Water Storage Tank Asset Management

OTCO Water Distribution Workshop
November 13, 2018

Presenter:

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Water System Consultant – SUEZ

ready for the resource revolution

SUEZ

Suez Asset Protection Programs

Production > Treatment > Storage > Distribution

Wells

- Assessment
- Pump Services
- Maintenance
- Rehabilitation
- Drilling

Water Quality

- Mixing
- THM Reduction
- Ice Pigging
- Chlorine Residual
- Gravity Filters

Steel and Concrete Assets

- Assessment
- Inspections
- Chemical Cleaning
- Emergency Calls
- **8,000 Tanks in Service Contracts**
- Repairs
- Safety Upgrades
- Maintenance
- Rehabilitation
- Drone Inspections

Pipe Network

- Pipe Lining
- Valve&Hydrant
- Leak Detection
- Aquadvanced

Asset Management Plan: Major Components Per OEPA

- Components:
  - Inventory of all major assets
  - Condition assessment of those assets
  - Rehabilitation plan for the assets
  - Capital plan for the rehabilitation
  - Long term funding strategy to maintain the asset in the future

Asset Management Plan: Based on a Water Tower

- Components:
  - Inventory of all major assets(1 tank to 114)
  - Condition assessment of those assets (scoring system)
  - Rehabilitation plan for the assets (based on the scores of each tank)
  - Capital plan for the rehabilitation (spread upfront cost over several years)
  - Long term funding strategy to maintain the asset in the future (maintenance fee for future work)

Did you know?

- “ A good, comprehensive preventative maintenance program can extend the life of an existing tank (as well as that of a new tank) INDEFINITELY”

AWWA M42 – Chapter 9

AWWA M42 – Chapter 10

“Why have a maintenance program?

The answer is simple: Preventive maintenance has been, and always will be, less expensive than crisis maintenance.”

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Water Storage Tank Condition Assessment Report

Project:		**Proj #:**		**Evaluation Type:**	
Location:		**Task #:**		**Tank Design:**	
Inspector:		**Date:**		**Capacity:**	Gallons

Exterior Tank Conditions: All questions are Yes / No / NA / NR unless listed (G/F/P) for Good / Fair / Poor / NA / NR

Tank Area	Item of Concern	Status	Tank Area	Item of Concern	Status
Exterior	Coating visual assessment? (G/F/P)		Vent	Design meets state standards?	
Coating	Actionable checking / delamination?			Screen intact?	
	Actionable corrosion / deterioration?			Separate vent and overflow?	
	Is there any graffiti paint or etchings?			Vent is accessible for repair?	
	Coating adhesion assessment? (G/F/P)			Vent extends to exterior of enclosure?	
	Does soiling impact visual appearance?		Overflow	Meets state standard?	
	Head wall to cylinder sealant intact?			Actionable corrosion / deterioration?	
Exterior	Structural visual assessment? (G/F/P)			Unsealed penetrations present?	
Structure	Are all plate seams sealed?			Overflow extends to exterior of enclosure?	
	Significant pitting or metal loss visible?			Required air gap present?	
	Are all visible penetrations sealed?			Screen is intact or was replaced?	
	Circulation lines in sound condition?			Flapper is functional or was replaced?	
	Sight glass / sensors in sound condition?			Drain, spillway or rip-rap present?	
Tank Access	At least two manholes present?		Tank Safety	Access tube, ladder or stairway present?	
	Access points meet state standards?			Required fall arrest system present?	
	All external access points secured?			Safe access to tank interior possible?	
	Ground entry at least 24" above grade?			Confined space ventilation required?	
	External equipment limits tank access?			Unsafe standing water near electrical?	
Tank Support	Cylinder equipped with external support?		Pump House	Tank access inside secondary structure?	
	Actionable corrosion / deterioration?		or Enclosure	Is entry to the enclosure locked?	
	External soil coverage erosion occurring?			Coating on pipes & valves? (G/F/P)	
	Leakage from the head wall evident?			Enclosure equipped with a sump / drain?	
	Undermining of the tank grounds noted.			Enclosure free of standing water?	

Interior Tank & Site Conditions: All questions are Yes / No / NA / NR unless listed (G/F/P) for Good / Fair / Poor / NA / NR

Tank Area	Item of Concern	Status	Tank Area	Item of Concern	Status
Interior	Coating visual assessment? (G/F/P)		Water quality	Water quality visually acceptable?	
Coatings	Actionable blistering / delamination?			Significant staining or biofilm present?	
	Actionable corrosion / deterioration?			Root growth or soil infiltration present?	
	Coating adhesion assessment? (G/F/P)			Significant floor sediment present?	
	Coating at penetrations is acceptable?			Is there a mixing system present?	
Interior	Structural visual assessment? (G/F/P)			Is there a cathodics system present?	
Structure	Are cylinder round seams sealed?		Site	Is site equipped with a security fence?	

Over 150 items reviewed per water tower

Tank Assessment Index 2018

Priority	Tank	Size	Type	Year Built	Paint Ext	Paint Int	Inspect	TAI '15	TAI '16	Change	Structure	Ext Paint	Int Paint	Dry Paint	Sanitary	Safety	Security
1	TRAP FALLS	10.000	GST	1980	1980	1980	04/21/16	6.10	5.65	-0.45	6.5	5.7	3.2	NA	8.8	8.3	10.0
2	PINE STREET	0.200	ELEV	1948	1994	1994	08/17/16	7.43	5.96	-1.47	6.1	4.8	6.0	NA	7.4	5.7	9.1
3	FAIRCHILD WHELER	0.075	ELEV	1935	1986	2004	06/17/16	6.61	6.04	-0.57	7.2	6.5	3.0	NA	6.5	3.4	8.9
4	NICHOLS	0.200	ELEV	1930	1996	1996	08/17/16	6.74	6.36	-0.38	7.9	6.4	3.4	NA	5.3	5.4	9.1
5	WHITE HILLS	0.750	GST	1970	1991	1991	08/18/16	6.96	6.69	-0.27	7.5	6.0	5.2	NA	9.1	4.8	10.0
6	NORTH AVE	1.500	GST	1956	1987	1974	06/16/16	7.59	6.79	-0.80	8.4	2.9	6.5	NA	8.7	5.4	10.0
7	GREENFIELD HILL	0.200	ELEV	1930	1993	1993	08/17/16	8.30	6.93	-1.37	7.3	6.0	6.5	NA	8.5	4.2	10.0
8	SILVERMINE	2.500	GST	1984	1984	1984	08/15/16	7.77	7.24	-0.53	9.3	7.7	4.7	NA	9.5	9.9	10.0
9	BRINSMADE	4.000	GST	1967	1996	1996	08/17/16	8.28	7.36	-0.92	8.0	3.5	7.6	NA	9.2	4.6	8.2
10	BUNGAY	0.075	GST	1954	2000	2000	08/12/16	7.67	7.54	-0.13	9.3	5.5	6.1	NA	9.3	7.2	10.0
11	WAVENY	2.000	STDP	1989	1989	1989	06/16/16	7.70	7.58	-0.12	8.8	4.3	7.8	NA	8.1	5.8	8.2
12	FIELDCREST	0.150	ELEV	1959	1979	1979	06/22/16	7.77	7.65	-0.12	9.1	7.1	5.3	NA	8.6	7.9	10.0
13	SKOKORAT	0.500	STDP	1988	1988	1988	07/09/16	9.04	7.66	-1.38	9.3	7.5	4.7	NA	9.2	7.1	10.0
14	LLOYD	0.800	STDP	1967	1997	1997	06/12/16	8.22	7.96	-0.26	9.1	4.1	9.5	NA	9.1	6.6	6.4
15	SCUPPO RD	0.131	STDP	1981	1998	1997	06/15/16	8.10	7.96	-0.14	8.3	6.8	8.3	NA	8.1	9.2	6.7
16	WEST SCHOOL	0.390	STDP	1959	1989	1989	06/21/16	8.25	7.96	-0.29	9.2	6.8	6.8	NA	8.6	3.6	10.0
17	KING STREET	0.500	ELEV	1956	1996	1996	07/14/15	8.08	8.08	0.00	9.3	9.2	5.1	NA	7.5	5.7	10.0
18	EASTON #2	3.000	GST	1993	2007	2004	04/20/16	8.35	8.18	-0.17	9.3	9.5	5.4	NA	9.2	7.1	8.2
19	LAKEVILLE	0.220	GST	1994	1995	1995	09/12/16	8.59	8.32	-0.27	9.5	9.1	6.8	NA	8.7	8.2	10.0
20	STAMFORD WTP 1	2.200	GST	2006	2006	2006	04/21/16	8.51	8.35	-0.16	9.4	8.7	6.2	NA	9.3	8.2	10.0
21	SULLIVAN FARM	0.500	STDP	2002	2002	2002	08/18/16	8.44	8.44	0.00	9.8	7.3	6.8	NA	9.7	7.0	10.0
22	LITCHFIELD	0.500	GST	1998	1998	1998	07/08/15	8.51	8.51	0.00	9.6	6.6	7.7	NA	9.8	8.5	10.0
23	VILLAGE WATER 5	1.400	CONC	1995	1995	1995	06/10/16	8.77	8.51	-0.26	9.7	5.3	9.7	NA	9.5	2.7	10.0
24	STAMFORD WTP 2	2.200	GST	2006	2006	2006	04/21/16	8.86	8.52	-0.34	9.4	8.7	6.8	NA	9.3	8.2	10.0
25	MOUNTAIN RD	0.200	GST	1956	1998	1997	04/21/16	8.53	8.53	0.00	9.1	7.2	9.0	NA	9.1	3.7	5.0

- Major components to inspect:
  - Coating Conditions
  - Sanitary Conditions
  - Structural Conditions
  - Safety Conditions
  - Security Conditions
  - Antenna’s (Safety, Coatings, Structural)

So… where do I start?

Professional inspection options

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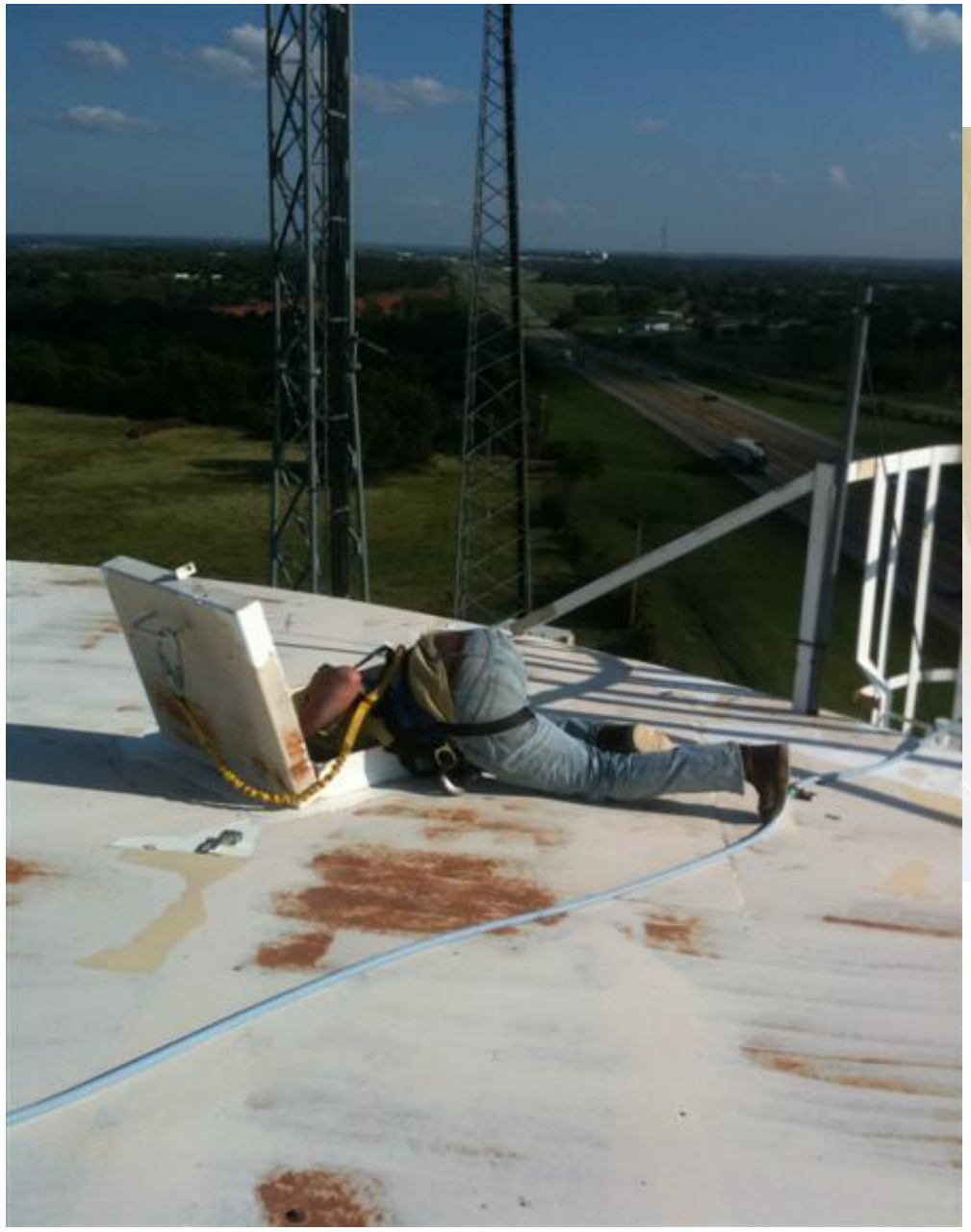
1. Visual inspection
2. Washout inspection

Visual



OR

a washout inspection.

Did you know?

AWWA M42 “Tanks should be washed out and inspected at least once every 3 years, and where water supplies have sediment problems, annual washouts are recommended.”

Question ?

Is the inside of the bowl of a water tower considered a confined space?

By definition, yes

UNITED STATES DEPARTMENT OF LABOR

Find it in OSHA

A TO Z INDEX

Occupational Safety and Health Administration

English | Spanish

ABOUT OSHA | WORKERS | EMPLOYERS | REGULATIONS | ENFORCEMENT | TOPICS | NEWS & PUBLICATIONS | DATA | TRAINING

SAFETY AND HEALTH TOPICS

Confined Spaces

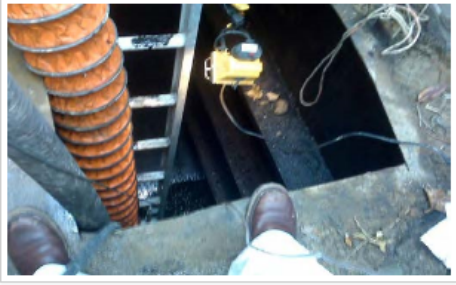
Standards/Enforcement | Hazards and Solutions | Construction | Additional Information | Safety and Health Topics

Visit the Confined Spaces - Final Rule Page for information on the new final rule.

What are confined spaces?

Many workplaces contain areas that are considered "confined spaces" because while they are not necessarily designed for people, they are large enough for workers to enter and perform certain jobs. A confined space also has limited or restricted means for entry or exit and is not designed for continuous occupancy. Confined spaces include, but are not limited to, tanks, vessels, silos, storage bins, hoppers, vaults, pits, manholes, tunnels, equipment housings, ductwork, pipelines, etc.

OSHA uses the term "permit-required confined space" (permit space) to describe a confined space that has one or more of the following characteristics: contains or has the potential to contain a hazardous atmosphere; contains material that has the potential to engulf an entrant; has walls that converge inward or floors that slope downward and taper into a smaller area which could trap or asphyxiate an entrant; or contains any other recognized safety or health hazard, such as unguarded machinery, exposed live wires, or heat stress.



Ventilation hoses provide air and exhaust toxic vapors during confined space entry. A guardrail would also be necessary to protect workers from potential falls.

Highlights

- Calibrating and Testing Direct-Reading Portable Gas Monitors. OSHA Safety and Health Information Bulletin (SHIB), (September 30, 2013). Provides workers and employers guidance on calibrating and testing direct-reading portable gas monitors (hereafter, "DRPGMs" or "instruments").
- Loss of Start-Up Oxygen in CSE SR-100 Self-Contained Self-Rescuers (PDF*). OSHA Alert, (April 2012). Alerts employers and workers using the CSE Corporation's SR-100 Self-Contained Self-Rescuer (SCSR) to potential failure problems with these respirators.
- Permit-Required Confined Spaces in General Industry (PDF*). OSHA QuickCard™. Explains what workers should do before entering a confined space, such as an underground vaults, tanks,

Question ?

Is it a permit required confined space?

What are confined spaces?

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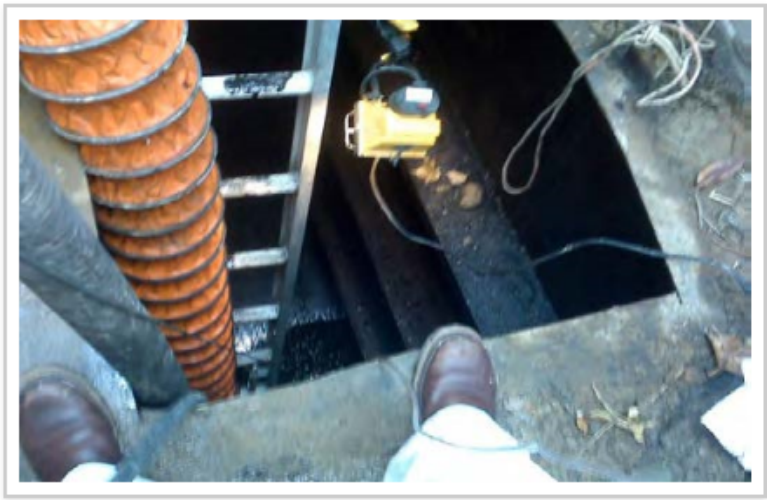

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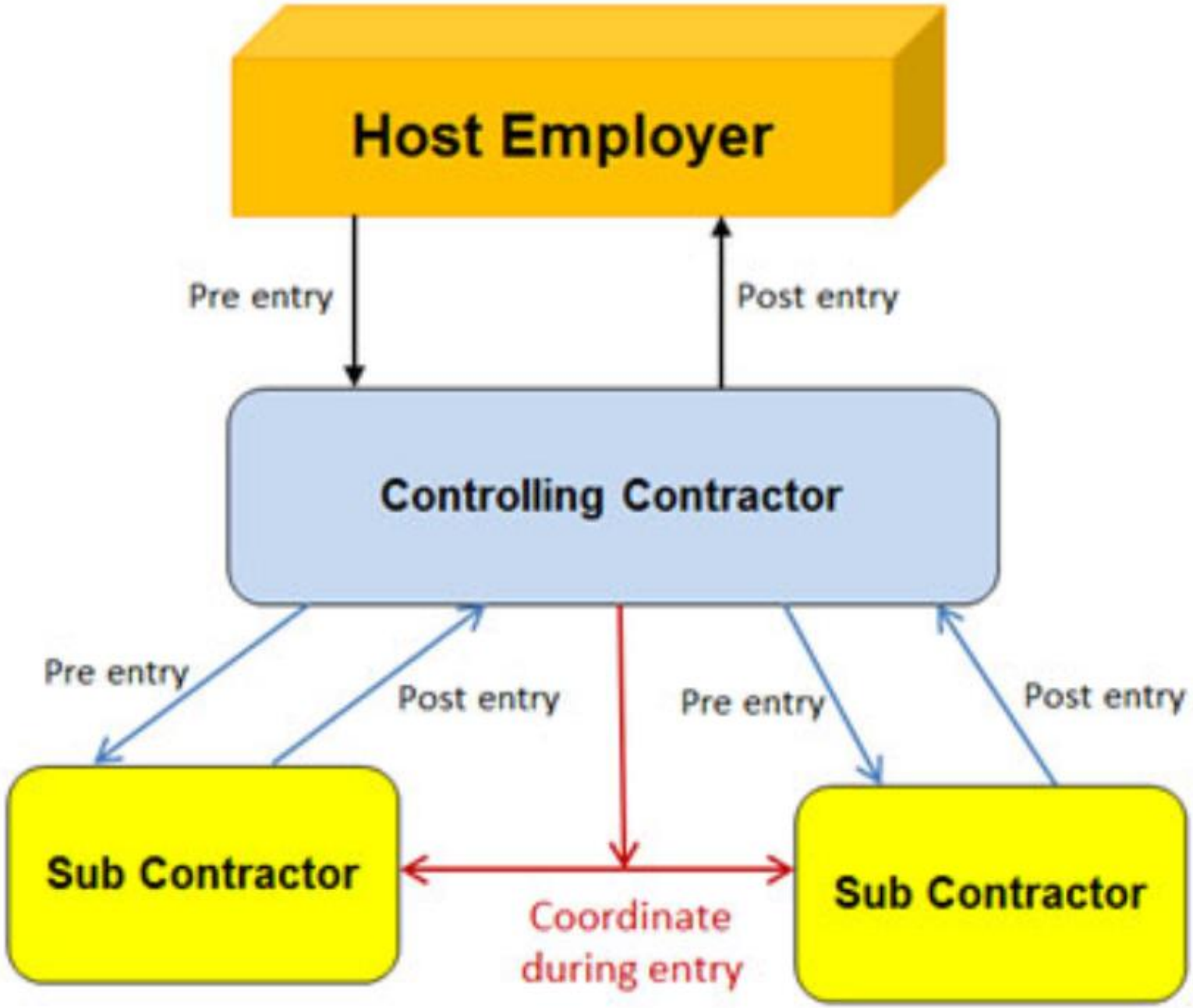
Question ?

Can the tank owner be held accountable if a contractor enters the bowl of their tank and does not follow confined space rules?


Host Employer
Pre entry
Post entry
Controlling Contractor
Pre entry
Post entry
Pre entry
Post entry
Sub Contractor
Coordinate
during entry
Sub Contractor

So, what does that mean regarding washing out my tank?

The washout inspection team must have a minimum of a 3 person crew and follow the permit required confined space rules.

1. Attendant
2. Entrant
3. Supervisor

Ok, now let’s start with the washout Inspection…

suez

Now that the tank is clean, we can inspect the tank

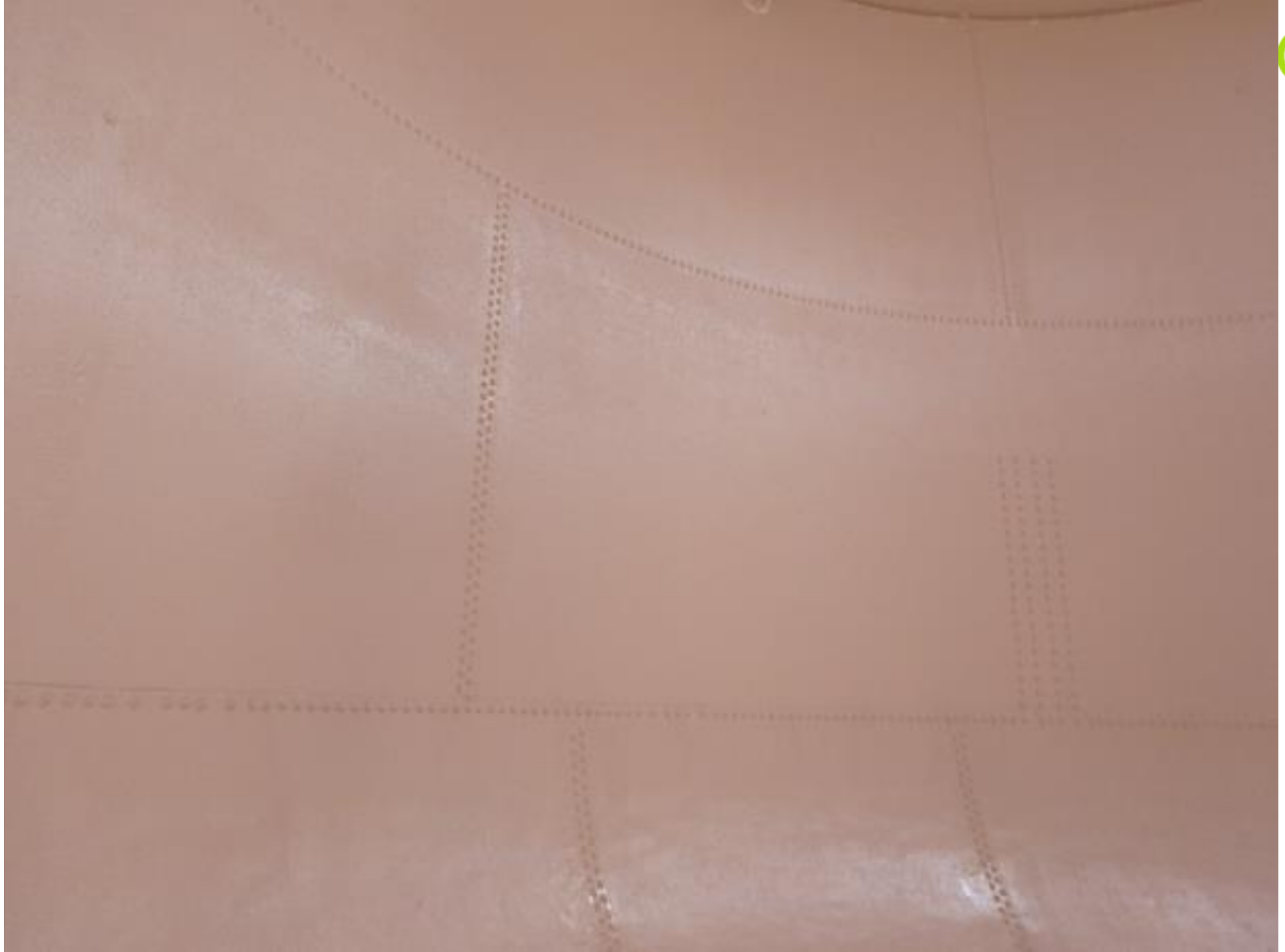
COATING CONDITIONS

COATING CONDITIONS

- General condition
- Type of current coating
- Adhesion/Cohesion
- Thickness of coatings
- Heavy metal content
- Overcoat or Blast

INTERIOR COATINGS

- Current Conditions
- Type of current interior coating
- Thickness of coatings
- Heavy metal content
- Typical life of an interior coating (12-15 years)
- Blast and apply new coating




Brand new tank

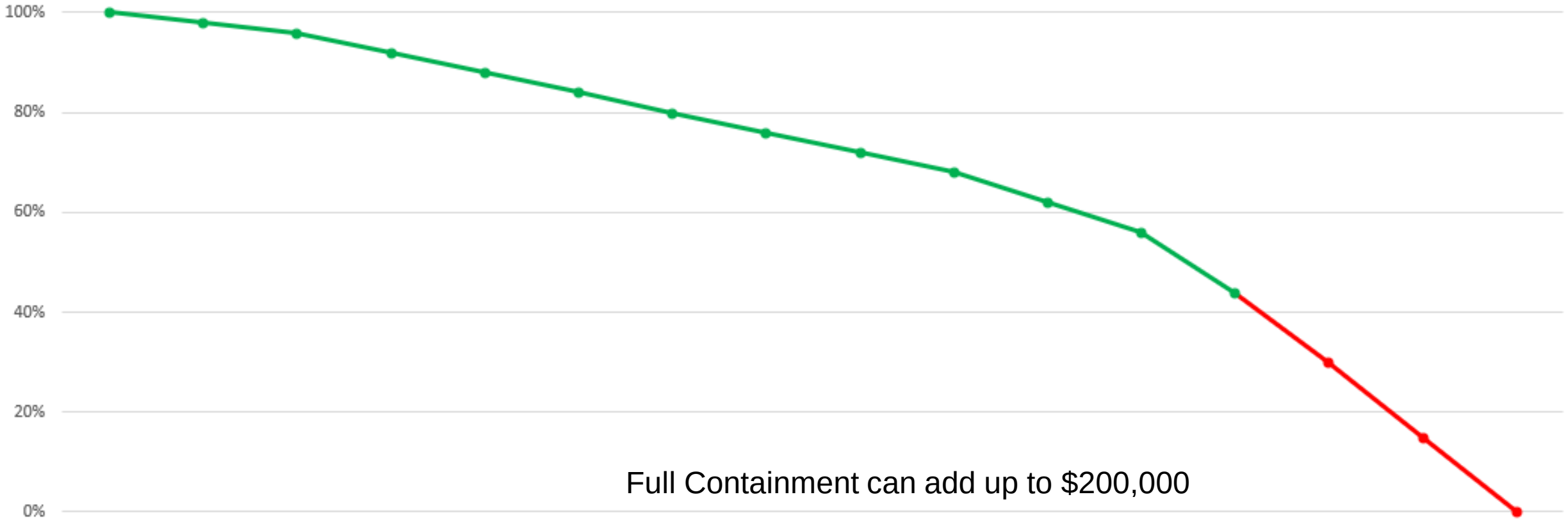

New paint job
Cohesion issue

EXTERIOR COATINGS

- General condition
- Type of current coating
- Adhesion/Cohesion
- Thickness of coatings
- Heavy metal content (lead)
- Overcoat or Blast (what is the difference?)

- **COULD BE SINGLE MOST EXPENSIVE ITEM**

Exterior coatings life cycle curve
(Over coat or Full Containment Blast)



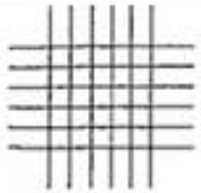
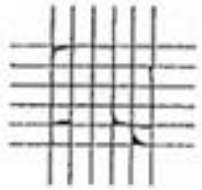
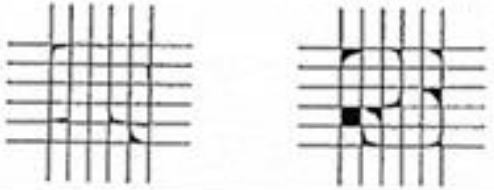
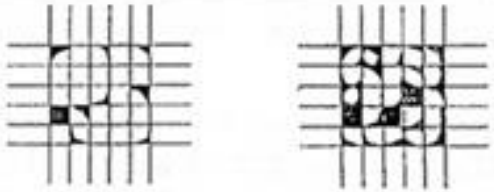
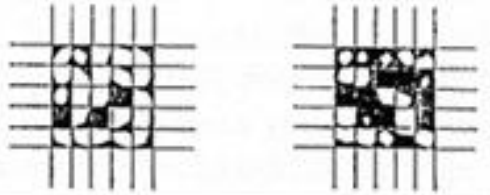
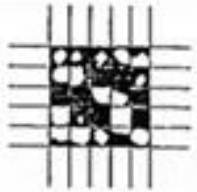
What are some reasons you could have poor exterior coatings

1. Faulty coatings from the manufacture
2. Incorrect spec from the engineer
3. Incompatible coatings used
4. Steel not blasted to proper depth
5. Poor workmanship
   Prep work, paints not mixed properly, too thick, too thin, coatings didn’t cure between coats
6. Painted in poor weather conditions
   Hot, cold, wet, humid, etc

ASTM D3359

Over Coat

Full Blast

Classification	% of Area Removed	Surface of Cross-cut Area From Which Flaking has Occured for 6 Parrallel Cuts & Adhesion range by %
5B	0% None	
4B	Less than 5%	
3B	5 - 15%	
2B	15 - 35%	
1B	35 - 65%	
0B	Greater than 65%	

ASTM D 3359 – Method a test:

Designation: D 3359 – 97

AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Dr., West Conshohocken, PA 19428
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Standard Test Methods for Measuring Adhesion by Tape Test[1]

1. Scope

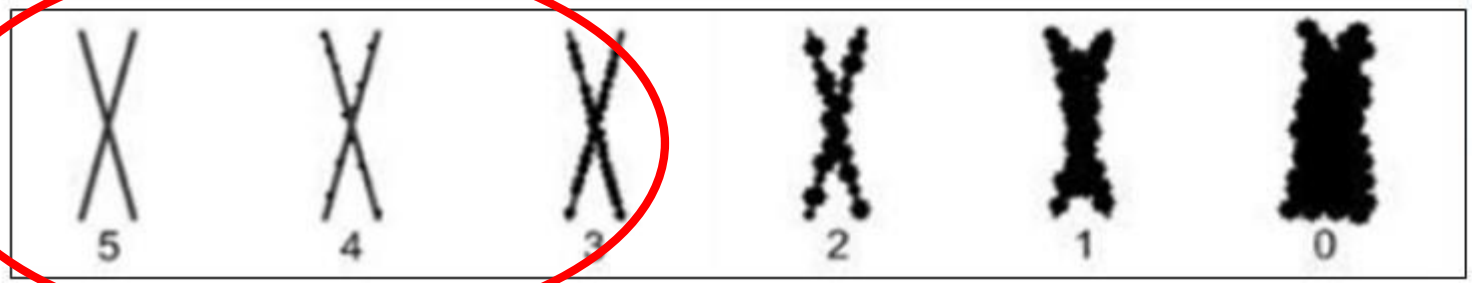
1.1 These test methods cover procedures for assessing the adhesion of coating films to metallic substrates by applying and removing pressure-sensitive tape over cuts made in the film.

Page No 1

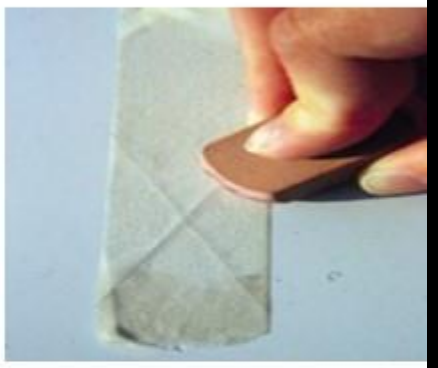
3.1 *Test Method A*—An X-cut is made in the film to the substrate, pressure-sensitive tape is applied over the cut and then removed, and adhesion is assessed qualitatively on the 0 to 5 scale.

Page No 1

Rating	Description
5A	No peeling or removal
4A	Trace peeling or removal along the incisions
3A	Jagged removal along the incisions up to 1/16" on either side
2A	Jagged removal along the incisions up to 1/8" on either side
1A	Removal of most of the coating from the area of the "X" unde the tape
0A	Removal of coating beyond the area of the "X"

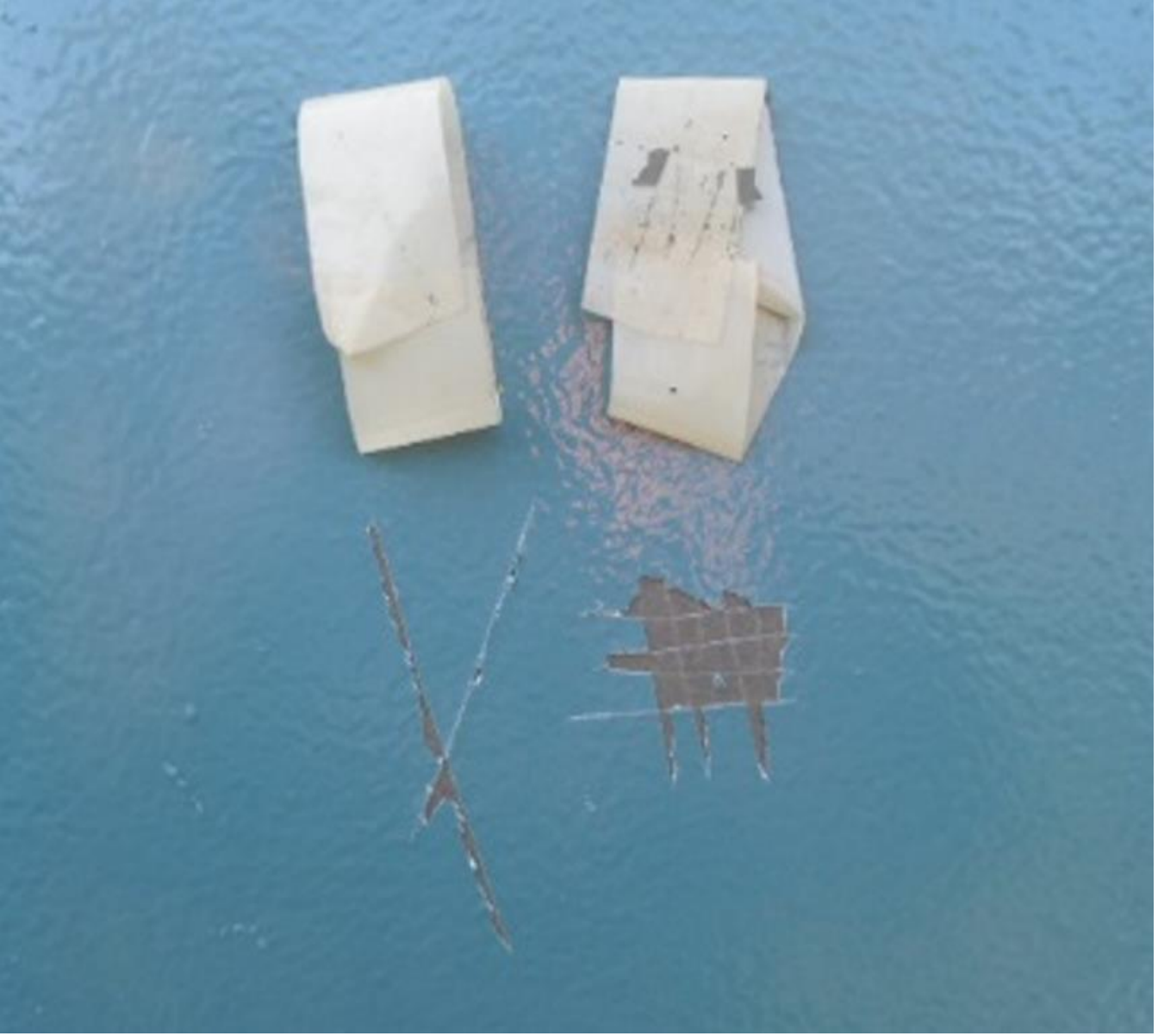


1. Cut "X" mark

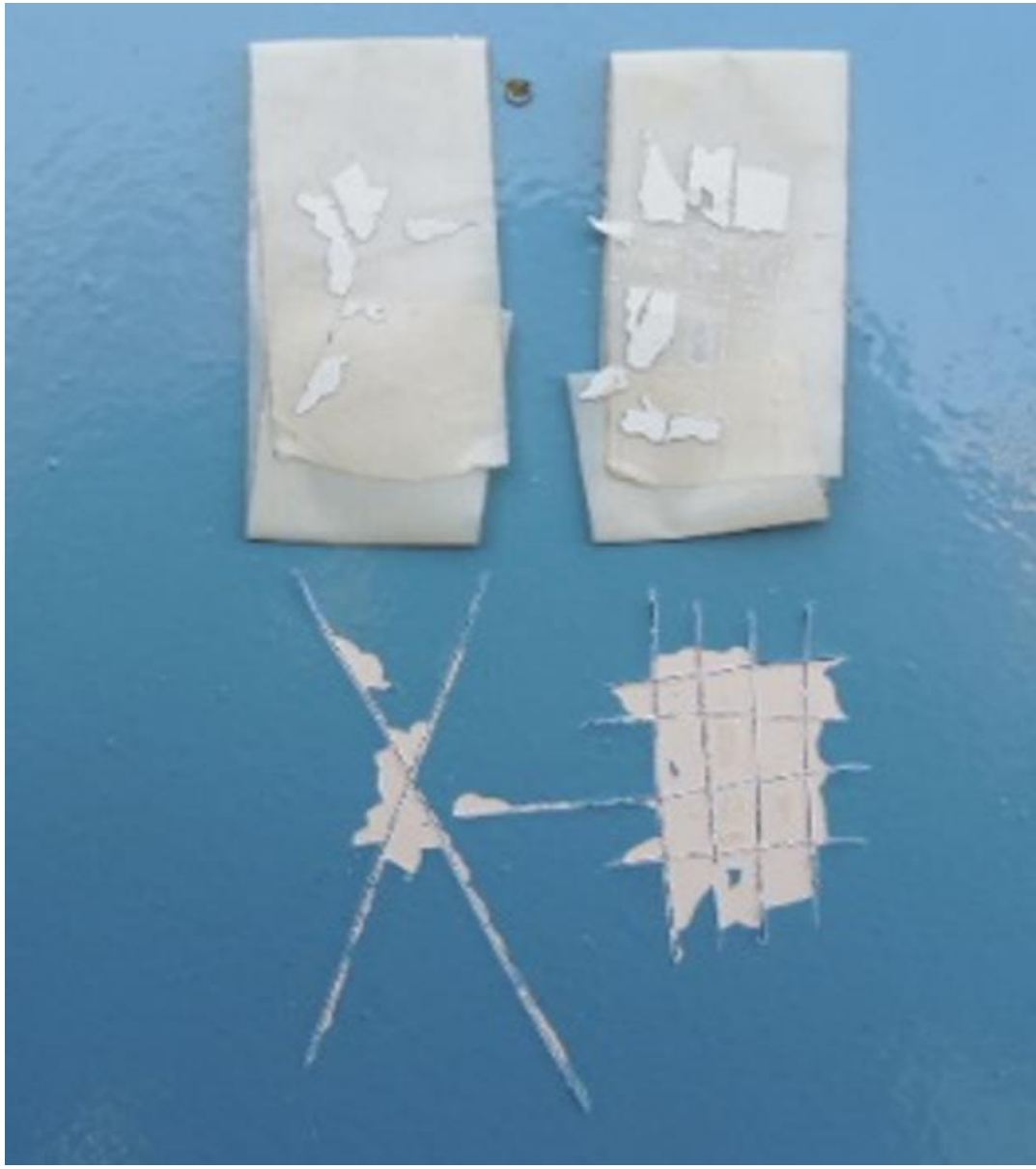


2. Place 25mm wide Transparent Tape.

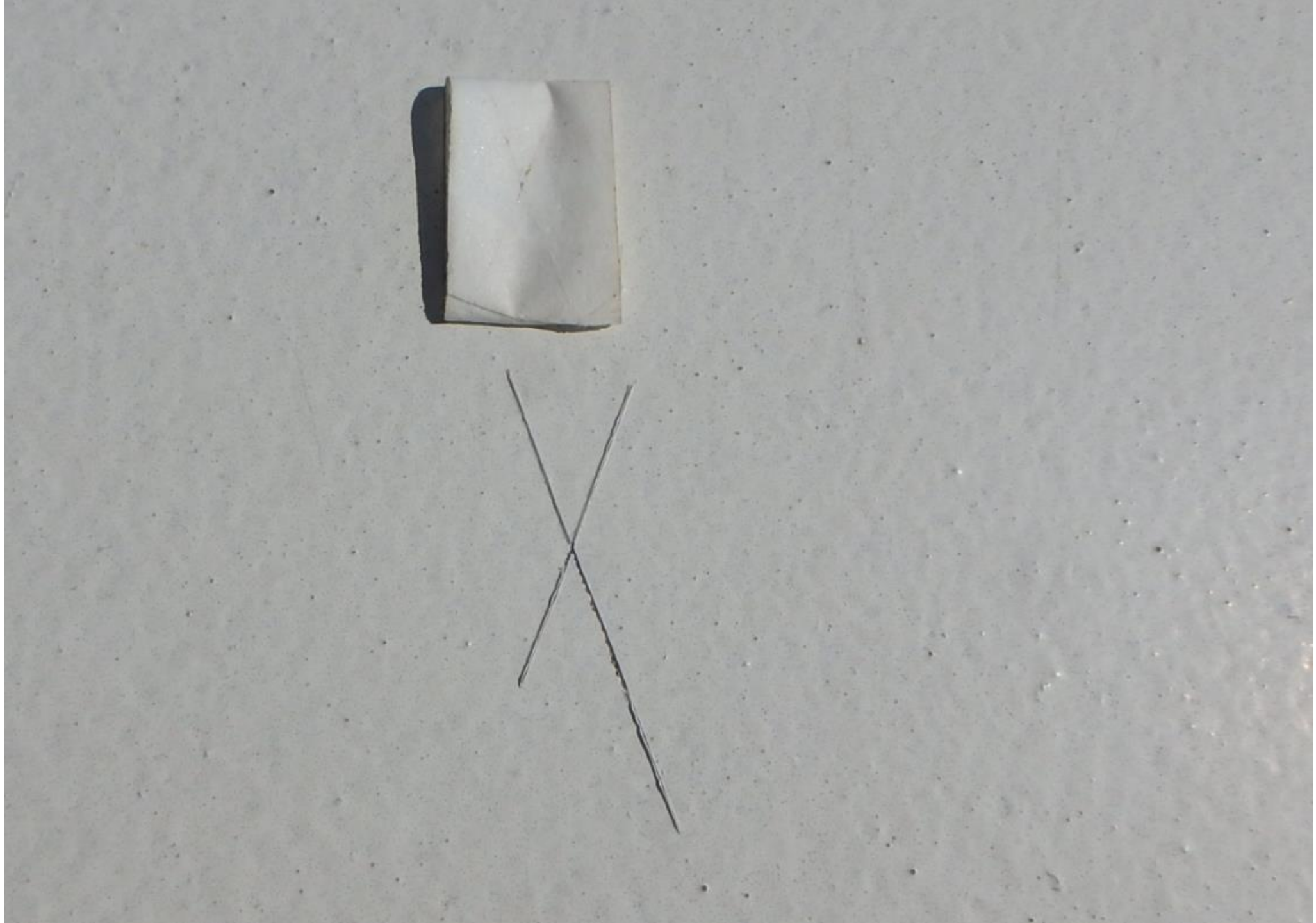
3. Remove the tape quickly.



Adhesion failure

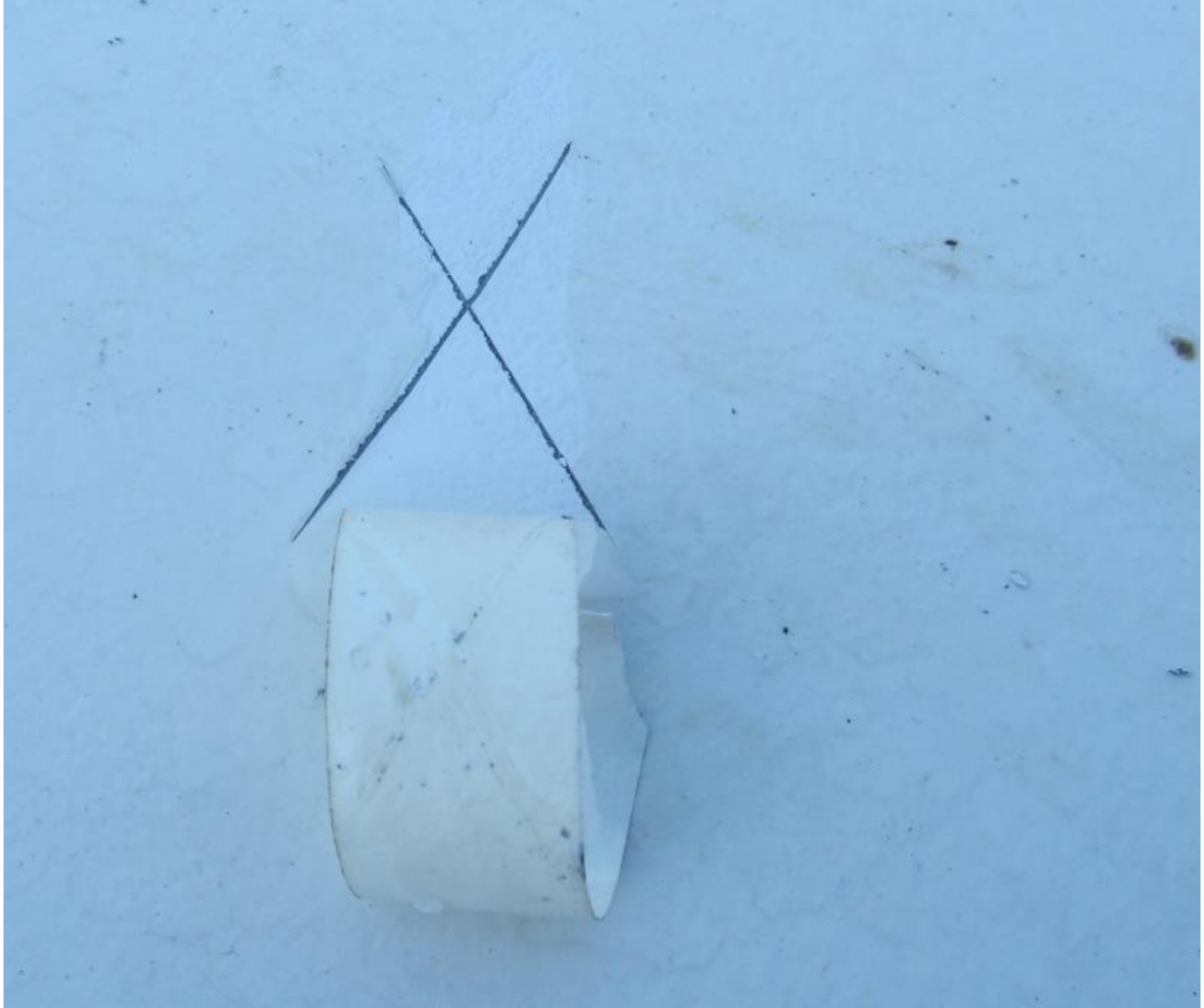


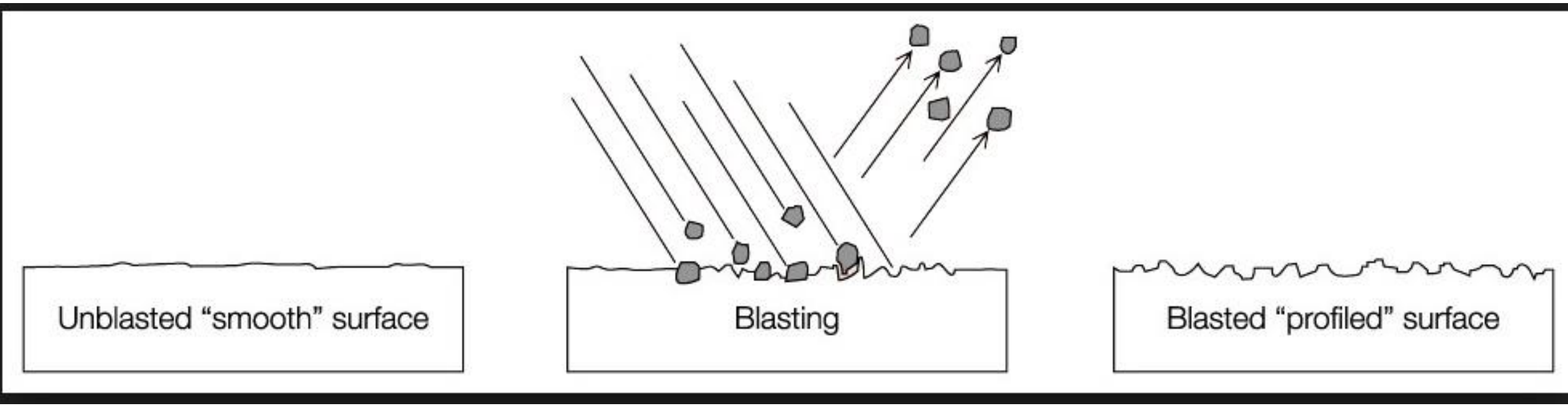
Cohesion failure

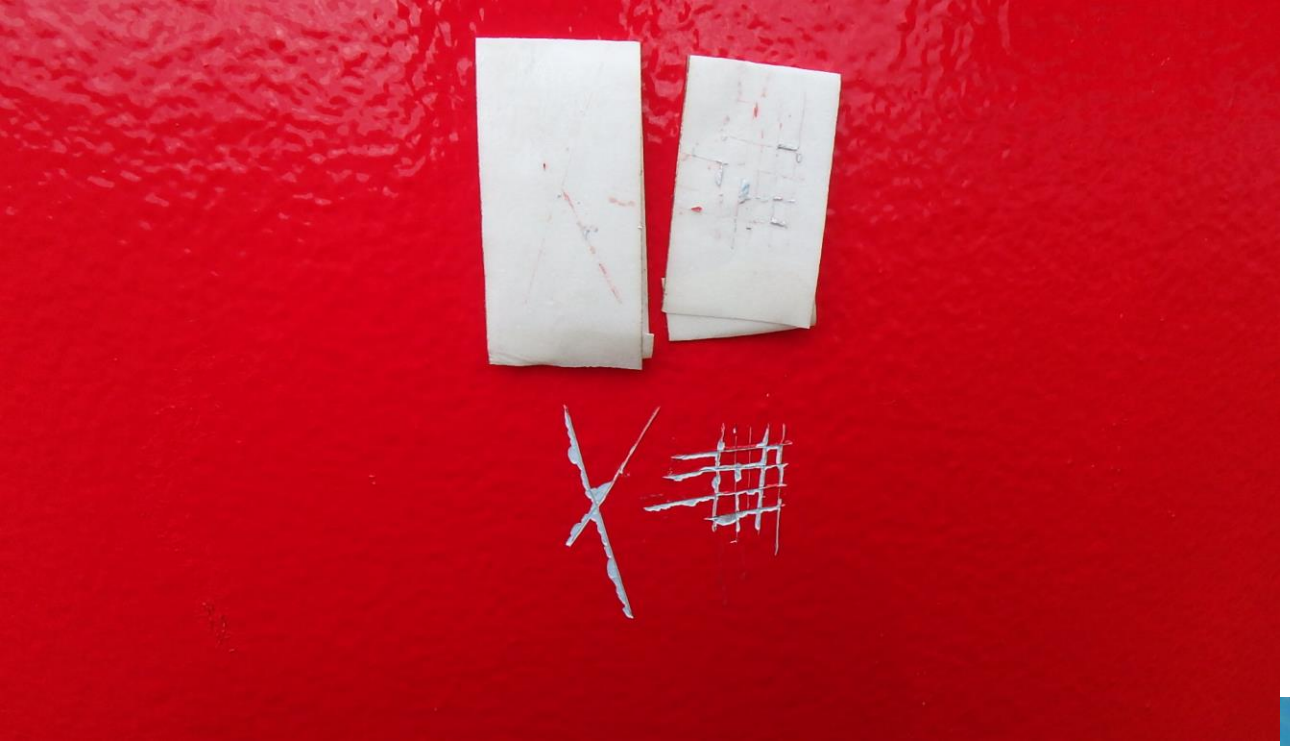


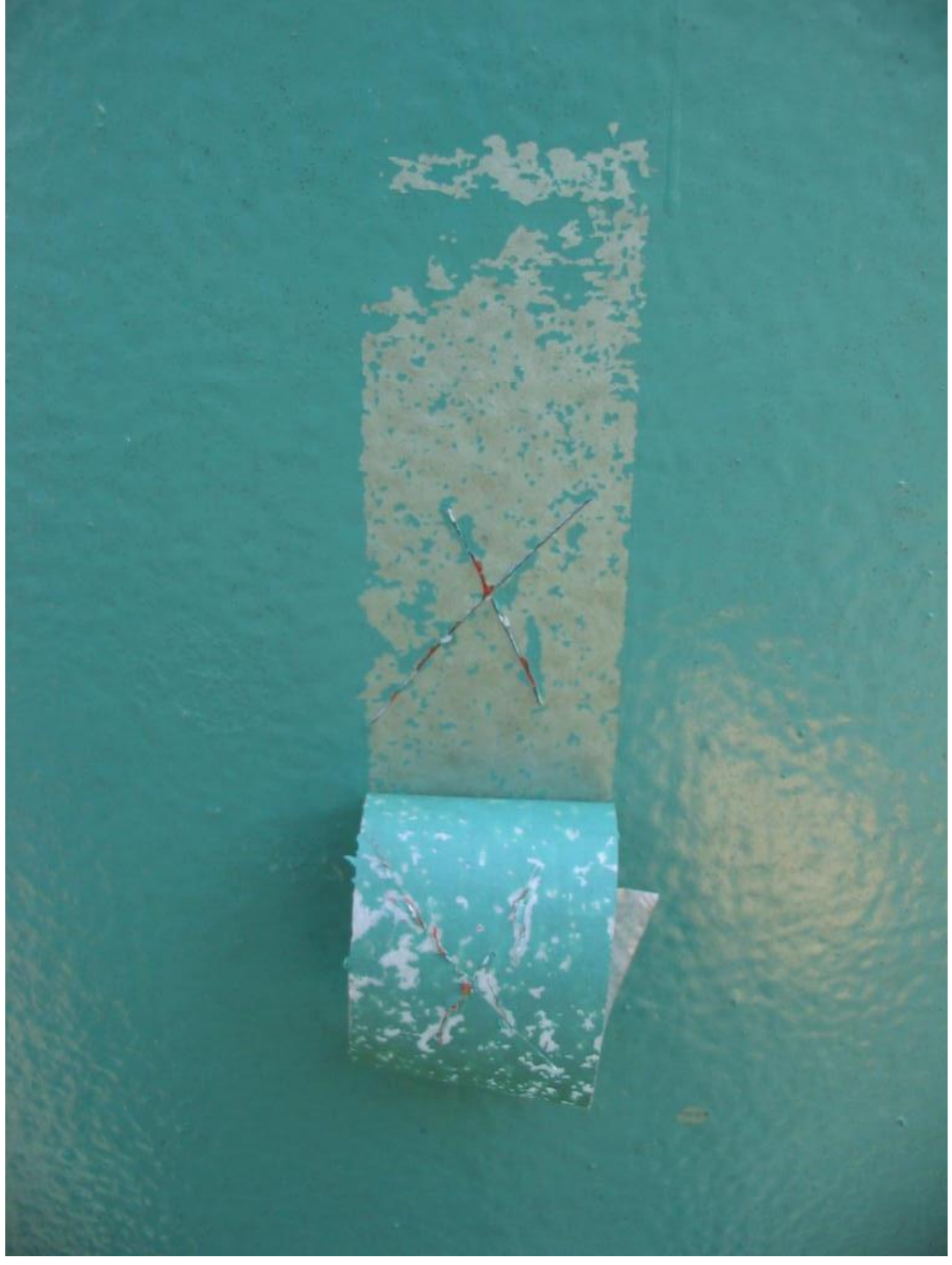
X- Scribe Tape Test – ASTM D 3359

Can we Over Coat this tank?




Unblasted “smooth” surface
Blasting
Blasted “profiled” surface






What is this orange stuff???

AWWA D102 Coating Systems

OUTSIDE COATING SYSTEMS

OCS No. 1 (three or four coat alkyd) Aluminum, Metallic, Alkyd, Silicone Alkyd

OCS No. 2 (three coat) Moisture cured Polyurethane

OCS No. 3 (three coat) Water-based Acrylic or Modified Acrylic

OCS No. 4 (three coat) Zinc rich primer (organic or inorganic), Aliphatic Polyurethane, Aliphatic Fluorourethane

OCS No. 5 (three coat) Epoxy primer, Epoxy intermediate, Aliphatic Polyurethane

OCS No. 6 (three coat) Zinc rich primer (organic or inorganic), Epoxy intermediate, Aliphatic Polyurethane

Coatings – Paint Chip Samples

Analyte	Method	Result	Detection Limit
Chromium (Cr)	**EPA 6010B**	**ND**	**50**
Lead (Pb)	**EPA 6010B**	**ND**	**100**

1. Interior Sample

Sample Location: (i.e.: Roof, Sidewall, Floor) **Int Roof**

This sample should reflect the majority of the tested area, please avoid Touch-Up areas.

Topcoat Color that needs to be identified: **white**

FTIR Generic Topcoat Analysis: Epoxy

2. Exterior Sample

Sample Location: (i.e.: Roof, Sidewall, Floor) **Stem**

This sample should reflect the majority of the tested area, please avoid Touch-Up areas.

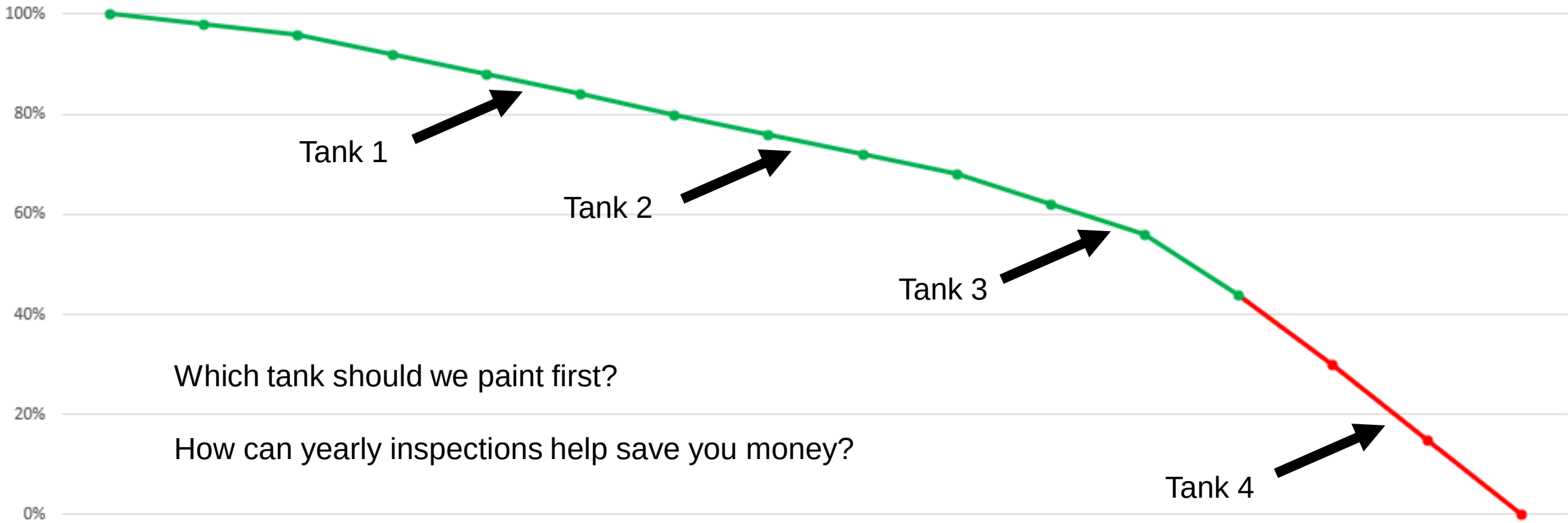
Topcoat Color that needs to be identified: **White**

*** Please check for clear coat:**

FTIR Generic Topcoat Analysis: Pigmented Acrylic Polyurethane

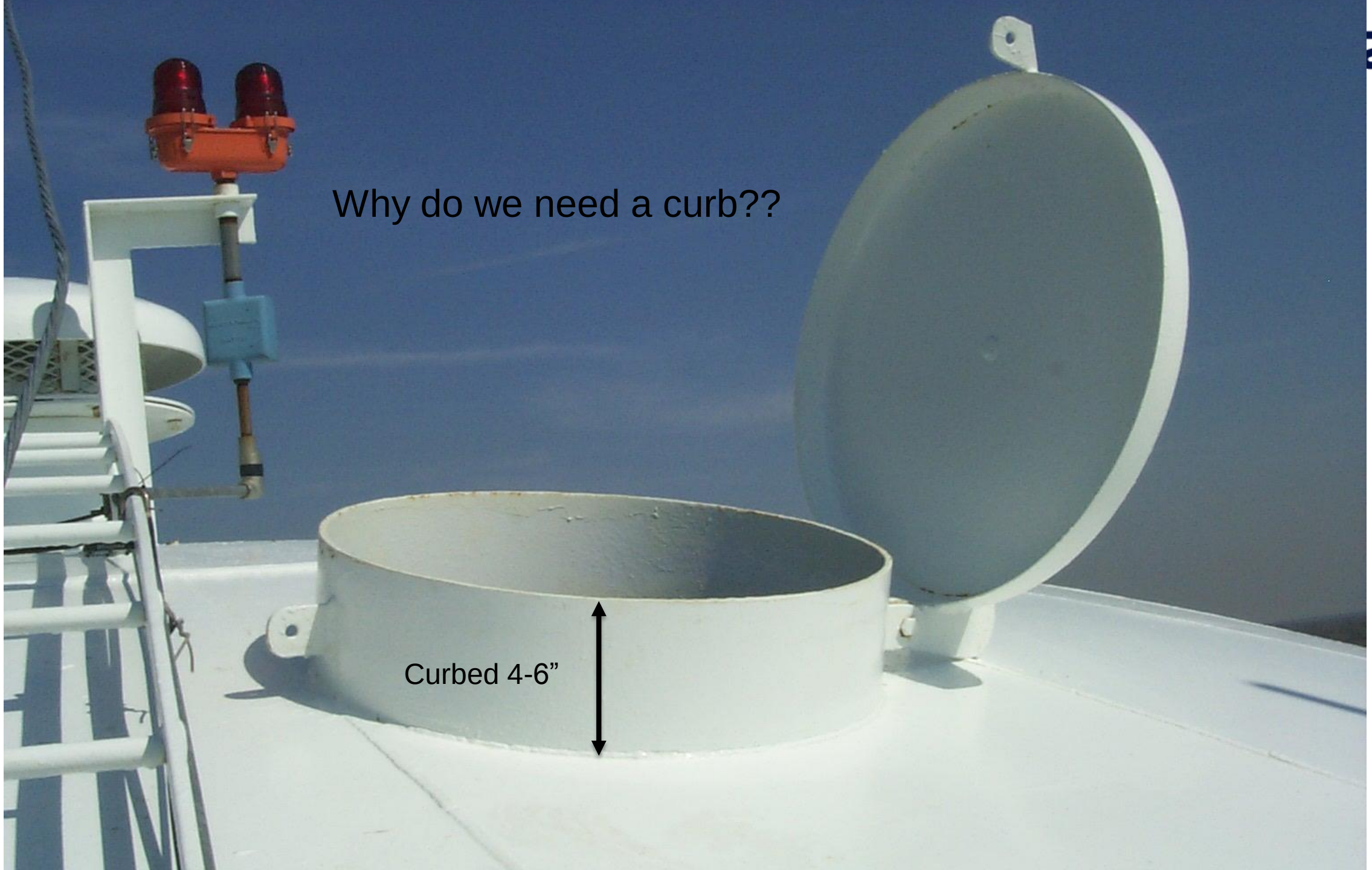
If you can’t overcoat your tank, you have to do a full blast.

Exterior coatings life cycle curve (Over coat or Full Containment Blast)



Sanitary Conditions

- Roof Openings
- Access Hatches
- Low Spots
- Vents
- Overflows


Why do we need a curb??
Curbed 4-6”

How many things can you find wrong with this picture?

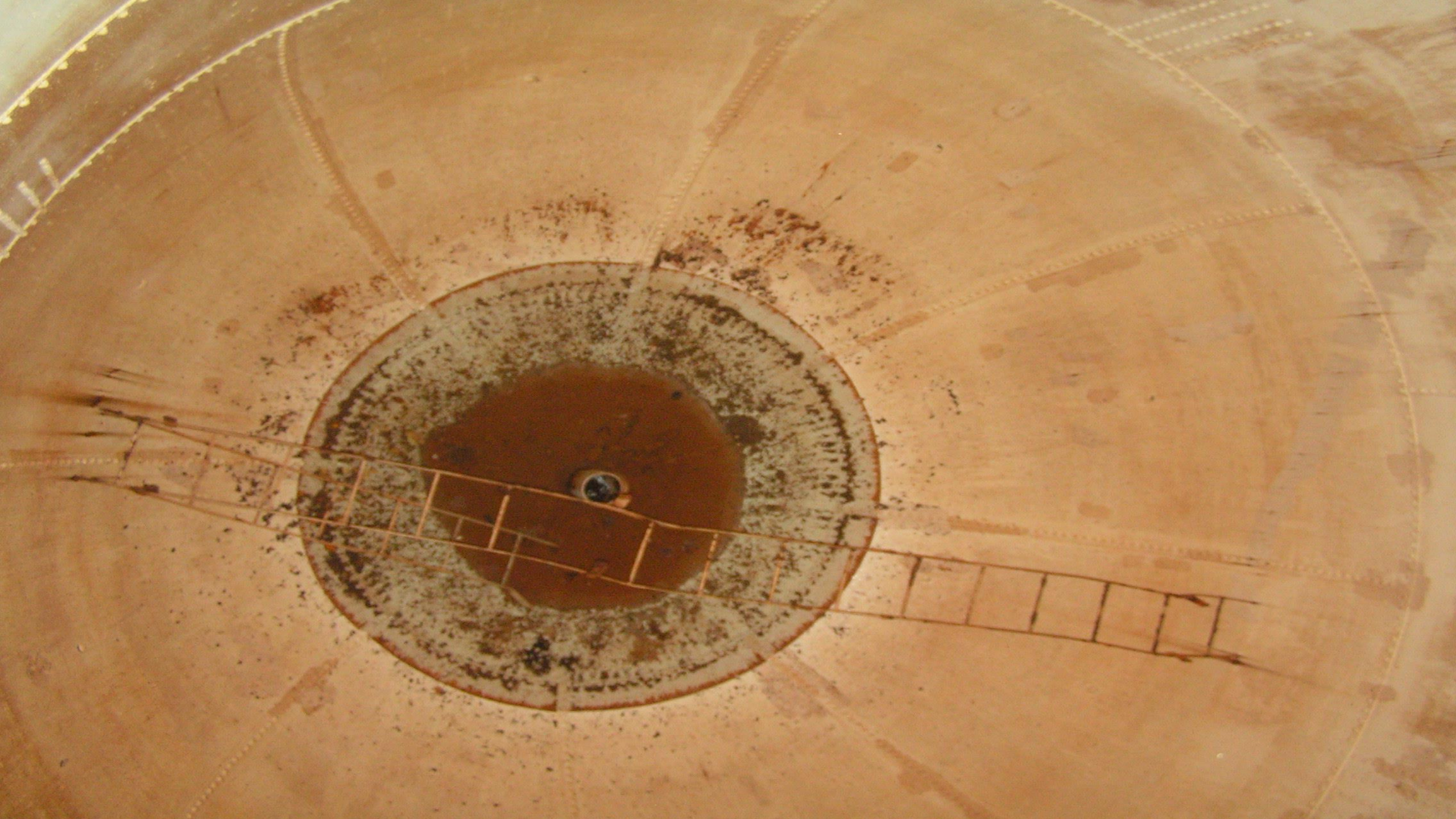

bmc

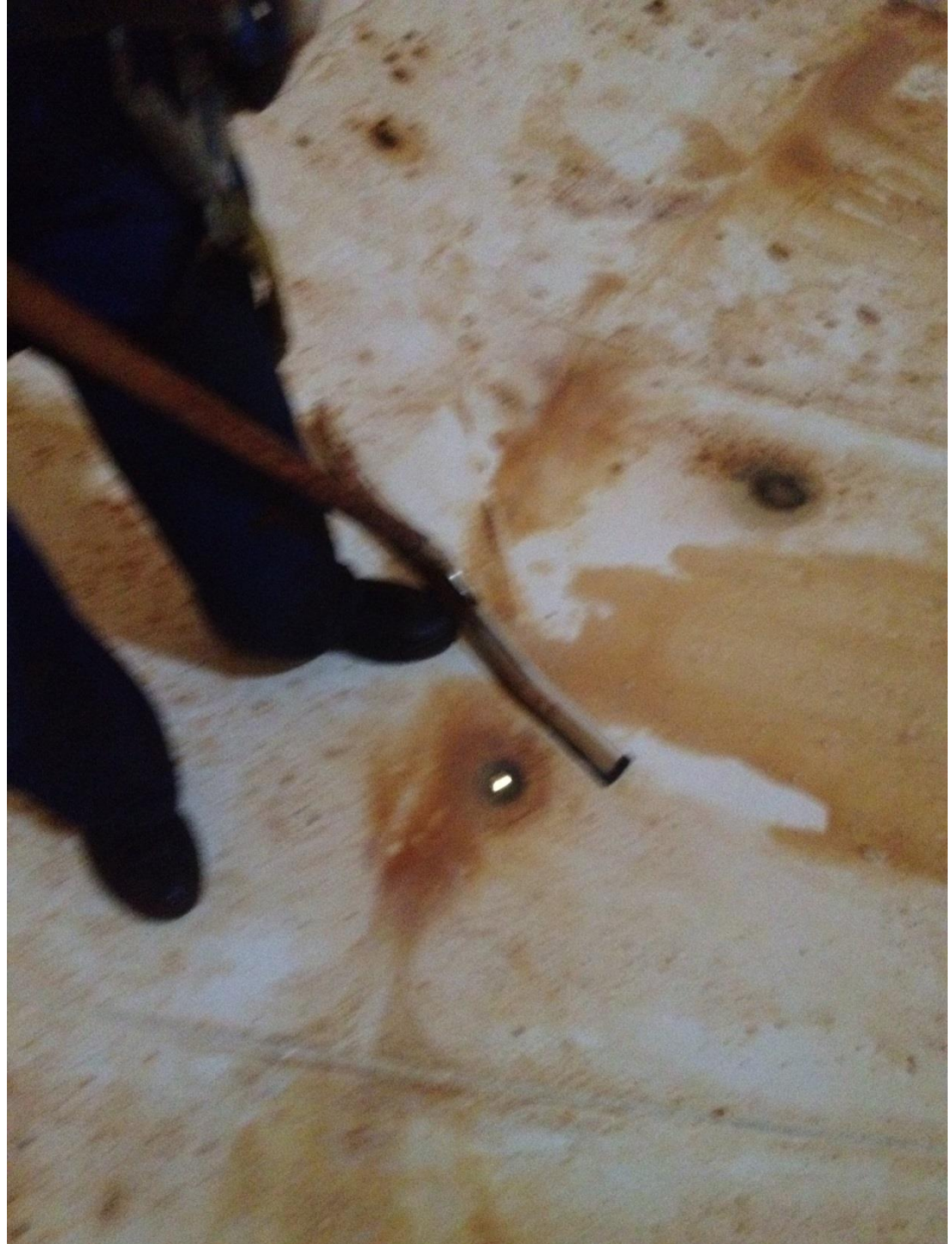

THINK

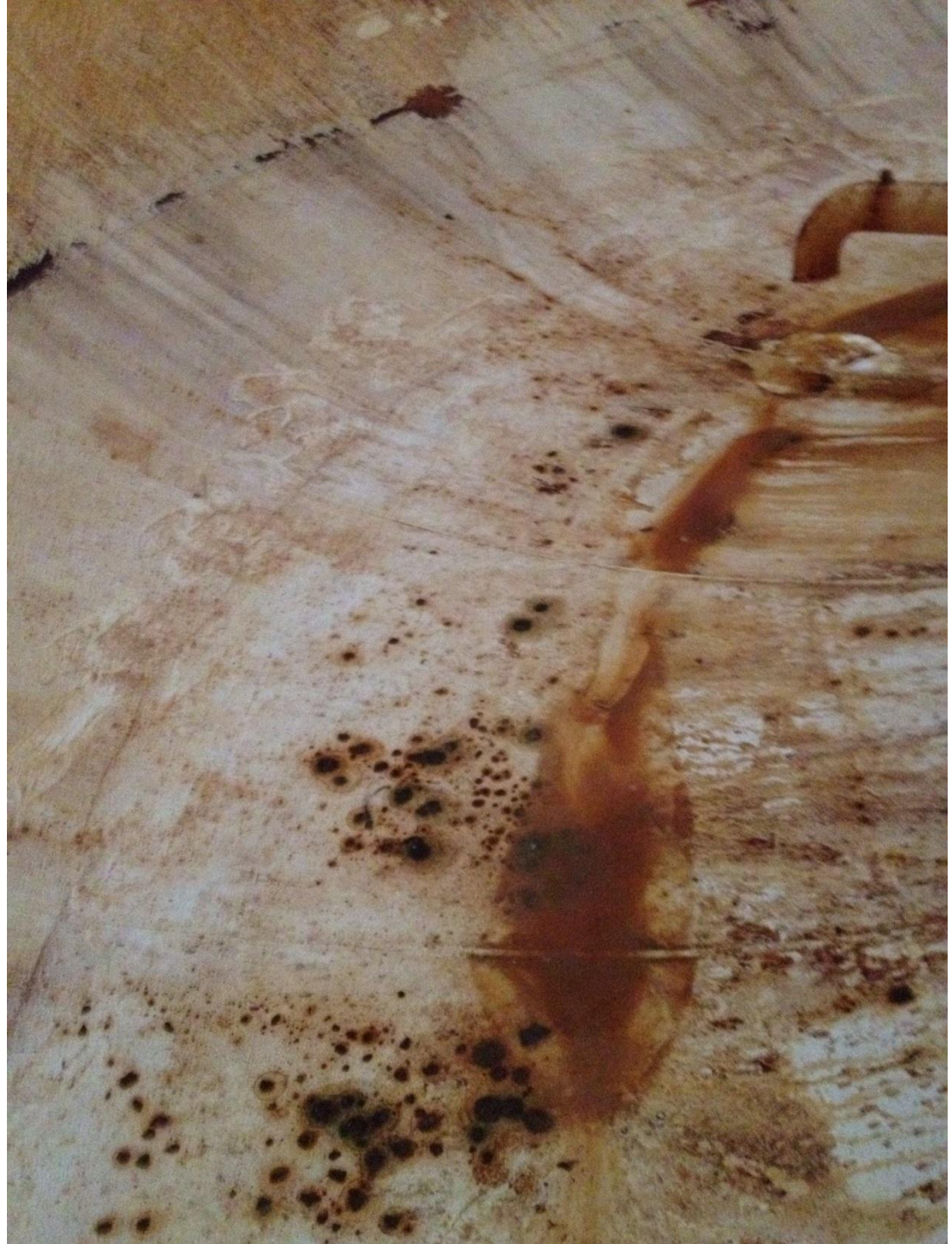
Structural

STRUCTURAL CONDITIONS

- Anchor bolts
- Foundations
- Wind rods
- Riser/Shell steel
- Spider rods
- Roof Trusses
- Ladders







How about the structural condition of a Concrete tank?

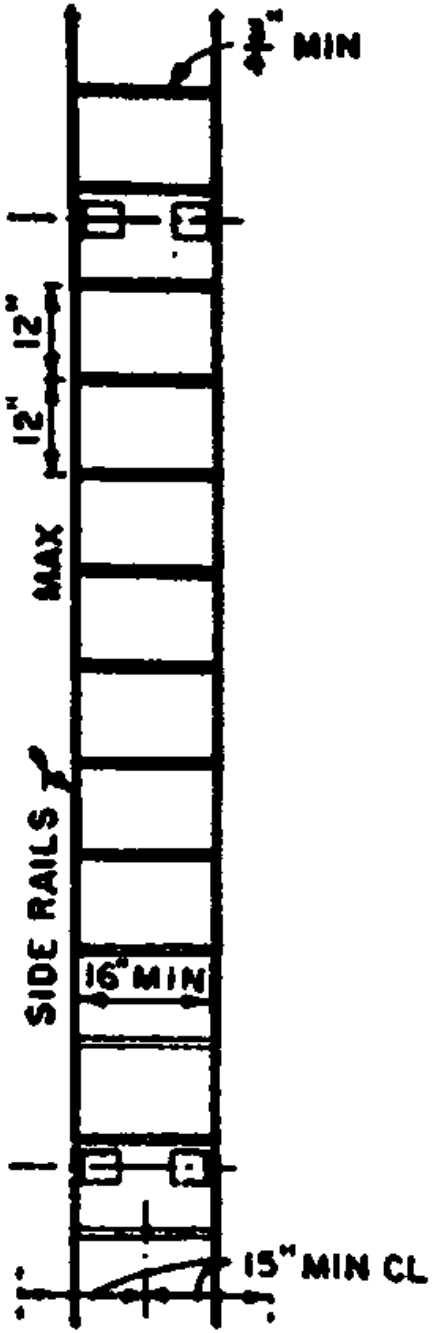
Safety

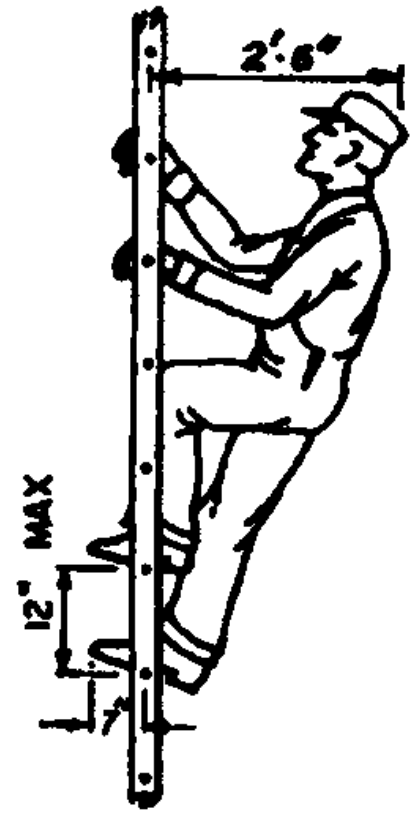
SAFETY CONDITIONS

- OSHA Standards
- Ladders
- Fall prevention devices
- Handrails
- Access hatches
- Radiation hazards

Safety Conditions: Fixed Ladders

- 29 CFR 1910.27
  - Minimum design load of 200 lbs.
  - 12 in. rung distance
  - 16 in. minimum side rail distance
  - 7 in. toe clearance
  - 15 in. clearance from centerline
  - 30 in. headroom


MIN
12"
12"
MAX
SIDE RAILS
16" MIN
15" MIN CL


2'-6"
12" MAX

This ladder looks safe …
Right??

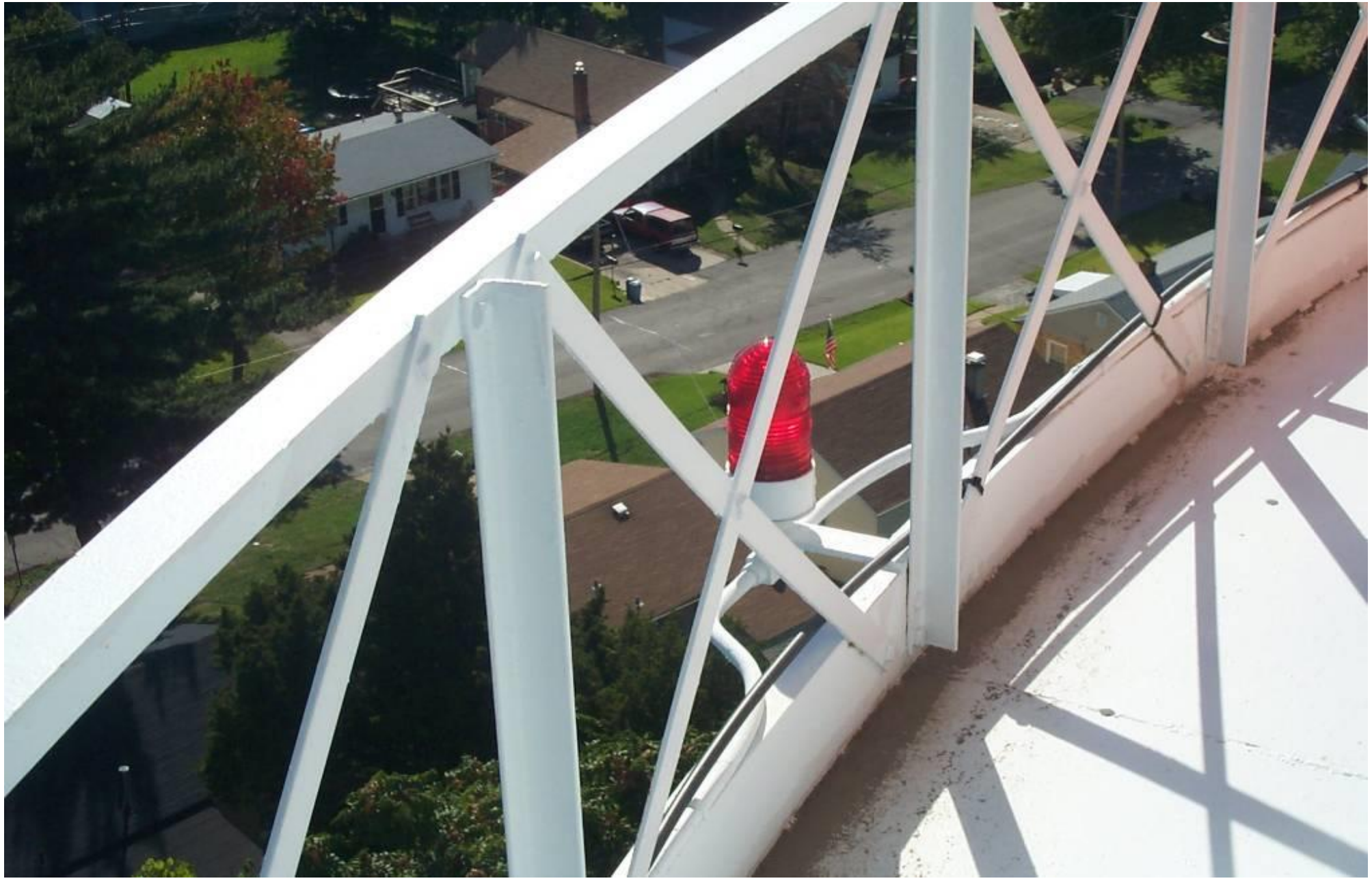
Safety Conditions: Handrail Systems

- 29 CFR 1910.23
- Handrail shall consist
  - Top rail 42” tall (200 lb force)
  - Toe board
  - Intermediate rail
  - No openings greater than 19”
  - 2”x2”x3/8” posts 8’ intervals


Balcony railing is only 36” tall and has no mid-rail

Safety Conditions: Handrail Systems

Safety Conditions: Handrail Systems




Trip Hazard

What happened here?


Hang in there!

Security

Security Conditions

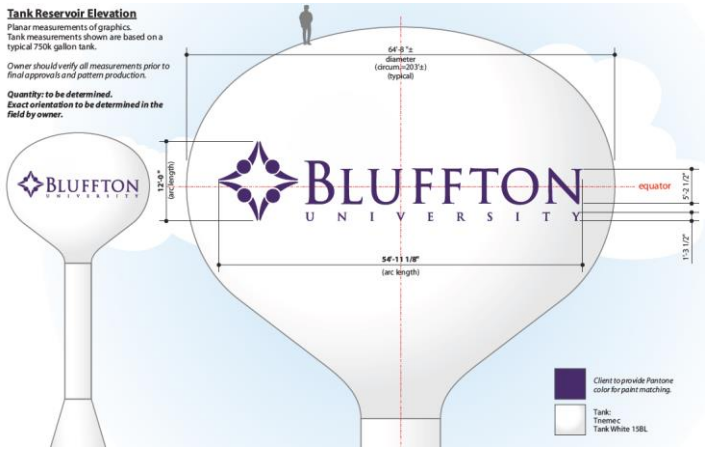
- Exterior ladders terminate at least 12 ft above grade
- Properly fenced site
- All doors and access hatches are locked.

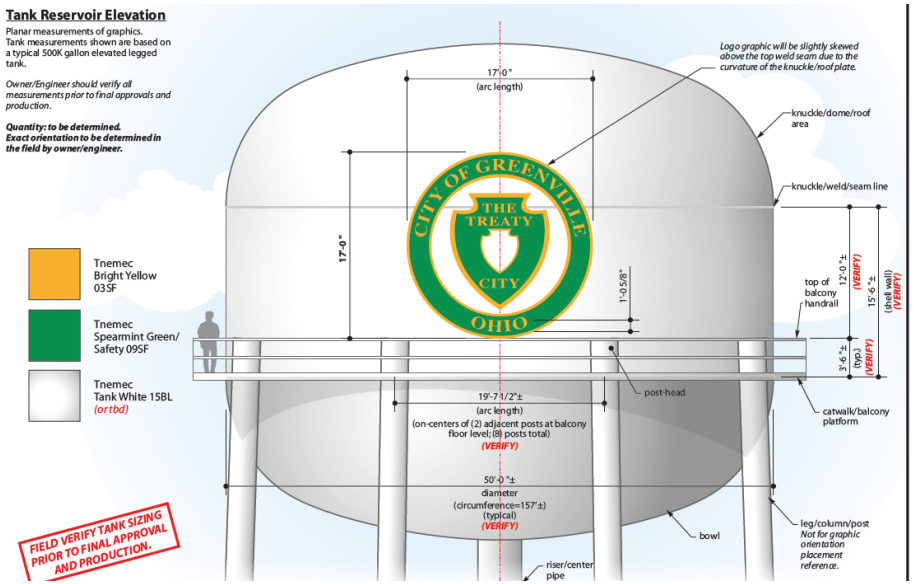

WARNING!
FEDERAL
OFFENSE


Sesame

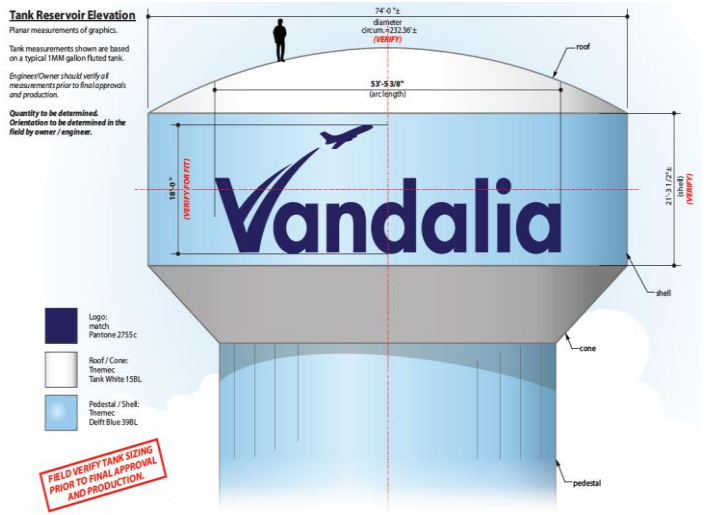
Is your city ready for a new tank logo?

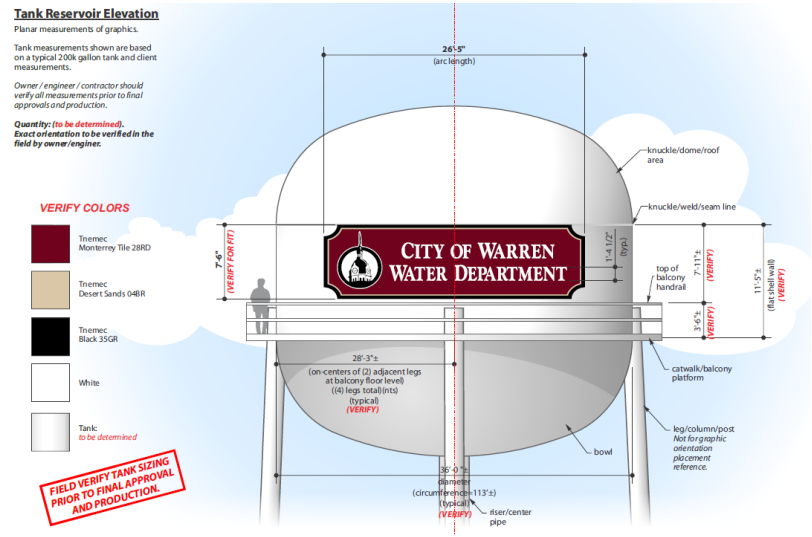
Suez





Troy, Ohio USA®





suez

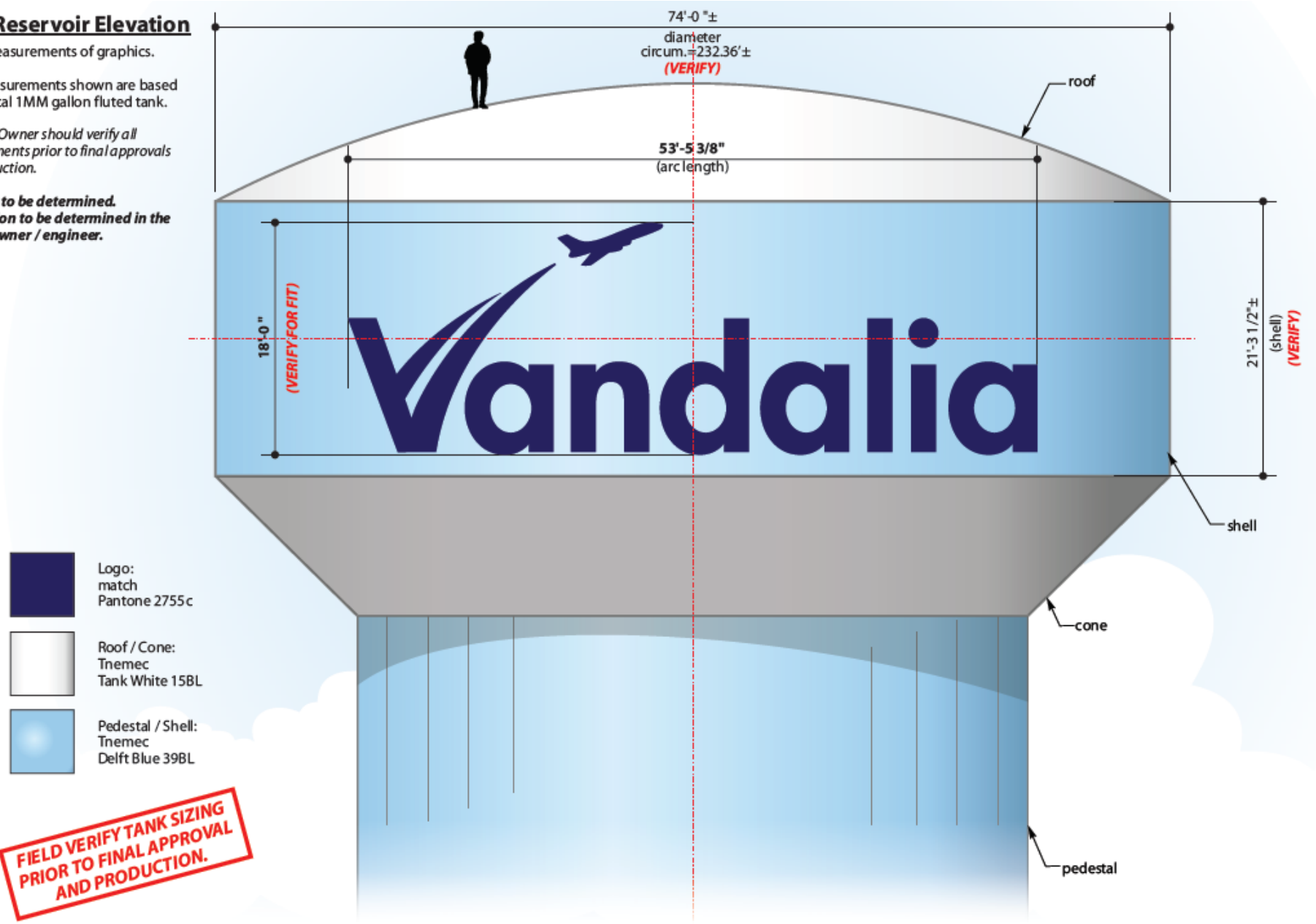
Tank Reservoir Elevation

Planar measurements of graphics.

Tank measurements shown are based on a typical 1MM gallon fluted tank.

Engineer/Owner should verify all measurements prior to final approvals and production.

Quantity to be determined. Orientation to be determined in the field by owner / engineer.




Vandalia


Vandalia


Vandalia


Vandalia

Asset Management Plan: Based on a Water Tower

- Components:
  - Inventory of all major assets(1 tank to 114)
  - Condition assessment of those assets (scoring system)
  - Rehabilitation plan for the assets (based on the scores of each tank)
  - Capital plan for the rehabilitation (spread upfront cost over several years)
  - Long term funding strategy to maintain the asset in the future (maintenance fee for future work)

So what’s the best way to maintain my tank and guarantee the quality?

Ohio Revised Code
General Provisions
Chapter 9:

9.29 Multi-year asset management professional service contracts.

(A) The following political subdivisions may enter into, by direct negotiation or through the solicitation of requests for proposals or requests for qualifications, a multi-year, asset management professional service contract for the engineering, repair, sustainability, water quality management, and maintenance of a water storage tank and appurtenant facilities owned, controlled, or operated by that political subdivision, but only if the contract complies with division (B) of this section:

(1) A board of county commissioners, board of directors of a conservancy district, board of directors of a sanitary district, or board of trustees of a regional water and sewer district;

(2) A municipal corporation through its director of public service, mayor, city manager, board of trustees of public affairs, village administrator, or other contracting officer, commission, board, or authority as authorized by ordinance of the municipal corporation's legislative authority.

(B) A contract entered into pursuant to division (A) of this section shall include provisions that do all of the following:

(1) Provide that the contracting political subdivision is not required to make total payments in a single year that exceed the excess of (a) the political subdivision's water utility charges over (b) the operating expenses of the water system payable from such charges and the principal, interest, and other debt charges, including reserves and coverage requirements, for outstanding debt due in that year;

(2) Require that the work performed be done under the supervision of a professional engineer licensed under Chapter 4733. of the Revised Code, who certifies that the work will be performed in compliance with all applicable codes and engineering standards;

(3) Provide that if, on the date of commencement of the contract, the water tank or appurtenant facilities require engineering, repair, sustainability, water quality management, or service in order to bring the tank or facilities into compliance with federal, state, or local requirements, the party contracting with the political subdivision must provide the engineering, repair, sustainability, water quality management, or service. The cost of the work necessary to ensure such compliance shall be itemized separately and may be charged to the political subdivision in payments spread over a period of not less than three years from the date of commencement of the contract. The charges shall be paid after provision is made to pay operating expenses and the principal, interest, and other debt service charges, including reserves and coverage requirements for outstanding debt due in that year.

Example

Example only

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Tank	Over Coat Exterior	Visual	Washout or ROV	Interior Blast	Visual	Washout or ROV	Visual	Washout or ROV	Visual	Exterior Overcoat
	$80,000	$80,000	$80,000	$80,000	$80,000	$21,000	$22,000	$23,000	$24,000	$25,000

$400,000

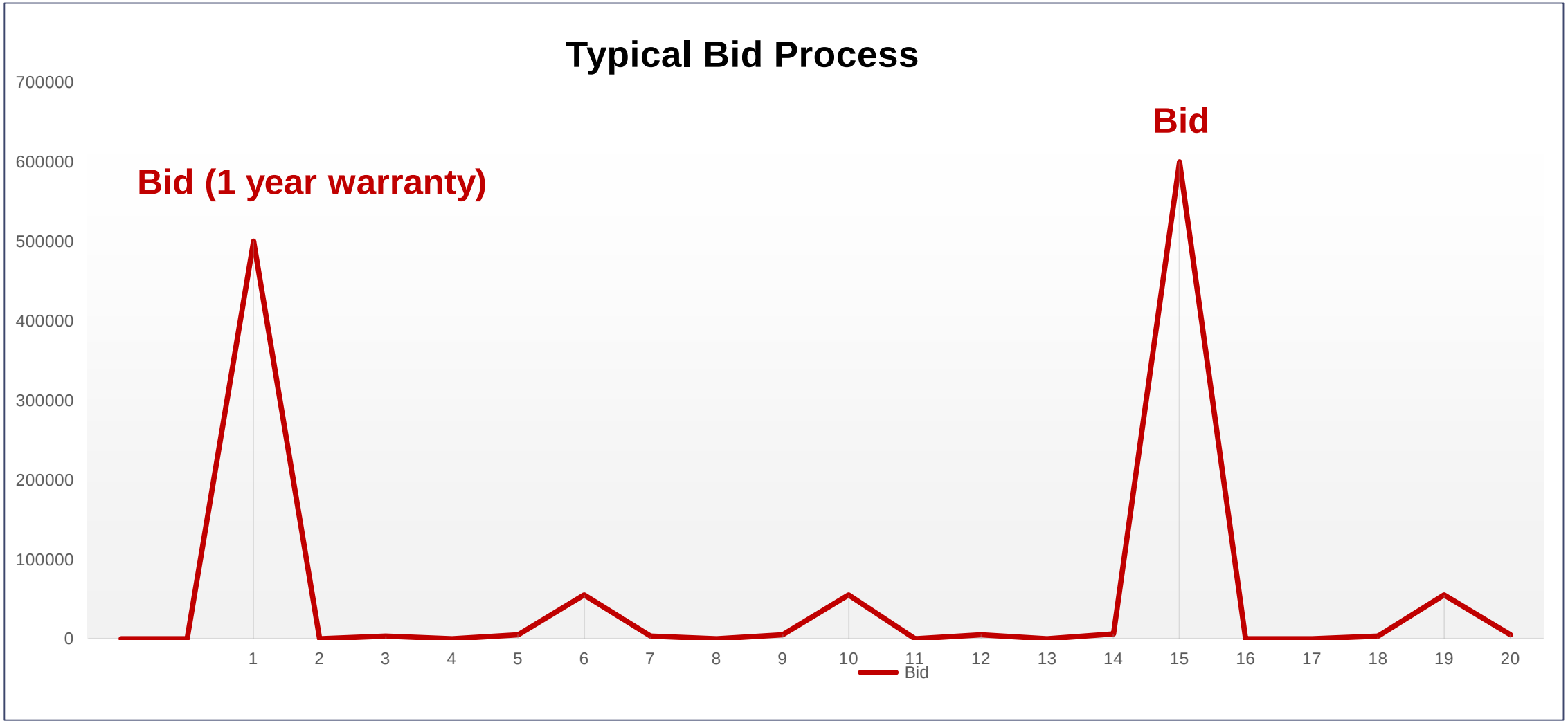
Maintenance and future painting

Tank is inspected to determine scope of work to bring the tank to "Like New" Condition

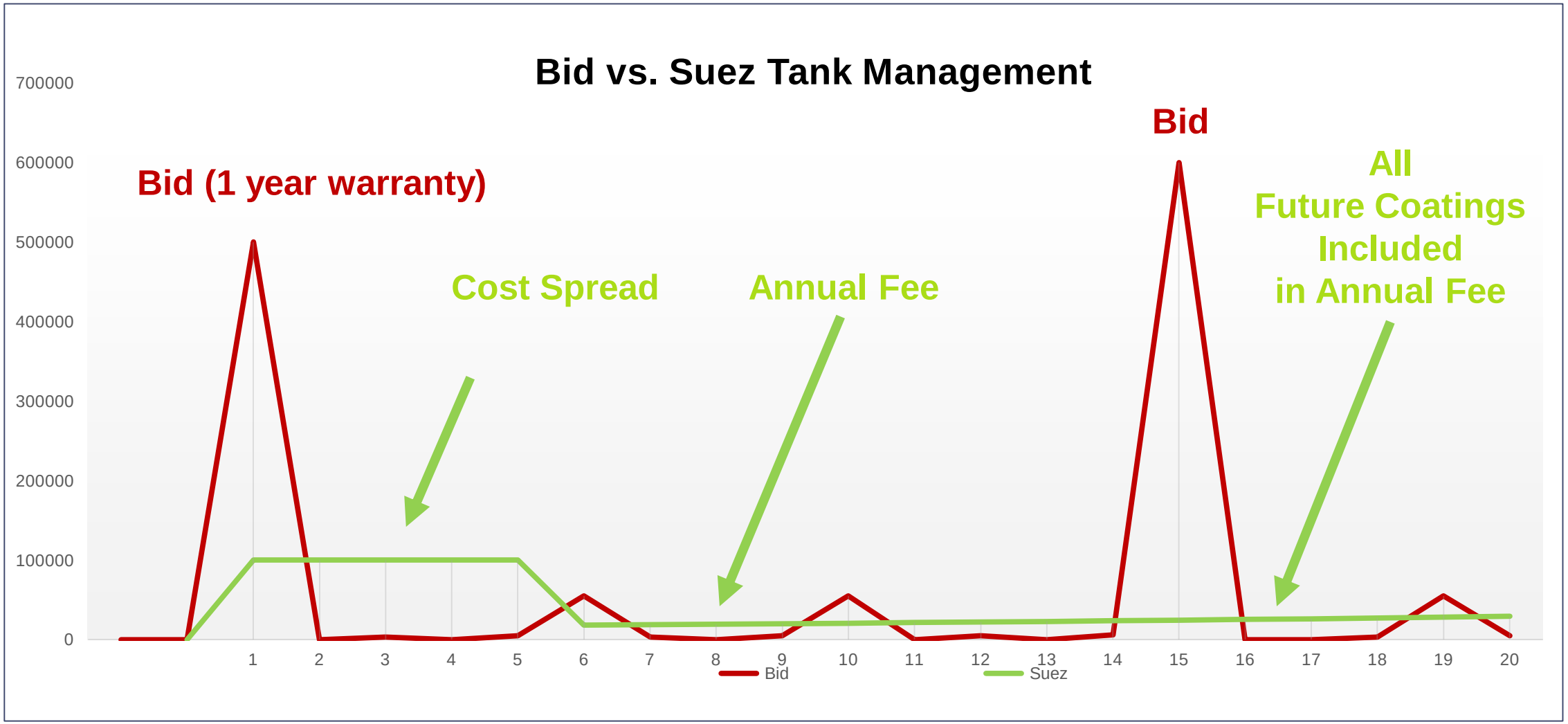
The above includes:
All engineering
All permitting required by Ohio EPA
100% compliance with Ohio Revised Code
Prevailing wages
Exterior every 11-12 years
Interior every 14-15 years
100% warranty of all work and coatings
Emergency Services
Yearly inspection reports

Compliant with Ohio EPA Asset Management Program

Financial Flexibility



Financial Flexibility



Suez assumes all risk in this model

BURNING QUESTIONS?