UNDERWATER SOLUTIONS INC.

INSPECTION AND CLEANING (SEDIMENT REMOVAL) OF THE WEDGE STREET 500,000-GALLON WELDED STEEL (HYDROSPHERE) ELEVATED WATER STORAGE TANK

CITY OF LOWELL WATER UTILITY
LOWELL, MASSACHUSETTS

JUNE 15, 2015

MUNICIPAL DIVING SERVICES • P.O. Box 208 • Mattapoisett, MA 02739 • Tel: (508) 758-6126 • Fax: (508) 758-6128 •
• E-Mail: uws@underwatersolutionsinc.com • Web Address: www.underwatersolutionsinc.com •

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SCOPE:

On June 15, 2015, Underwater Solutions Inc. conducted an inspection of the Wedge Street 500,000-gallon welded steel elevated potable water storage tank (hydrosphere) to provide information regarding the overall condition and integrity of this welded steel structure and removed the sediment accumulation found on the floor.

EXTERIOR INSPECTION:

The entire exterior of this water storage tank and all components was inspected to include walls and coating, anchor bolts, foundation, manway, ladders, overflow, roof, vent and hatches.

Walls And Coating

All elevations of the welded steel pedestal and bowl (tank) were found appearing sound and free of obvious fatigue (pitting) of the steel at this time.

The protective coating applied to these welded steel surfaces remains having good adhesion value throughout all surfaces and elevations of this structure, providing adequate protection for the steel.

A non-uniform accumulation of mildew exists throughout all elevations of the pedestal and the bowl base, reducing the overall aesthetics.

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Anchor Bolts

Twenty, 1-3/4" diameter anchor bolts extend up from the concrete base pad through a 6" wide by 1-1/2" thick steel plates welded to the pedestal base.

Each anchor bolt has a nut securely installed, and the protective coating applied to this hardware was found having good adhesion value at this time.

Foundation

The concrete base pad (foundation) has an average height of 1" and an average width of 16" and appeared sound and free of cracks, spalls or other obvious fatigue of the concrete at this time.

Manway

One, 23-1/2" inside diameter manway penetrates the center access tube, located approximately 12" above the base of the bowl and is securely installed and free of obvious leakage. The protective coating applied to these steel surfaces was found having good adhesion value at this time.

Ladders

Three welded steel ladders provide access for the pedestal base to the roof of this water storage tank.

The lowest ladder begins approximately 10" above the pedestal floor, extends up to a platform and is supported to the pedestal wall with two sets of welded standoffs. An aluminum fall prevention device is installed throughout the length of this ladder.

The protective coating applied to this steel ladder has good adhesion value throughout its length, while the aluminum fall prevention device was found un-coated at this time.

The second ladder extends from a platform up to a second platform located below the bowl base and is supported to the pedestal wall with three sets of welded standoffs. An aluminum fall prevention device is installed throughout the length of this ladder.

The protective coating applied to this steel ladder has good adhesion value throughout its length, while the aluminum fall prevention device was found un-coated at this time.

The third ladder extends from a platform located below the bowl base up through the center access tube to the roof and is supported to the center access tube with nine sets of welded standoffs. An aluminum fall prevention device is installed throughout the length of this ladder.

The protective coating applied to this steel ladder has good adhesion value throughout its length, while the aluminum fall prevention device was found un-coated at this time.

Each ladder remains in good condition and the aluminum fall prevention devices installed on these ladders are properly installed, providing safe access to the roof.

Overflow

A 10" inside diameter steel overflow pipe penetrates through the center access tube approximately 8' below the top of the tank and turns 90° and extends down through the interior of the pedestal. This overflow pipe was found properly and securely welded in place at this time.

Approximately 18" above the pedestal floor, this pipe continues through a welded steel elbow and penetrates the pedestal wall to the exterior of the structure. This pipe then extends down approximately 54" and turns 90° down and terminates approximately 10" above a concrete splash pad. This overflow pipe was free of obvious obstructions and has a screen installed at its end, preventing access to the interior of the tank.

The protective coating applied to all steel surfaces of this piping has good adhesion value at this time.

Roof

The welded steel panel roof dome was inspected and was found appearing sound and free of obvious fatigue (pitting) of the steel at the time of this inspection.

Four, 2" diameter and two, 3" diameter rigging hole penetrations within the roof dome are secured with rubber plugs and stainless steel hose clamps, preventing access to the interior of the tank.

The protective coating applied to these surfaces was found having good adhesion value, providing adequate protection for the steel.

Vent

The vent penetrates the center of the bolted steel cap of a 24" inside diameter steel cover that is bolted to an access hatch. This access hatch is located approximately 48" from the center of the roof dome, having a 10" inside diameter and stands 32" tall.

A 50" outside diameter steel cap and associated screen was found securely installed over this vent, preventing access to the interior of the tank.

Hatches

One 30" inside diameter steel hatch provides good access to the interior of the tank through the roof dome. This hatch was opened and utilized to access the interior of the tank for this inspection and was found in good working condition and is secured with a nut and bolt, preventing accidental opening.

One 24" inside diameter steel hatch provides access to the tank interior through the roof dome. This hatch is secured with a series of nuts and bolts and was not opened or utilized during this inspection.

One 30" inside diameter steel hatch provides access from the center access tube to the roof. This hatch is in good working condition and is secured with a chain and snap-clip, preventing accidental opening.

INTERIOR INSPECTION:

The entire interior of this water storage tank and components was inspected to include sediment accumulations, floor, manway, piping, walls and coating, center access tube, interior ladder, overhead, overflow and aesthetic water quality.

Sediment Accumulations

A uniform layer of accumulated precipitate was found on all floor surfaces, ranging from 5" to 7" in depth.

After completing this inspection, all precipitate was removed (vacuumed) from the floor.

Floor

After removing the accumulated precipitate the welded steel floor surfaces were inspected and found appearing sound and free of obvious fatigue (pitting) of the steel.

The protective coating applied to these welded steel surfaces was found having good adhesion value, providing good protection for the steel.

Mild non-uniform staining exists throughout the floor due to the accumulation of precipitate.

Manway

One, 23-1/2" inside diameter manway having a 28" outside diameter steel lid penetrates the center access tube, located approximately 12" above the floor (bowl base) and is securely installed and free of obvious leakage.

The protective coating applied to this steel manway was found having good adhesion value at this time.

Piping

One pipe penetrates the center access tube approximately 22" above the bowl base, having a 12" inside diameter extends 22" and turns 45° directing this pipe up and supported to the center access tube prior to terminating approximately 72" above the bowl base. This pipe was free of obvious obstructions and had flow entering the tank at the time of this inspection.

Approximately 12" above this pipe is a 16" inside diameter pipe that extends upward and is supported to the center access tube with three welded standoffs prior to terminating approximately 30' above the bowl base. This pipe appears to serve as a water-mixing pipe and was free of obvious obstructions at the time this inspection was completed.

The protective coating applied to the 12" inside diameter pipe that penetrates the center access tube and the 16" inside diameter pipe that extends above the 12" inside diameter pipe was found having good adhesion value, providing adequate protection for these welded steel pipes.

A 3" inside diameter flush penetration within the bowl base is located 2" in from the center access tube and was found with an iron plug resting upside down within this penetration. An iron plug on the exterior of the tank, located opposite this penetration was found securely installed and free of leakage. This penetration appears to serve as the final drain penetration for the tank.

Walls And Coating

The interior walls were inspected beginning at the floor and by spiraling the circumference of the tank bowl up to the water surface.

These welded steel wall surfaces were found appearing sound and free of obvious fatigue (pitting) of the steel at this time.

The protective coating applied to these welded steel surfaces was found having mostly good adhesion value, yet eight areas of coating adhesion loss were found on the south-westernmost side of the tank, located approximately 8' to 10' below overflow level.

These areas of coating adhesion loss range in size from 2" by 2" to 12" by 12" and have resulted in exposure of the underlying steel.

No obvious fatigue (pitting) of the steel was evident within these areas of coating loss and steel exposure, rather mild surface corrosion exists at this time.

Mild to moderate staining exists throughout the interior walls, extending from approximately 15" below overflow level down to the floor.

Center Access Tube

The 42" inside diameter center access tube was found appearing sound and free of obvious fatigue (pitting) of the steel at this time.

The protective coating applied to these welded steel surfaces was found having good adhesion value, providing adequate protection for the steel.

Interior Ladder

A welded steel ladder extends from the floor up to the 30" inside diameter interior access hatch and is supported to the center access tube with eight sets of welded standoffs. An aluminum fall prevention device is installed throughout the length of this ladder, providing safe access when entering and exiting the tank.

The protective coating applied to this steel ladder has good adhesion value, while the aluminum fall prevention device was found un-coated at this time.

Overhead

The welded steel overhead was inspected from the water surface and was found appearing sound and free of obvious fatigue (pitting) of the steel at this time.

The protective coating applied to the steel overhead panel surfaces was found having good adhesion value, providing adequate protection for these welded steel surfaces.

Overflow

The overflow consists of a 10" inside diameter pipe penetration the center access tube located 8' below the overhead. This steel pipe extends inward 24" and turns 90° directing this pipe down an additional 4" and terminates approximately 9'-2" below the overhead. This pipe was free of obvious obstructions and is properly coated at this time.

Aesthetic Water Quality

The aesthetic water quality was found to be good throughout this entire tank, allowing unlimited visibility for this inspection.

CONCLUSION:

It is the opinion of Underwater Solutions Inc. that this elevated welded steel potable water storage tank (hydrosphere) appeared sound and free of obvious leakage at this time.

All exterior surfaces of the welded steel bowl and pedestal appeared very sound and free of obvious fatigue (pitting) of the steel at this time.

The protective coating applied to these exterior welded steel surfaces was found having very good adhesion value, providing adequate protection for these welded steel surfaces.

The welded steel roof dome surfaces appeared sound and free of fatigue (pitting) of the steel, while the protective coating has good adhesion value, providing adequate protection for the steel.

All components affixed to this tank are properly installed at this time. The screens installed around the circumference of the vent and at the end of the overflow pipe remain secure, preventing access to the interior of the tank.

The hatch that provides access to the interior of the tank was found secured with a nut and bolt.

It is our recommendation that a lock be installed on this hatch to prevent unwanted access to the tank interior.

The interior welded steel overhead surfaces appeared sound and free of fatigue (pitting) of the steel at this time.

The protective coating applied to the steel overhead panels was found having good adhesion value, providing adequate protection for the steel.

The interior floor surfaces appeared sound and free of obvious fatigue (pitting) of the steel. The protective coating applied to these welded steel surfaces was found having good adhesion value, providing adequate protection for the steel.

The center access tube appeared sound and free of obvious fatigue (pitting) of the steel, and the protective coating applied to these welded steel surfaces has good adhesion value throughout its length.

The interior walls appeared sound and free of obvious fatigue (pitting) of the steel. The protective coating applied to these steel wall panels and welds was found having mostly good adhesion value, while eight areas of coating adhesion loss and steel exposure were observed on the south-westernmost side of the tank located between 8' to 10' below overflow level.

No obvious fatigue (pitting) of the steel was observed within these areas of coating loss and steel exposure, rather mild surface corrosion exists at this time.

It is our recommendation to spot grind and re-coat these areas of steel exposure using an A.N.S.I. /N.S.F.61 approved coating for use in structures containing potable water to halt corrosion, prevent steel fatigue and to seal and protect the steel.

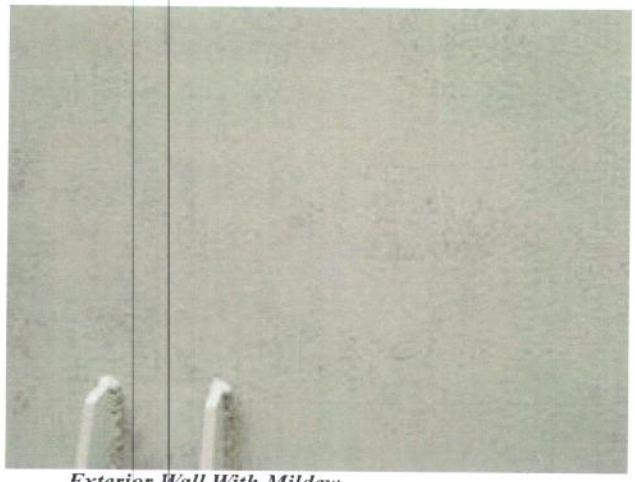
The pipe within this structure is properly installed and free of obvious obstructions at this time.

After completing this inspection all precipitate was removed (vacuumed) from the floor.
As always, we recommend re-inspection and cleaning of all water storage facilities in accordance with state and federal mandates, A.W.W.A. standards, and be completed by an experienced and authorized inspection corporation.

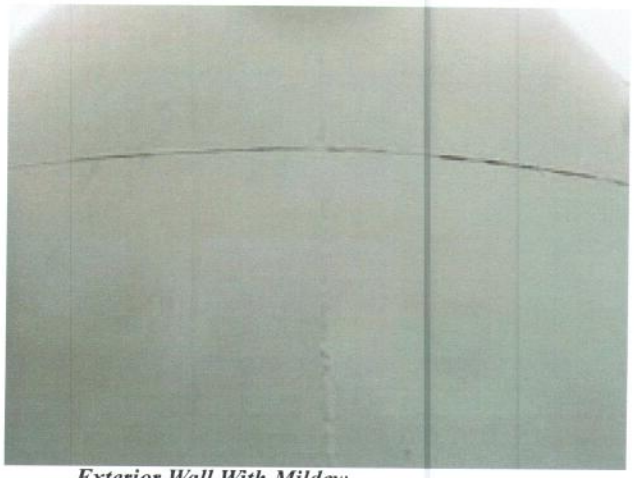
UNDERWATER SOLUTIONS INC.
Christopher A. Cole, Project Manager

This report, the conclusions, recommendations and comments prepared by Underwater Solutions Inc. are based upon spot examination from readily accessible parts of the tank. Should latent defects or conditions which vary significantly from those described in the report be discovered at a later date, these should be brought to the attention of a qualified individual at that time. These comments and recommendations should be viewed as information to be used by the Owner in determining the proper course of action and not to replace a complete of specifications. All repairs should be done in accordance with A.W.W.A. and/or other applicable standards.

1 *Exterior Wall With Mildew*



2 *Exterior Wall With Mildew*



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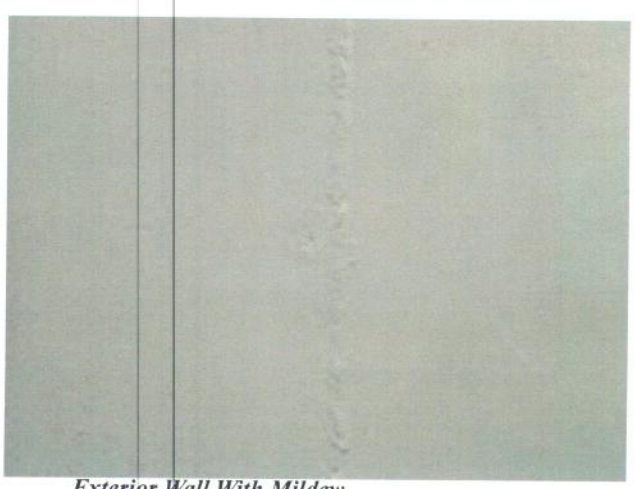

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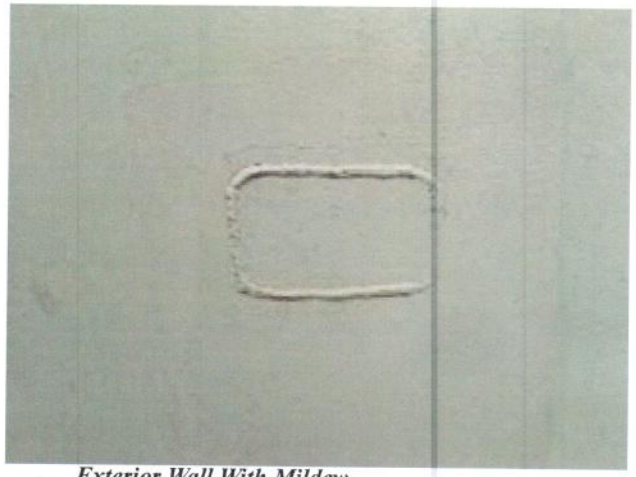

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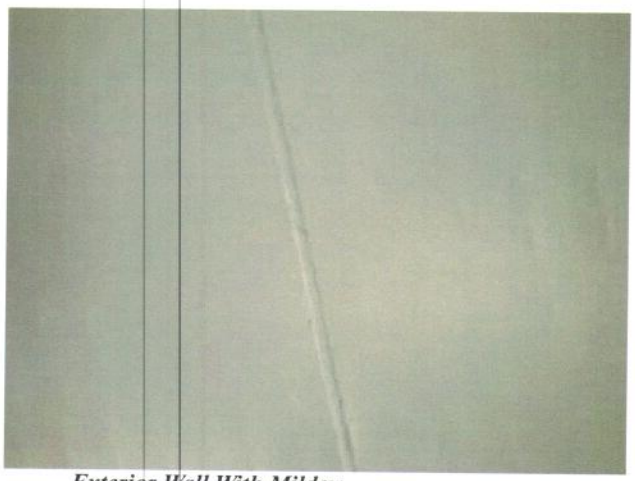
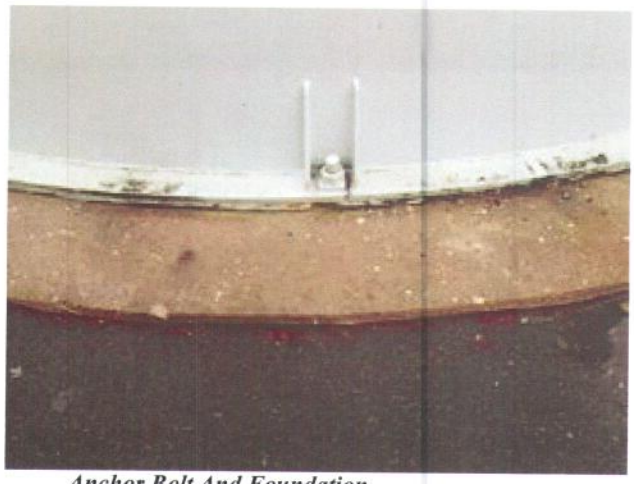
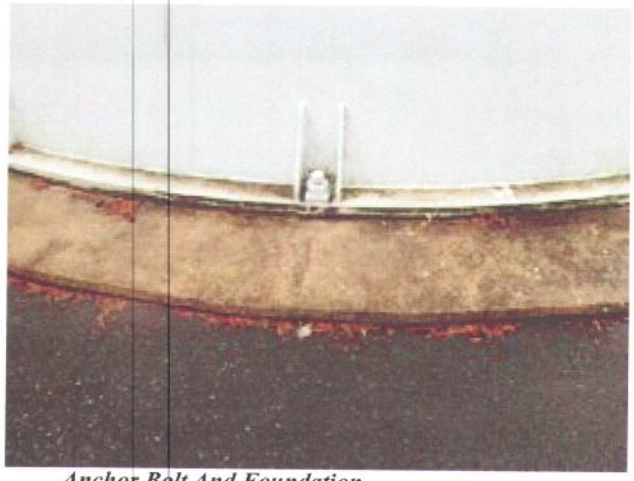


6 *Exterior Wall With Mildew*

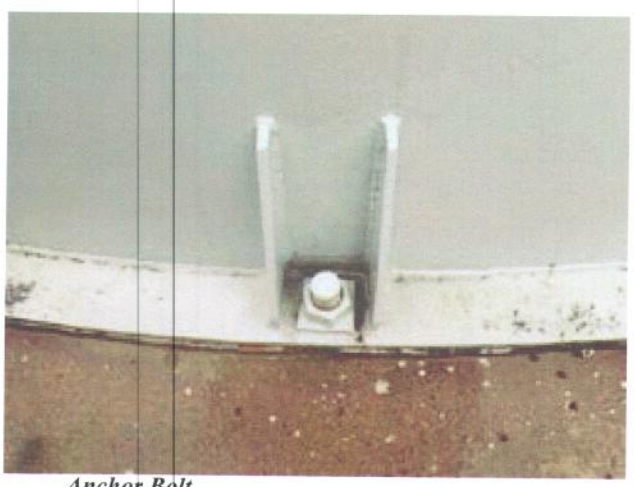


7 *Anchor Bolt And Foundation*

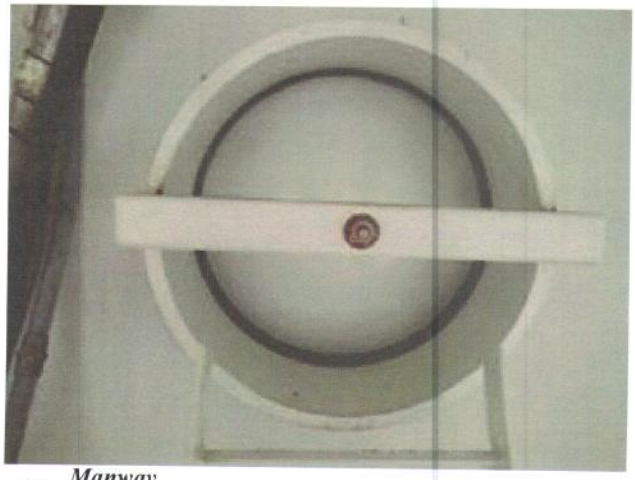


8 *Anchor Bolt And Foundation*

9 *Anchor Bolt*



10 *Anchor Bolt*

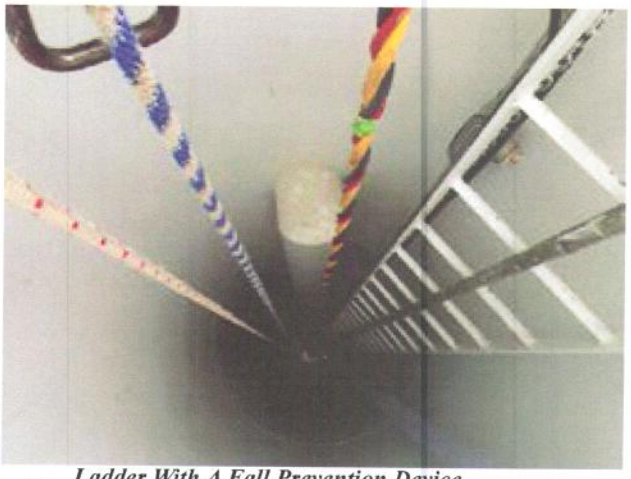


11 *Manway*

12 *Ladder With A Fall Prevention Device*

13 *Ladder With A Fall Prevention Device*

14 *Ladder With A Fall Prevention Device*



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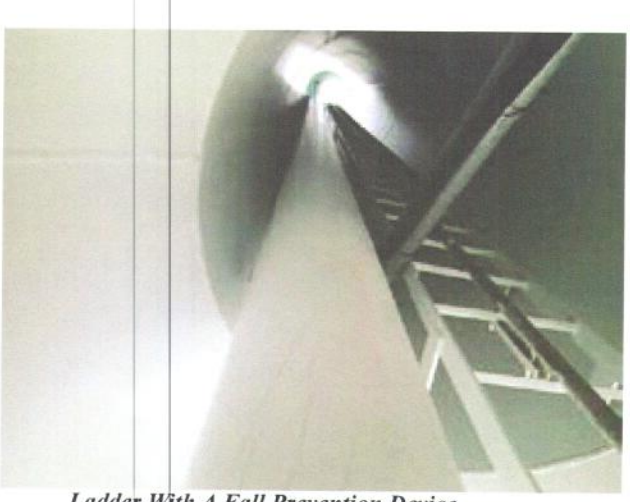
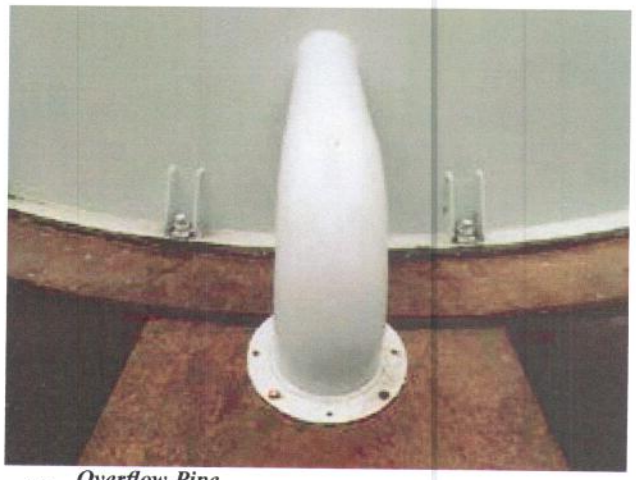
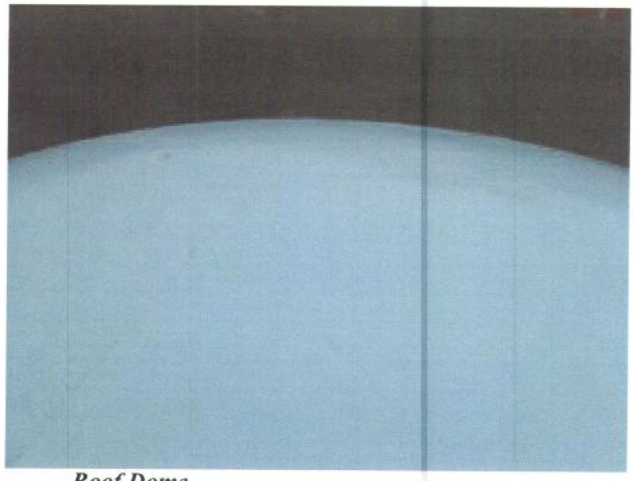


16 *Ladder With A Fall Prevention Device*

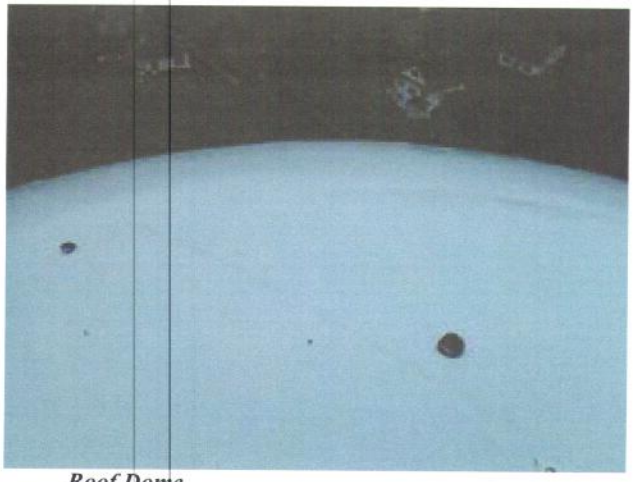


17 *Overflow Pipe*

18 *Screened Overflow*



19 *Roof Dome*



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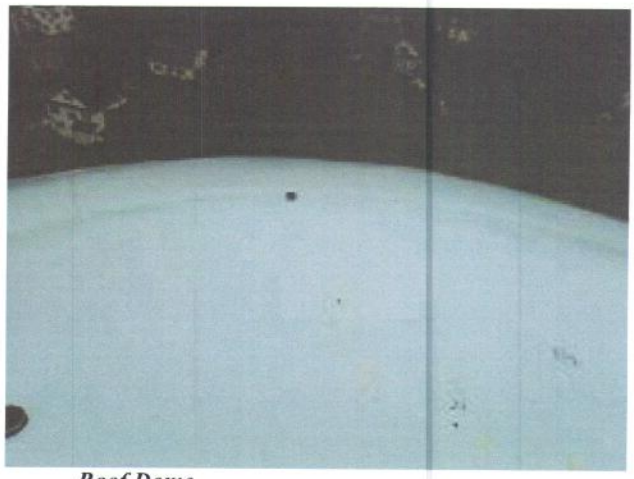

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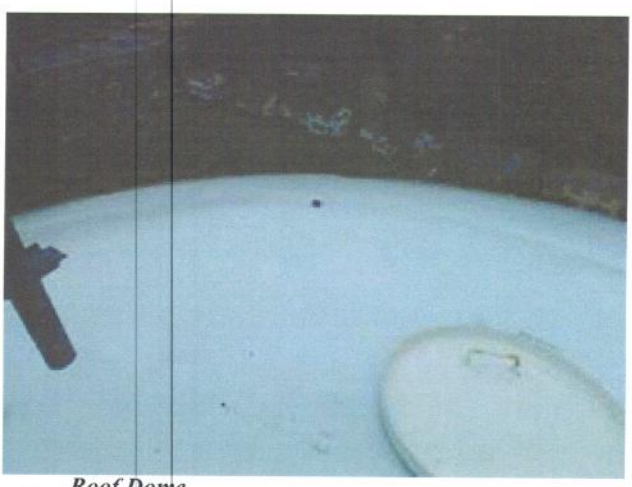
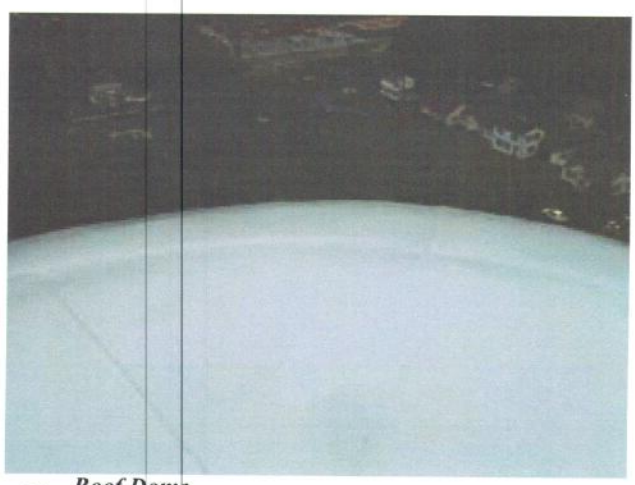
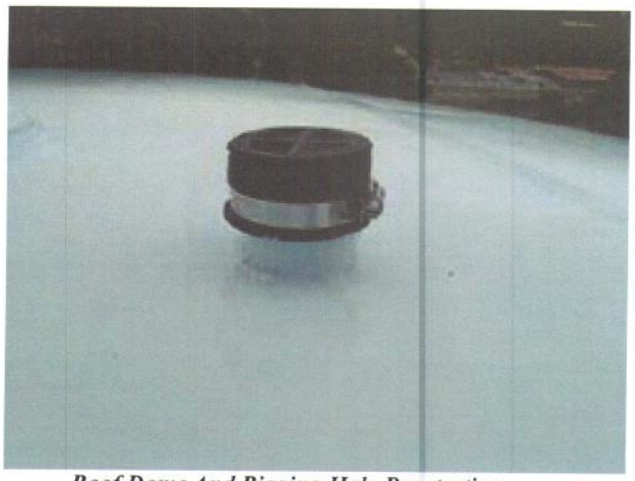


22 *Roof Dome*

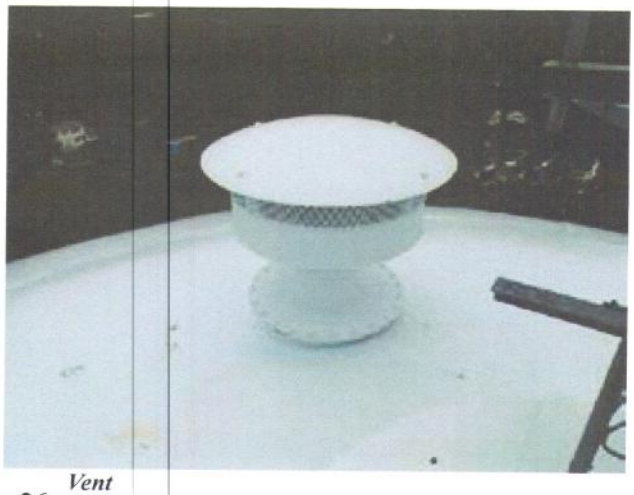
23 *Roof Dome*



24 *Roof Dome*

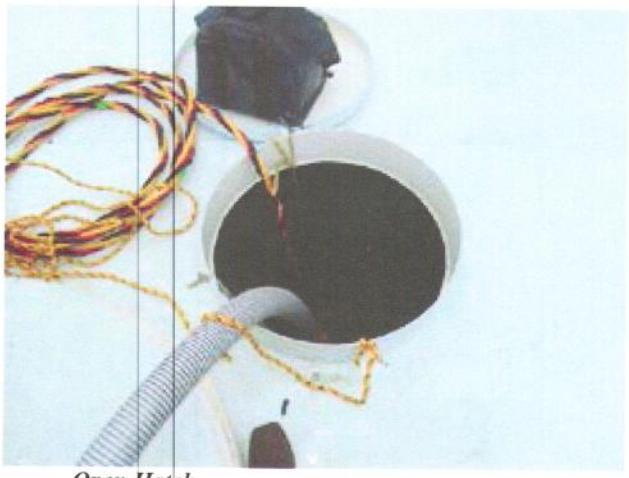


25 *Roof Dome And Rigging Hole Penetration*

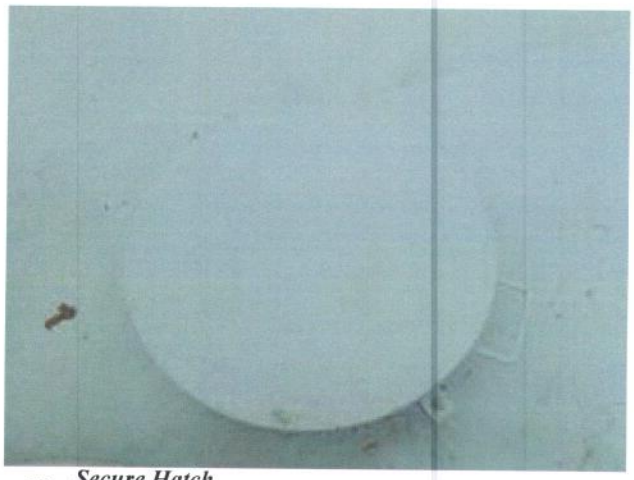


26 *Vent*

27 *Screened Vent*



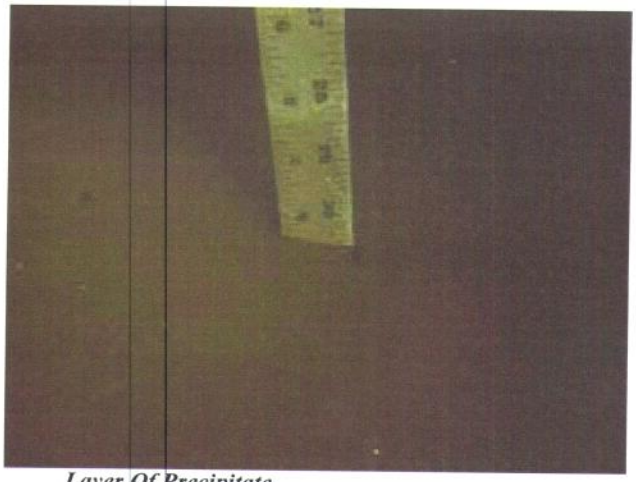
28 *Open Hatch*



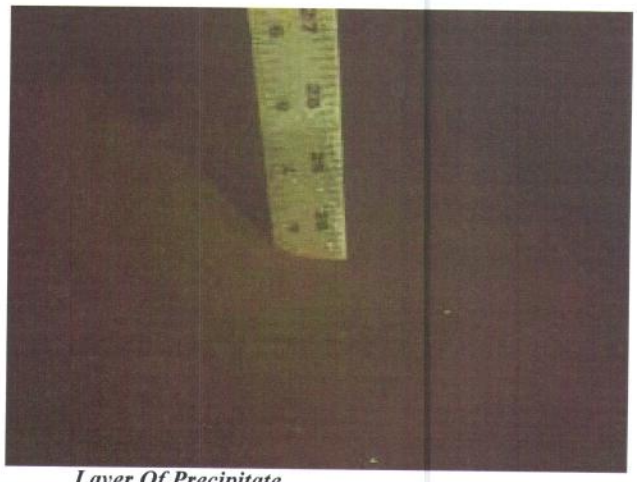
29 *Secure Hatch*

30 *Secure Hatch*

31 *Hatch Access Tube*



32 *Layer Of Precipitate*



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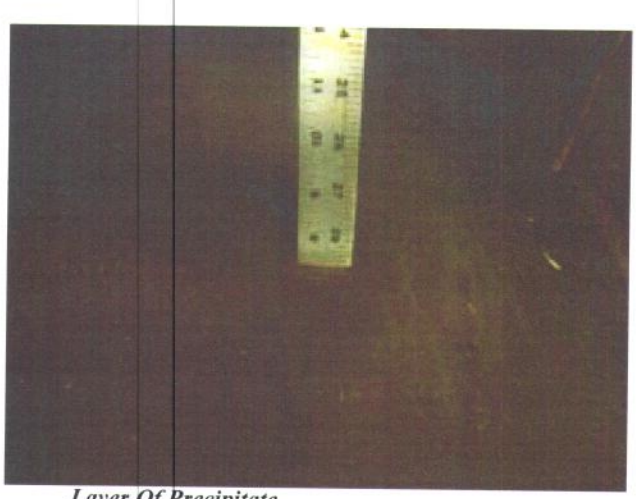

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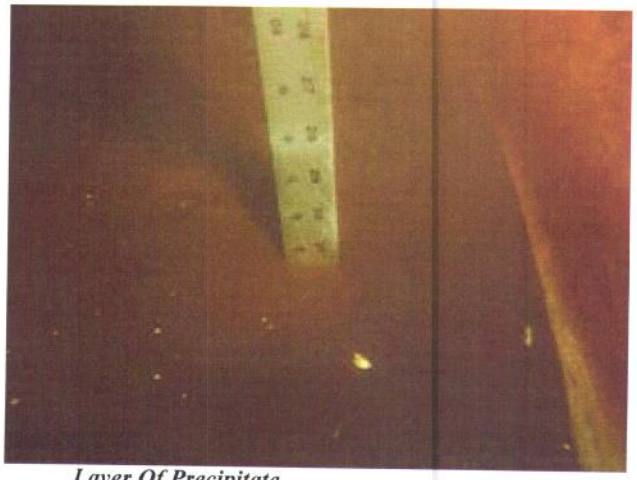

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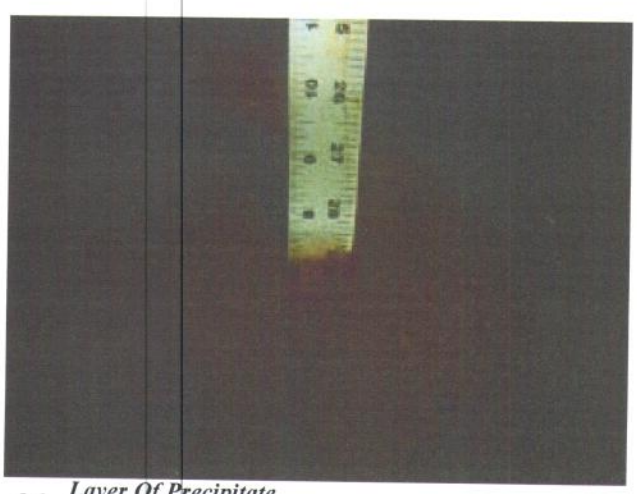

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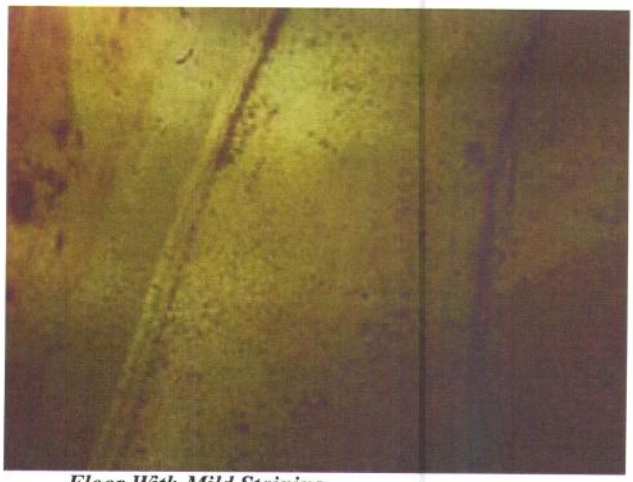
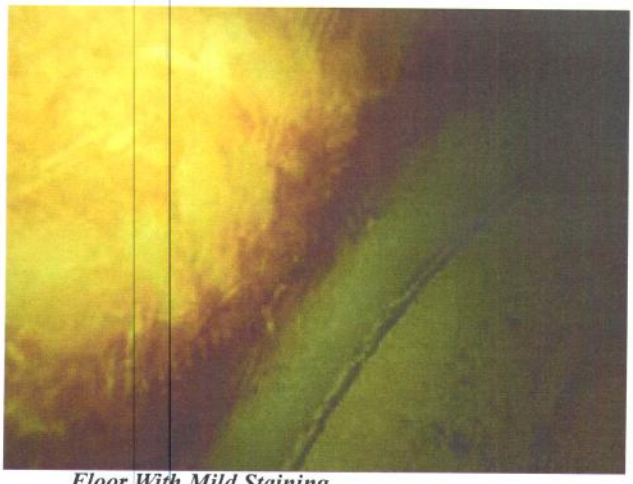
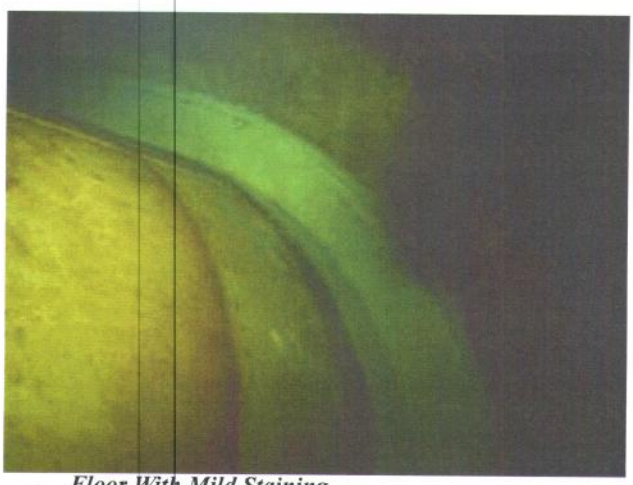


37 *Floor With Mild Staining*



38 *Floor With Mild Staining*

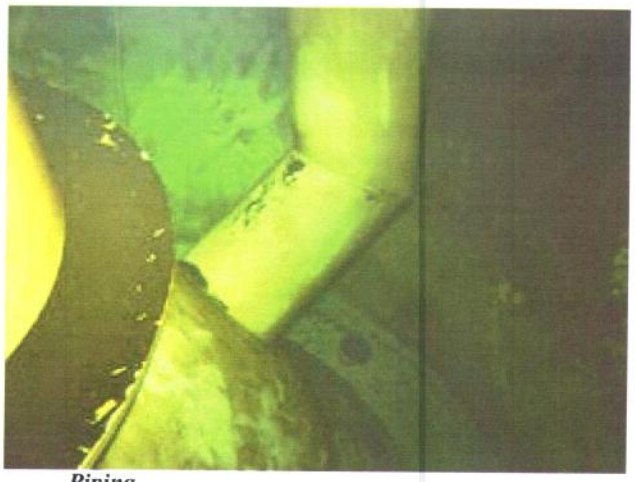
39 *Floor With Mild Staining*



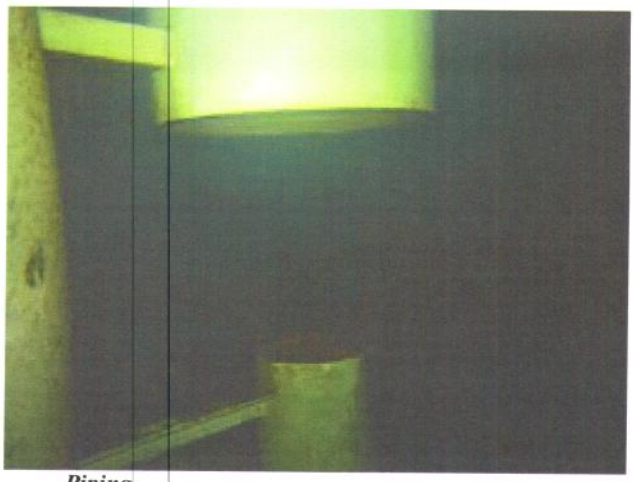
40 *Floor With Mild Staining*

41 *Floor With Mild Staining*

42 *Manway*



43 *Piping*



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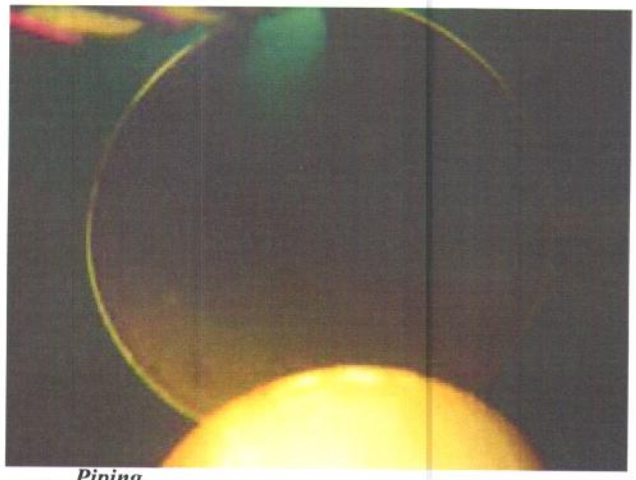
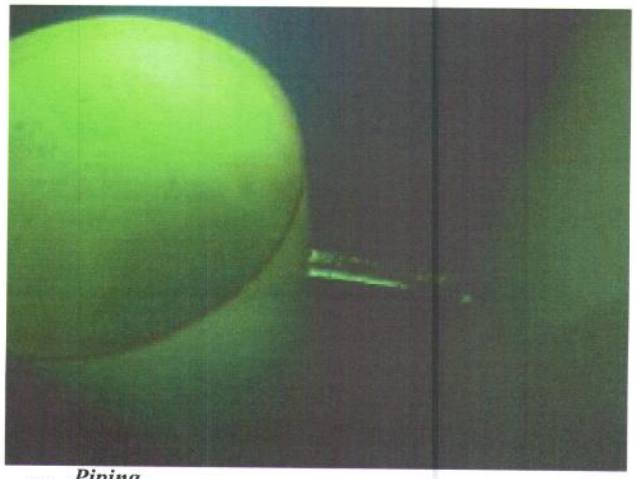


45 *Piping*

46 *Piping*



47 *Piping*

48 *Unsecure Plug*

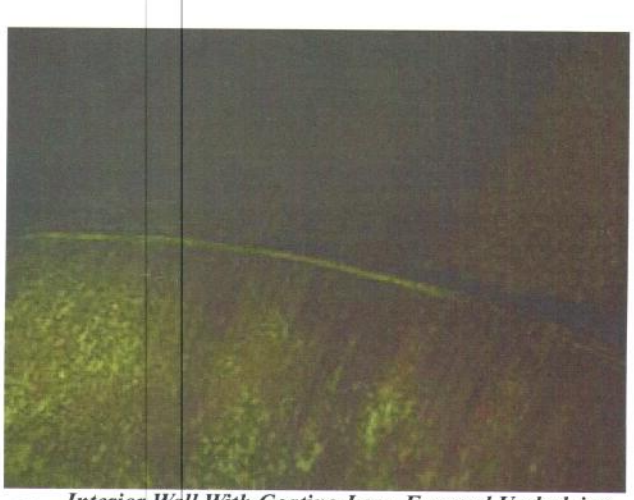
49 *Secure Plug*

50 *Interior Wall With Coating Loss, Exposed Underlying Steel, Mild Surface Corrosion And Mild To Moderate Staining*

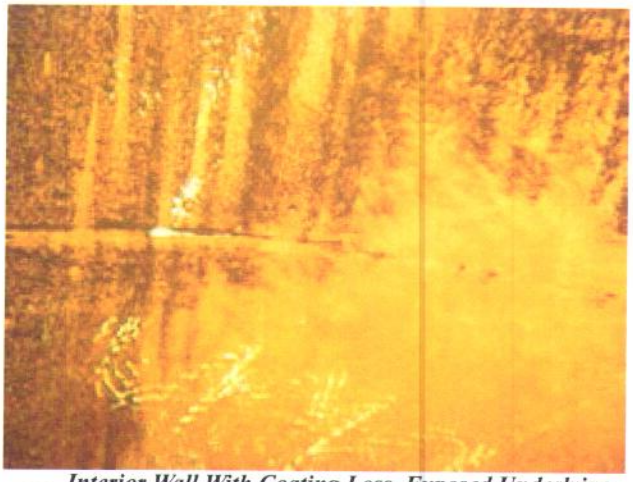
51 *Interior Wall With Coating Loss, Exposed Underlying Steel, Mild Surface Corrosion And Mild To Moderate Staining*

52 *Interior Wall With Coating Loss, Exposed Underlying Steel, Mild Surface Corrosion And Mild To Moderate Staining*

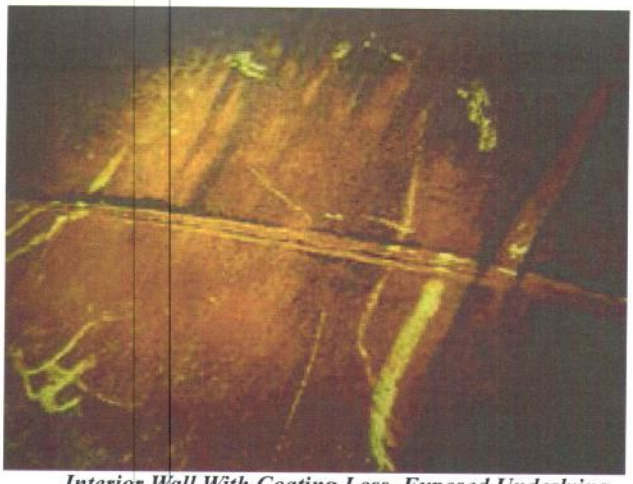
53 *Interior Wall With Coating Loss, Exposed Underlying Steel, Mild Surface Corrosion And Mild To Moderate Staining*



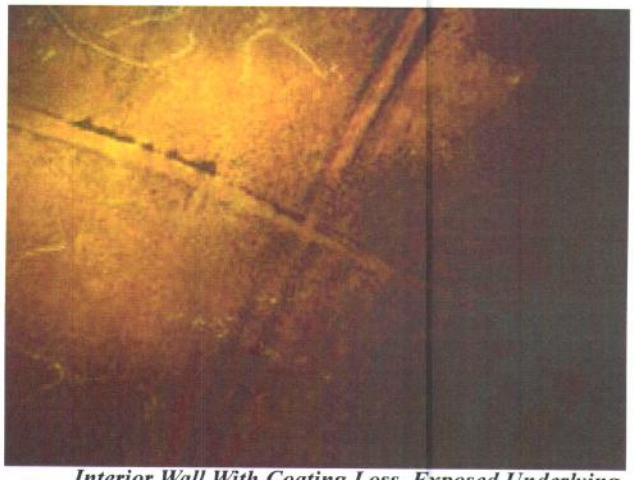
54 *Interior Wall With Coating Loss, Exposed Underlying Steel, Mild Surface Corrosion And Mild To Moderate Staining*



55 *Interior Wall With Coating Loss, Exposed Underlying Steel, Mild Surface Corrosion And Mild To Moderate Staining*



56 *Interior Wall With Coating Loss, Exposed Underlying Steel, Mild Surface Corrosion And Mild To Moderate Staining*



57 *Interior Wall With Coating Loss, Exposed Underlying Steel, Mild Surface Corrosion And Mild To Moderate Staining*

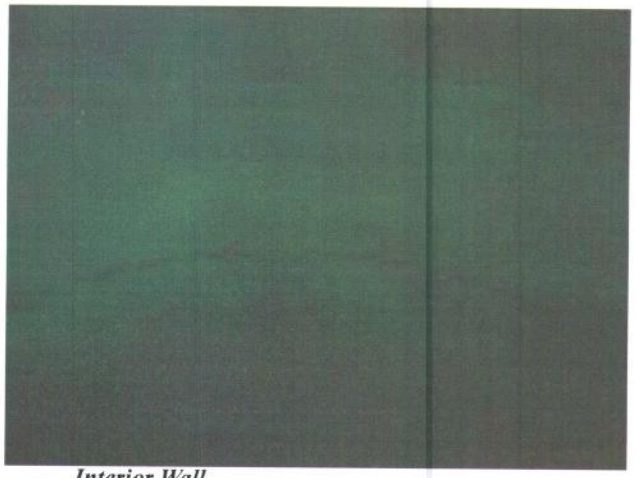
58 *Interior Wall With Coating Loss, Exposed Underlying Steel, Mild Surface Corrosion And Mild To Moderate Staining*

59 *Interior Wall With Coating Loss, Exposed Underlying Steel, Mild Surface Corrosion And Mild To Moderate Staining*

60 *Interior Wall With Coating Loss, Exposed Underlying Steel, Mild Surface Corrosion And Mild To Moderate Staining*

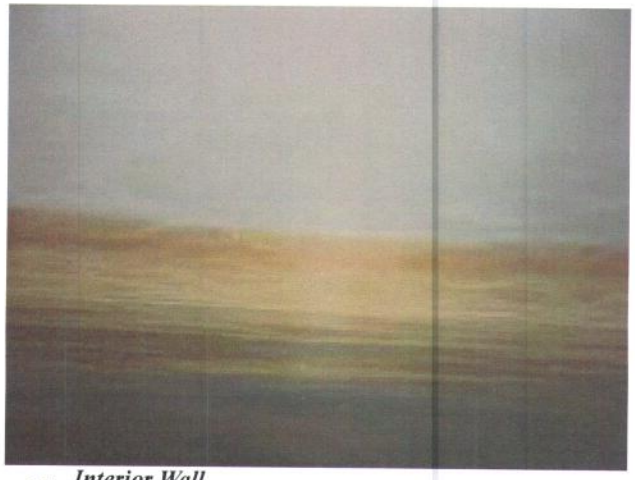
61 *Interior Wall With Coating Loss, Exposed Underlying Steel, Mild Surface Corrosion And Mild To Moderate Staining*

62 *Interior Wall With Coating Loss, Exposed Underlying Steel, Mild Surface Corrosion And Mild To Moderate Staining*



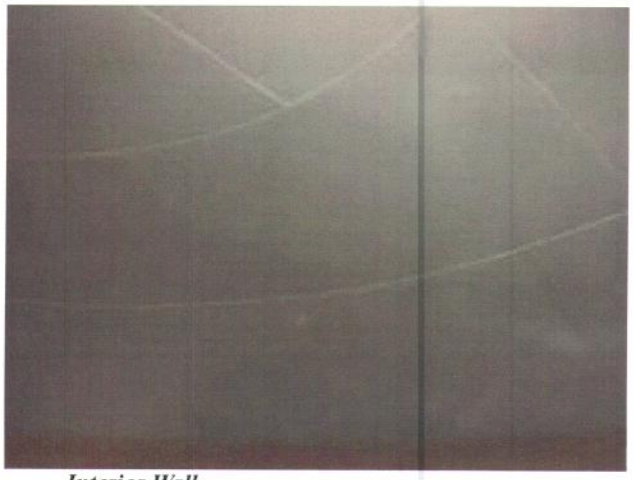
63 *Interior Wall*

64 *Interior Wall*



65 *Interior Wall*

66 *Interior Wall*



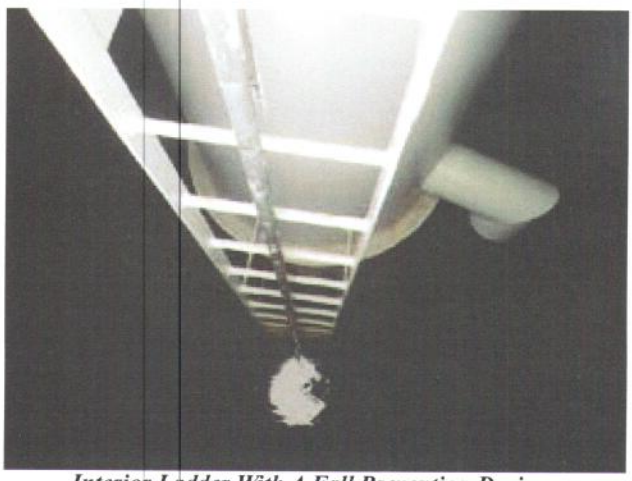
67 *Interior Wall*

68 *Interior Wall*

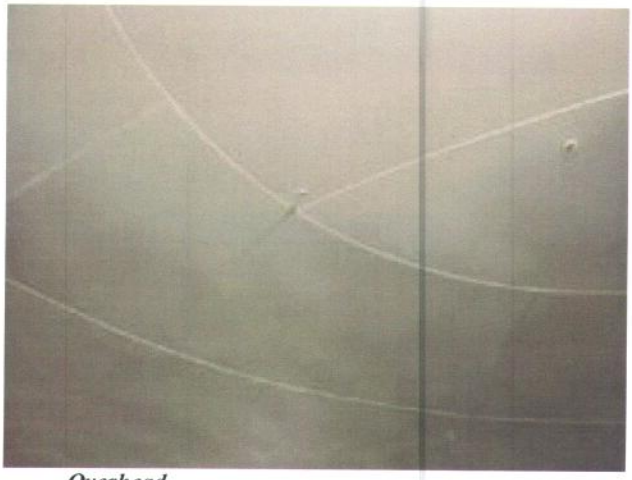
69 *Center Access Tube*

70 *Center Access Tube*

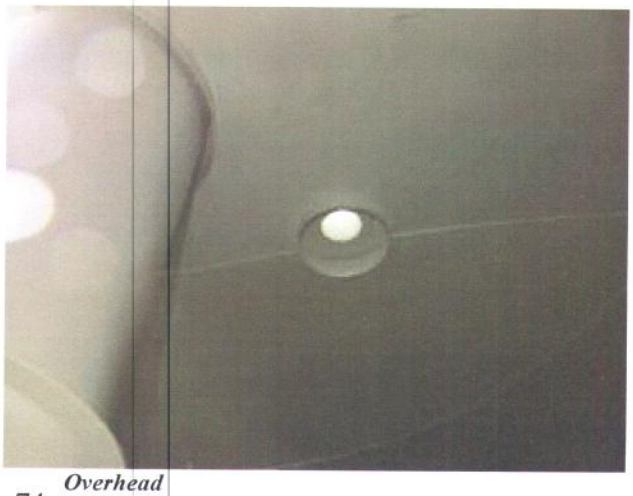
71 *Center Access Tube*



72 *Interior Ladder With A Fall Prevention Device*

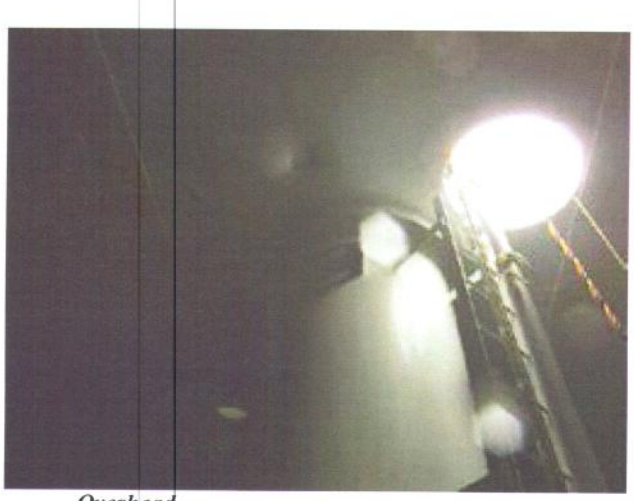


73 *Overhead*



74 *Overhead*

75 *Overhead*



76 *Overhead*

77 *Overflow Pipe*

78 *Discharge During Cleaning*