> _____	<b>Name:</b> _____ <b>TL Cert. #</b> _____ <b>or PE #</b> _____ <b>Company Name:</b> _____ <b>Company Cert. #:</b> _____ <b>Address:</b> _____ _____ _____ <b>Telephone #:</b> _____ <b>Email Address:</b> _____

TANK INFORMATION	
Evaluated UST ID #: _____ Date Tank Lined: _____ Date Lining Last Inspected: _____ Tank Diameter: _____ Original Thickness: Tank Head _____ <b>75%:</b> _____ <b>85%:</b> _____	Gallons Capacity: _____ Product Stored: _____ Lining Manufacturer: _____ Tank Length: _____ Center Section: _____ <b>75%:</b> _____ <b>85%:</b> _____

I, (Evaluator's Name) \_\_\_\_\_, the undersigned, hereby certify that I am trained and qualified in accordance with the requirements of API Standard 1631 or NLPA Standard 631 to perform the evaluation (inspection) of the above designated tank. The entire interior of the tank was physically evaluated on \_\_\_\_\_ (date or dates) in accordance with API Standard 1631, or NLPA Standard 631, as follows:

INITIAL EITHER Y (Yes) OR N (No) BLOCK AS APPROPRIATE			
<b>1.</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	At least 98% of the lining was visible for inspection.
<b>2.</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	The tank was found to be structurally sound. There was no evidence of pitting, rusting, physical damage, water leakage, cracks, streaking, discoloration or other sign of structural instability.
<b>3.</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	A physical examination of the tank lining was conducted. There was no evidence of lining peeling, blistering, wrinkled surface, or surface roughening.
<b>4.</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	The lining is free of holidays (pinholes) in accordance with API standard 1631, or NLPA 631.

INITIAL EITHER Y (Yes) OR N (No) BLOCK AS APPROPRIATE			
5.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	The lining meets or exceeds minimum thickness specifications (NLPA 631). Minimum lining thickness measured: _____
6.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	The hardness test of the lining meets the lining manufacturer's hardness specifications, and testing was performed in accordance with the requirements of API Standard 1631, or NLPA 631; (Barcol test GYZJ 935 or equivalent instrument.) Minimum Barcol measurement: _____
7.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	The metal thickness of the tank shell was determined to meet the requirements of API 1631, or NLPA 631. The average metal thickness for all sections (cylinder wall, heads, full and partial), including the average thickness of designated thin wall areas is at least 75% of the original tank metal thickness. Average of all sections: _____
8.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	A test of the access opening seal has been completed successfully in accordance with NLPA 631 or a precision tightness test, in accordance with API 1631. Note: The test must be conducted after the tank opening was sealed and prior to backfilling the excavation. Attach the tightness test results or describe the test in the comments.

**Initial only one applicable statement below:**

Tank meets above standards, metal thickness average greater than 85% of original thickness, and the tank may be returned to unrestricted operational service. **OR**

Tank meets above standards, metal thickness average is at least 75% of original thickness, the tank shell is unpatched, and must have a corrosion protection system installed within six months to continue operational service. The corrosion protection system must be designed by a corrosion expert and installed under the oversight of a DEP-certified tank installer (UMX). **OR**

Tank fails to meet the above standards and must remain closed.

Signature of Qualified Tank Lining Evaluator \_\_\_\_\_ Date \_\_\_\_\_

Signature of Tank Owner or Operator \_\_\_\_\_ Date \_\_\_\_\_

The above signatories certify under penalty of law as provided in 18 PA C. S. A. 4904 (*relating to unsworn falsification to authorities*) that the information provided herein is true, accurate and complete to the best of their knowledge and belief.

Comments – Lining description; conditions observed, evaluation findings, results of physical measurements taken, and recommendation provided to the tank owner/operator. Attach additional sheets as necessary with Facility ID, tank number and date of inspection in the heading.

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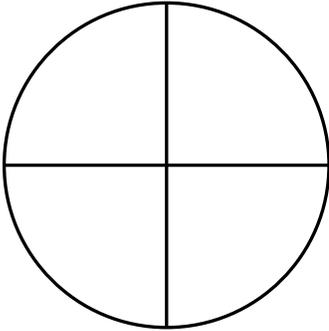


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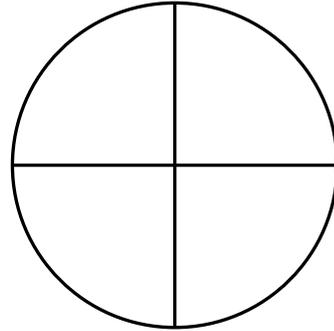


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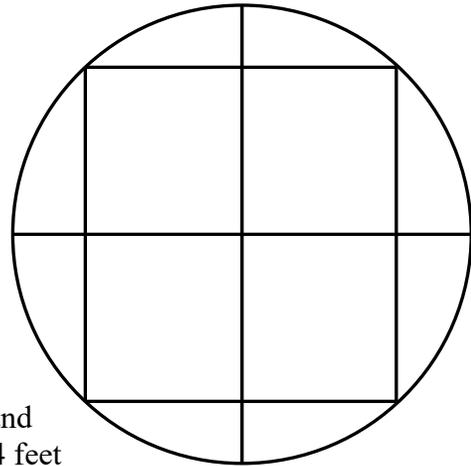
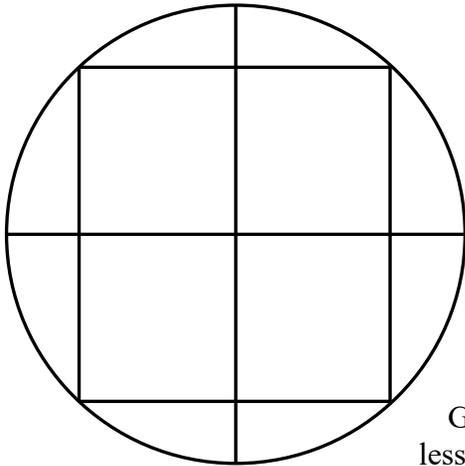
**Fill End**



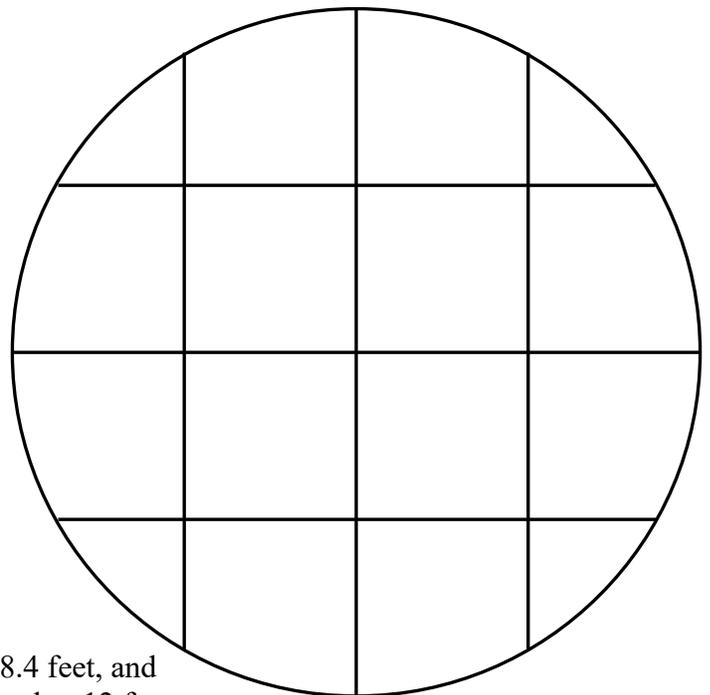
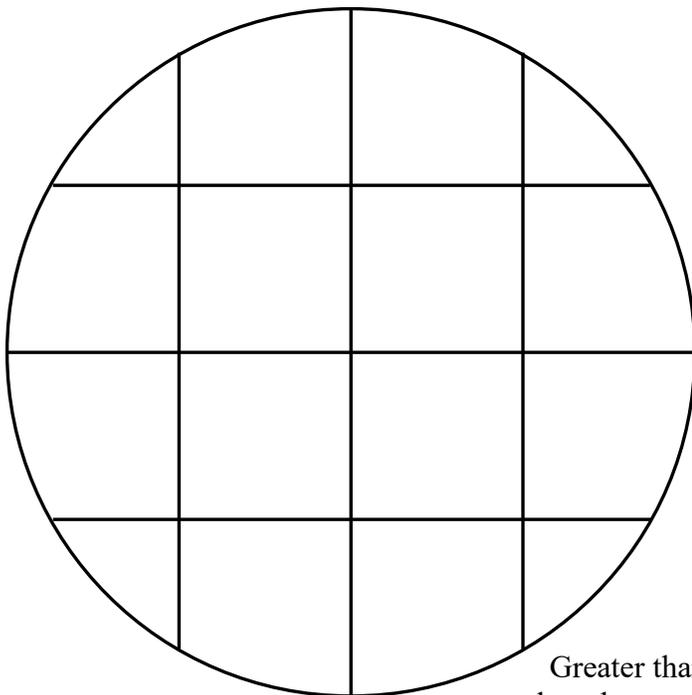
**Piping/Pump End**



6-foot diameter or less

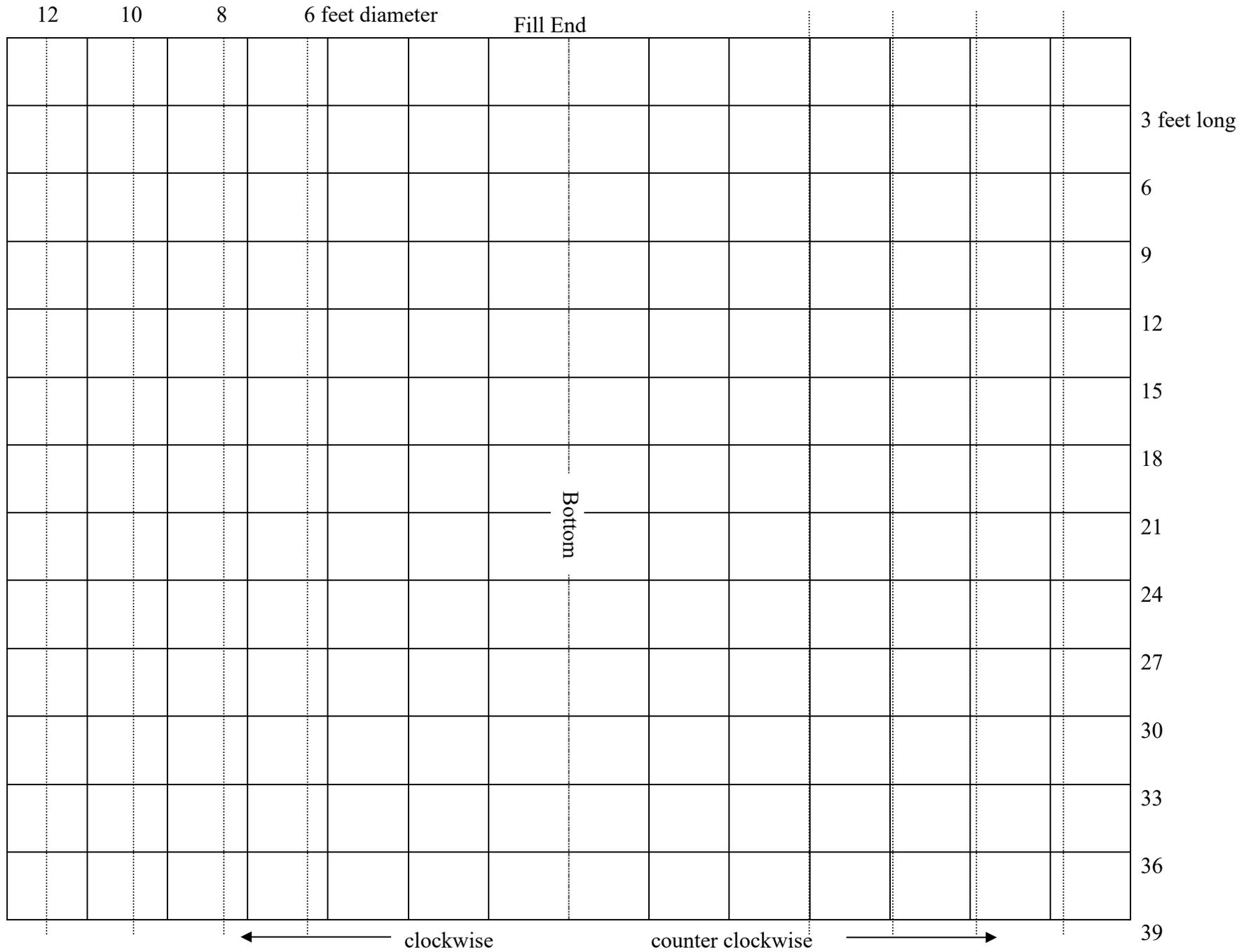


Greater than 6 feet, and  
less than or equal to 8.4 feet



Greater than 8.4 feet, and  
less than or equal to 12 feet

# Appendix B



**Appendix B**  
**Thin Wall Areas**

Area designated number \_\_\_\_\_


Initial thin wall reading \_\_\_\_\_

Average of above readings \_\_\_\_\_

Area designated number \_\_\_\_\_


Initial thin wall reading \_\_\_\_\_

Average of above readings \_\_\_\_\_

Area designated number \_\_\_\_\_


Initial thin wall reading \_\_\_\_\_

Average of above readings \_\_\_\_\_

Area designated number \_\_\_\_\_


Initial thin wall reading \_\_\_\_\_

Average of above readings \_\_\_\_\_

Area designated number \_\_\_\_\_


Initial thin wall reading \_\_\_\_\_

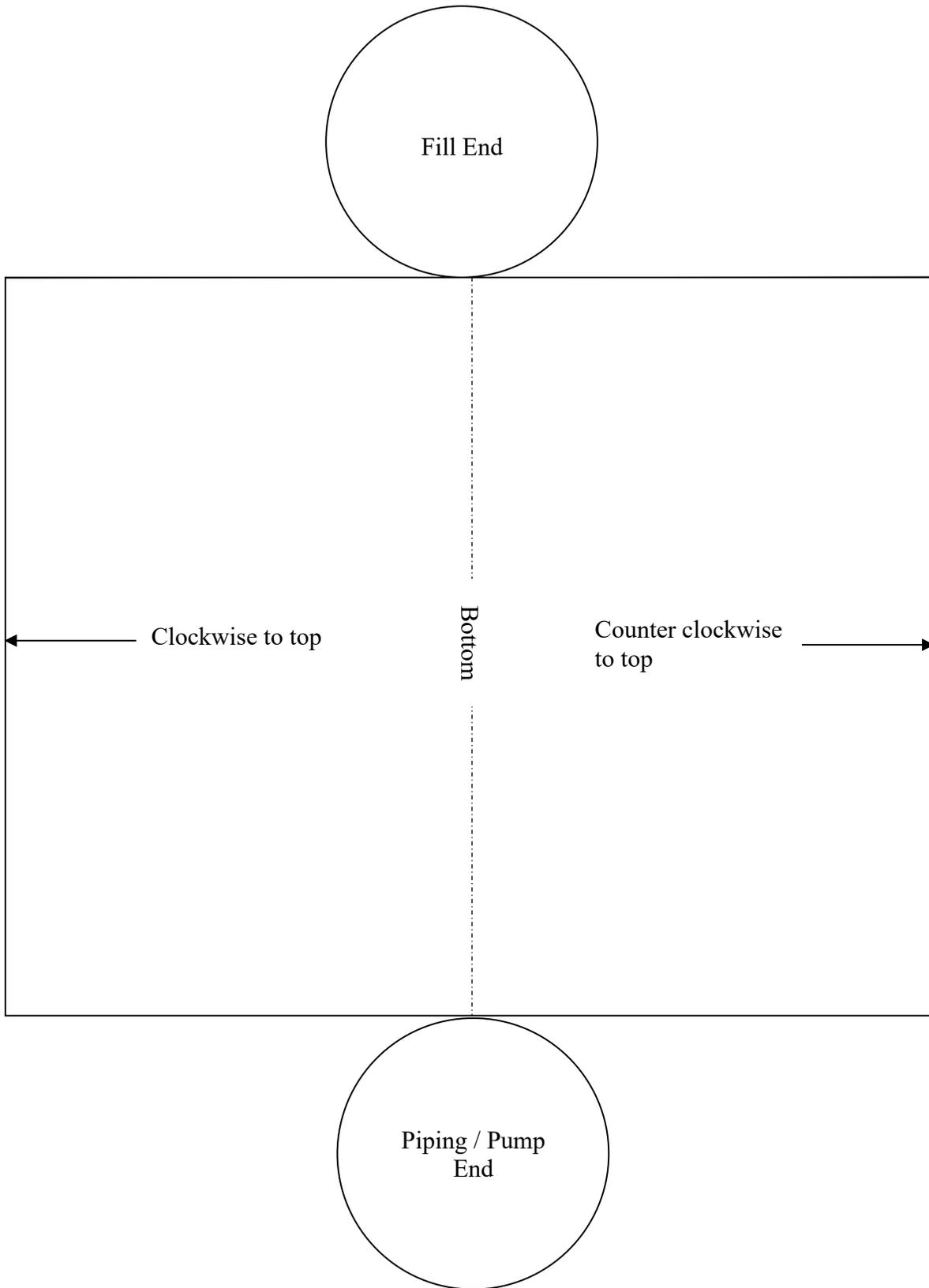
Average of above readings \_\_\_\_\_

Area designated number \_\_\_\_\_


Initial thin wall reading \_\_\_\_\_

Average of above readings \_\_\_\_\_

**Appendix C**  
**General Tank Measurement Layout**



## Tank Section Thickness

Uncoated, Carbon Steel

Tank Capacity (US Gallons)	Original Steel thickness (inches)	Minimum UL thickness (inches)	85% limit (inches/mm)	75% limit (inches/mm)
≤ 285	15 gauge, 0.070	0.067	0.060 / 1.50	0.052 / 1.35
286 to 560	13 gauge, 0.094	0.093	0.080 / 2.05	0.071 / 1.80
561 to 1100	11 gauge, 0.125	0.123	0.106 / 2.70	0.094 / 2.40
1101 to 4000	8 gauge, 0.172	0.167	0.146 / 3.70	0.129 / 3.30
4001 to 12000	1/4, 0.250	0.240	0.212 / 5.40	0.188 / 4.75
12001 to 20000	5/16, 0.312	0.302	0.266 / 6.75	0.234 / 6.00
20001 to 50000	3/8, 0.375	0.365	0.319 / 8.10	0.281 / 7.15

## U.S. Steel Plate Standard

Gauge Number	Fractional	Nominal (inch)
0000000	1/2	0.500
000000	15/32	0.469
00000	7/16	0.438
0000	13/32	0.406
000	3/8	0.375
00	11/32	0.344
0	5/16	0.312
1	9/32	0.281
2	17/64	0.266
3	1/4	0.250
4	15/64	0.234
5	7/32	0.219
6	13/64	0.203
7	3/16	0.188
8	11/64	0.172
9	5/32	0.156
10	9/64	0.141
11	1/8	0.125
12	7/64	0.109
13	3/32	0.094
14	5/64	0.078
15	9/128	0.070
16	1/16	0.062