

EFFECTIVE WATER STORAGE TANKS INSPECTIONS:

Presenter:

John Kitchen, Water System Consultant



AGENDA

- **Background**
- **Tank Designs**
- **Why Inspect**
- **Tank Condition Assessment**





OUR GOAL – Prevent this



BACKGROUND

- **USG**
 - The largest in the nation in maintaining and managing water storage tanks
 - Over (1,400) Renovations completed in 2014
 - Over (5,200) water tanks under the Full Service Maintenance Program nationwide
 - Perform over (8,000) inspections annually

- **John Kitchen – Training**
 - NACE level 3 Inspectors
 - Paint Manufactures Reps
 - Painting Contractors
 - Inspect over 50 water tanks per year



WHY INSPECT?

- DETERMINATION OF MAINTENANCE NEEDS FOR ONE OF THE WATER SYSTEMS MOST VALUABLE ASSETS:



Water Tank Styles & Design Issues:



Leg Tank





Single Pedestal



Fluted Column





Composite Elevated





Standpipe



Reservoir or Ground Storage





Concrete Tanks



Bolted Tanks



Redwood Tank



Tank converted into restaurant



House Tank



What could go wrong: 300,000gal Auburn, MA



Sidewall failure due to corrosion

TYPES OF INSPECTIONS

- **Routine:** daily/weekly
 - Visual Drive by
- **Periodic:** monthly/quarterly
 - Visual hands on inspection
- **Comprehensive:** 2-4 years
 - In-depth
 - Washout
 - ROV
 - Dive



INSPECTION FREQUENCY

- **AWWA M42:**
 - “The maximum interval for periodic inspections of the tank interior should normally be 3 years. It is usually advisable to wash out the tank at the time of inspection.” **Page 67**



INSPECTION CONTRACTORS:

- **Written contract that defines the scope of the inspection**
- **Report should include quality DVD or color photographs documenting findings**
- **Report should be detailed and cover conditions under all (6) categories**
- **Report on all conditions NOT just deficiencies**
- **Provide recommendations and cost estimates**



WHAT TO INSPECT:

- Six general categories of items on storage facilities that *must* be inspected:
 - Structural Conditions
 - Safety Conditions
 - Sanitary Conditions
 - Coating Systems Conditions
 - Security Conditions
 - **General Details**



Coatings Conditions

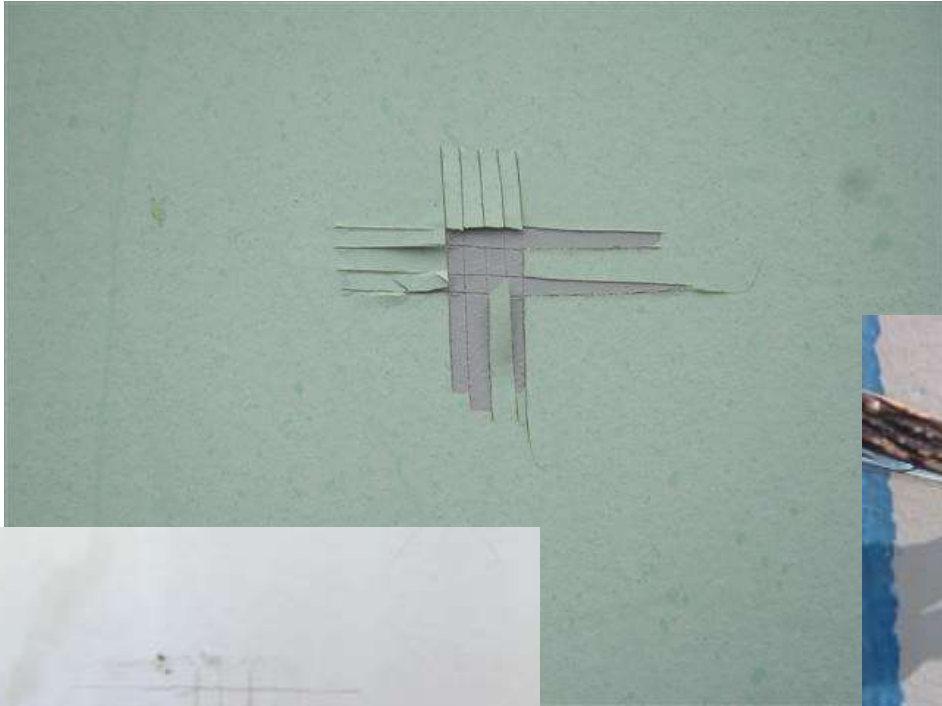
- **Generic type and general condition**
- **Approximate percentage and type of coatings system failure**
- **Adhesion**
- **Coating System Thickness**
- **Extent of Pitting Damage**
- **Heavy Metal Presence**



Coatings Conditions



Coatings Conditions





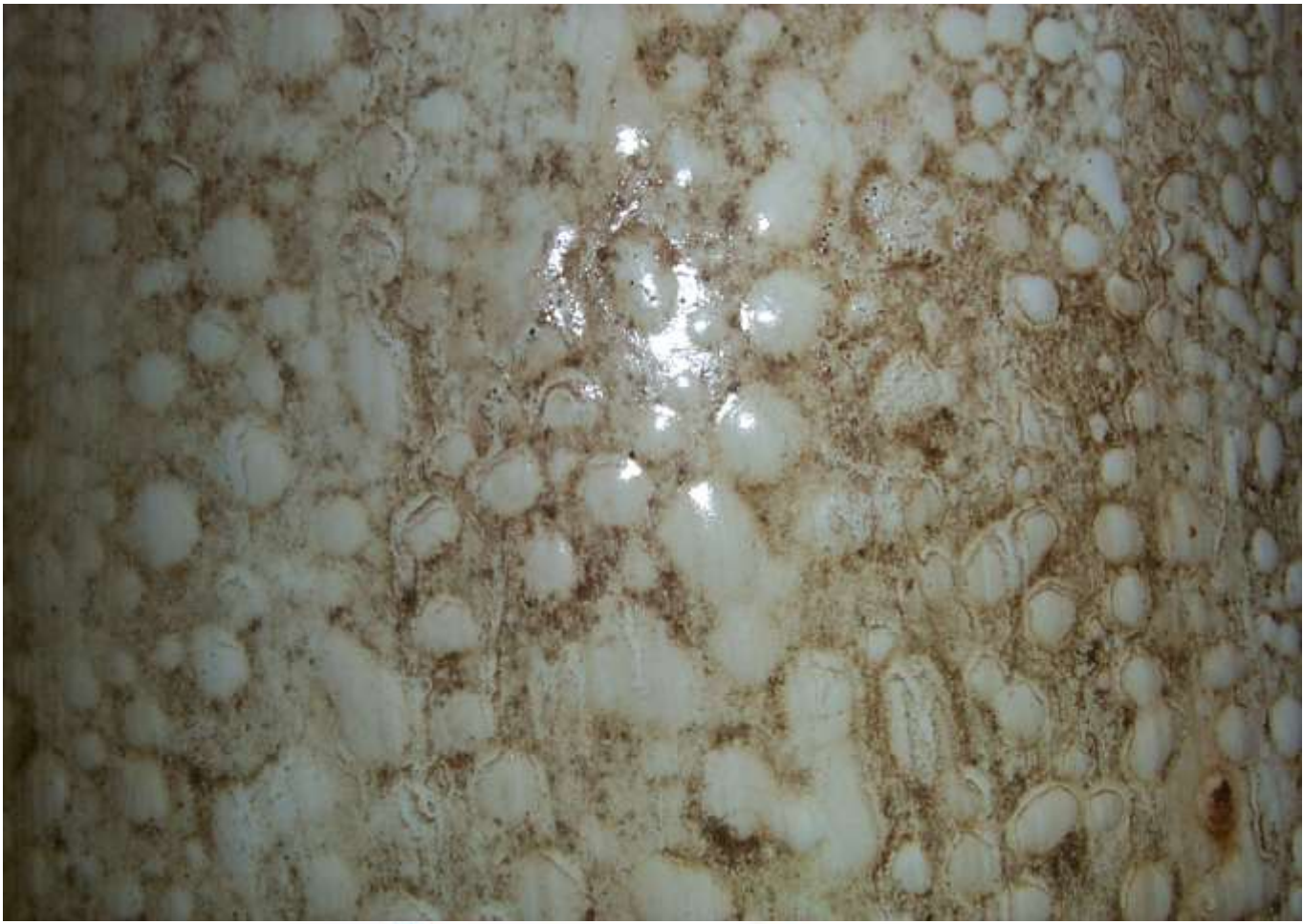
Coatings Conditions



Coatings Conditions



Coatings Conditions



Coatings Conditions



Coatings Conditions



Coatings Conditions



Sanitary Conditions

- **Roof Openings**
- **Access Hatches**
- **Low Spots on Roofs**
- **Vents**
- **Overflows**



Sanitary Conditions: Roof Openings



Sanitary Conditions: Roof Openings



Sanitary Conditions: Roof Openings



Sanitary Conditions: Roof Openings



Beer Can Tank

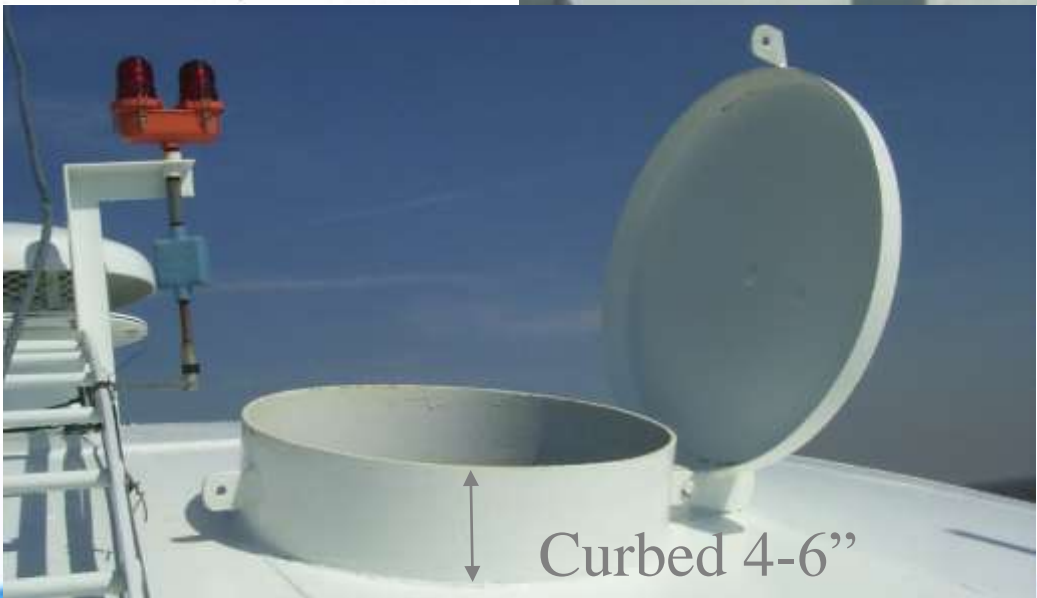




Sanitary Conditions: Roof Openings



Sanitary Conditions: Access Hatches

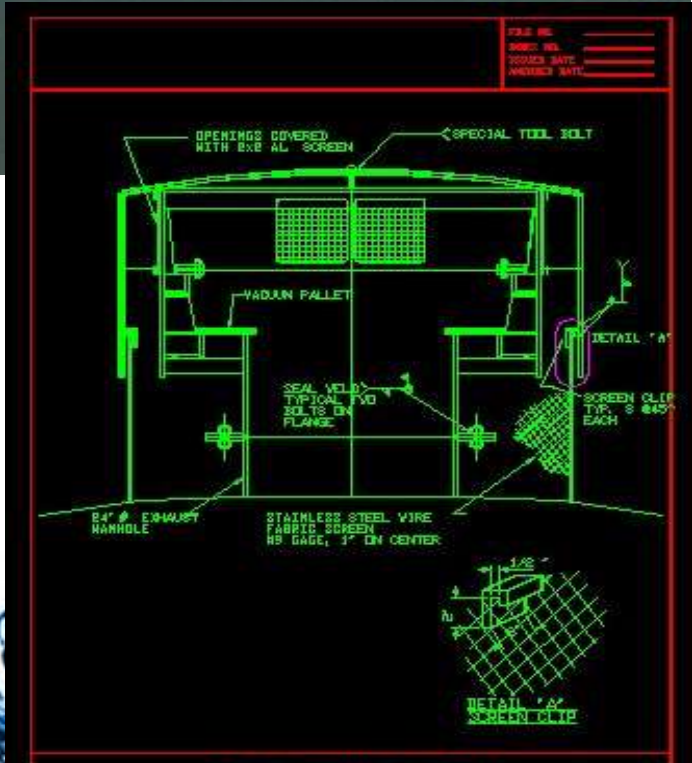
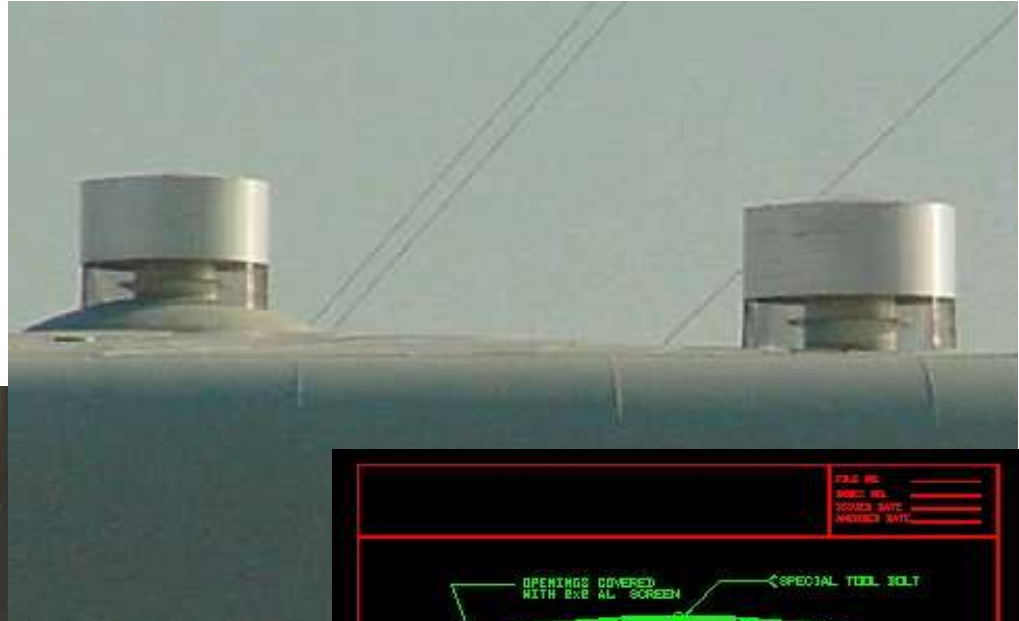


Sanitary Conditions: Vents





Sanitary Conditions: Secure Vent



Sanitary Conditions: Overflows





Tank Security Crew



Security Conditions: Threats

- **Terrorist Acts**
- **Disgruntled Employees**
- **Pranks**
- **Environmental**



Security Conditions

- **Physical Deterrents**
 - Fences/Locks
 - Barricades
 - Lighting
 - Ladder Guards
 - Vents
- **Telemetry**
 - Alarm Systems
 - Water Monitors
 - Residual Chlorine Analyzer
 - Turbidity Monitor
 - Control Systems



Security Conditions: Site Access





Security Conditions





Security Conditions





Security Conditions



Structural Conditions: Foundations



Structural Conditions

- **Anchor bolts**
- **Foundations**
- **Wind rods**
- **Riser/Shell steel**
- **Spider Rods**
- **Roof Trusses**
- **Weld Seams**



Structural Conditions: Anchor Bolts



Structural Conditions: Foundations



Structural Conditions: Roof Trusses





Structural Conditions: Roof Trusses



Safety Conditions

- **Regulations**
- **Appurtenances**
 - Ladders
 - Fall Prevention
 - Handrails
 - Access
 - Confined Space
 - Radiation



Safety Conditions: Fall Prevention

- **29 CFR 1926.502**
 - A fall protection system must be used when working 6 feet or more above a lower level
- **Systems include**
 - Guardrail Systems
 - Safety Net Systems
 - Personal Fall Arrest Systems
 - Positioning Device Systems
 - Warning line Systems





Ridged Rail Safety Climb





Flex-Cable Safety Climb System





Safety Conditions: Fixed Ladders



Safety Conditions: Fixed Ladders



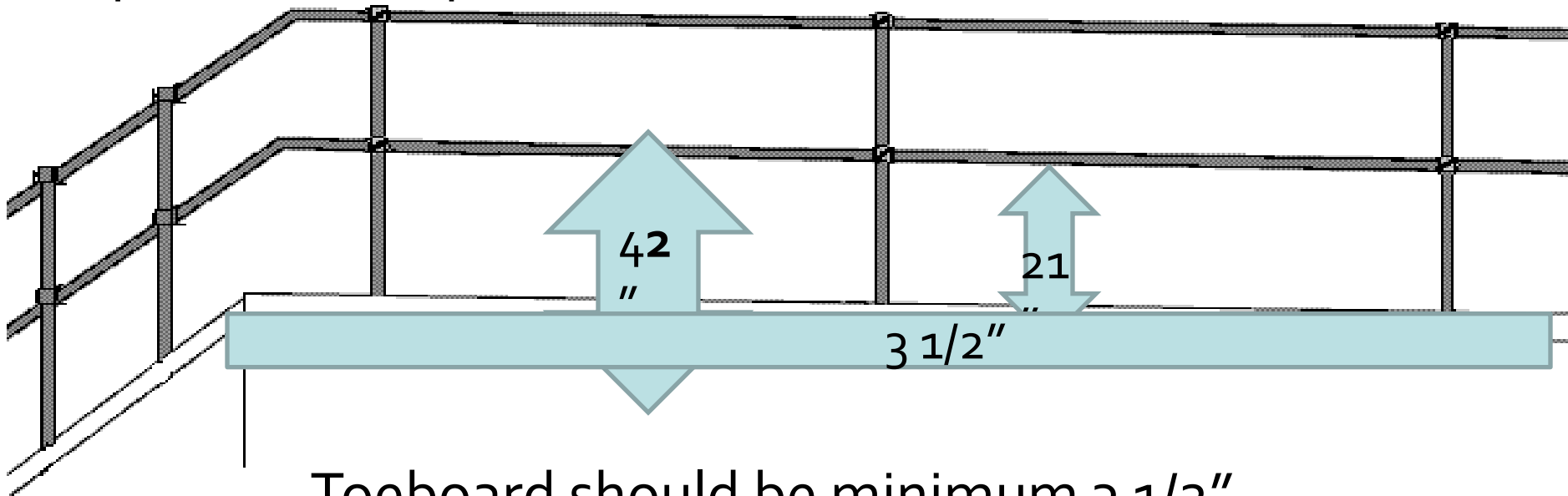
Safety Conditions: Fixed Ladders



Guardrail Height

Top Handrail should be 42" (+ or - 3") to the top of the rail

Mid Handrail should be 21" or midway between the top rail and the platform



Toeboard should be minimum 3 1/2"

Safety Conditions: Access

- **AWWA D100**
 - Section 7.1 – **“Two manholes in the first ring of the tank shell”**
 - Section 5.1.2 – “manhole shall not be less than 12in.x18in.”
 - Section 5.6.1 – Opening above the water line
 - Section 5.6.2 - Opening near the tank center
 - “shell manway may be substituted”



Safety Conditions: Radiation

- **FCC Issues**
 - Hazard Communications
 - Safety Plan



Summary:

- **Inspect:**
 - Safety
 - Sanitary
 - Security
 - Structural
 - Coatings





Burning Questions?

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