

APPENDIX C



NORTH AMERICAN MARINE, INC.

**960 DOMINION DRIVE
CLEVELAND, OHIO 44145
(440) 871-0662**

**17A SECOND DRIVE
ST. CATHARINES, ONTARIO L2N 1K9
(905) 682-4515
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Case No. C-8884
Condition Survey

June 12, 2018

Museum S.S. William A. Irvin

REPORT OF INSPECTION made by the undersigned surveyor of North American Marine, Inc., on June 6 & 7, 2018, at the request of the, City of Duluth, Duluth, Minnesota, on the Museum Steamship William A. Irvin, 8,240 gross registered tons, 237395 Official Number, 6,072 net tons, the City of Duluth, Duluth, Minnesota, Owners, while lying afloat port side to the dock at the Minnesota Slip, Duluth, Minnesota, in order to ascertain the general condition of the vessel.

ATTENDING

Mr. Steve Rankila, Building Superintendent
Mr. John Clark, Environmental Technician

DESCRIPTION

The steamship William A. Irvin is a retired Great Lakes bulk carrier of riveted and welded steel construction built by American Shipbuilding, Lorain, Ohio in 1937. It has three cargo holds serviced by 18 hatches with fore and aft superstructures. Propulsion is provided by two boilers generating 450 psi steam through high and low pressure turbines developing 2,000 horsepower driving a built up propeller.

DIMENSIONS

Length over All -----	610' 00"
Length between perpendiculars -----	586' 00"
Beam -----	60' 00'
Depth -----	32' 06'

ACTIONS

1. Cursory above waterline shell plate examination for fractures, failed riveted seams and butts and coating breakdown.
2. Cargohold examination of arches, tank top, transverse and longitudinal bulkheads for steel deterioration i.e. wastage.
3. Examination of all Port and Starboard ballast tanks including the forepeak, for knife edging of lightning holes, hammer test of water tight bulkheads, integrity of shell plate and framing rivets, ingress of seawater and lastly examination of water tight man hole covers.
4. Inspect the cargo holds hatch covers for water tightness.

Exterior Side Shell Plating

Starboard side shell plating examined from “over the rail” and across the slip. 12” of tumblehome. A close up examination was not performed. There were areas of light shell plate set-ins 0-1” however they are likely residual from the days of when the vessel was in operation. The set-ins are considered within the parameters of “normal” wear and tear. No fractures sighted. The side shell plating was found well coated with small areas of flaking paint. There was no evidence of riveted connection failure. Overall the above the waterline starboard plating was found in fair condition with no need for immediate or long term repairs apparent.

Vessel found port side to. Port side shell plating examined from “over the rail” and dockside. 12” of tumblehome. A close up examination was not performed. There were areas of light shell plate set-ins 0-1” however they are likely residual from when the vessel was in operation. The set-ins are considered within the parameters of “normal” wear and tear. No fractures sighted. In number 5 port ballast tank a single 4” diameter hole had been rough cut through hull between frames 4/5 from the forward bulkhead at approximately the 13’00” waterline. In number 6 port ballast tank a single 1 ½” diameter hole had been rough cut through hull between frame 5 and the aft bulkhead from the forward bulkhead at approximately the 13’06” waterline. Both penetrations render the compartments non-watertight. The side shell plating was found well coated with small areas of flaking paint. There was no evidence of riveted connection failure. Overall the above the waterline starboard plating was found in fair condition with no immediate or long term repairs apparent.



Number 5 Port – Sewage overboard



Number 6 Port – Through hull penetration

Cargo Holds

The cargo space is found with four athwartship bulkheads:

Forward bulkhead at frame 26.

Cargo hold bulkhead 1/2 at frame 75. Lower half of bulkhead removed.

Cargo hold bulkhead 2/3 at frame 123. Lower half of bulkhead removed.

Aft bulkhead at frame 172.

The longitudinal bulkhead is welded to the cargohold tank top at 19'00" from centerline and slopes outboard and upward connecting to either the cargohold arches or underside of the spar deck. The cargo slopes have all been renewed from the original riveted plate with welded steel. The cargo slopes are in satisfactory condition except for holes cut to access ballast tanks (see below comments under Ballast Tanks). The cargo hold tank also has been renewed and replaced with a channel tank top. The tank top is in satisfactory condition.

The arches which span the cargohold and support the spar deck were found well coated and in satisfactory condition.

Note: Low lighting did not allow for proper photography of cargo space.



Cargohold arch and underside of spar deck.

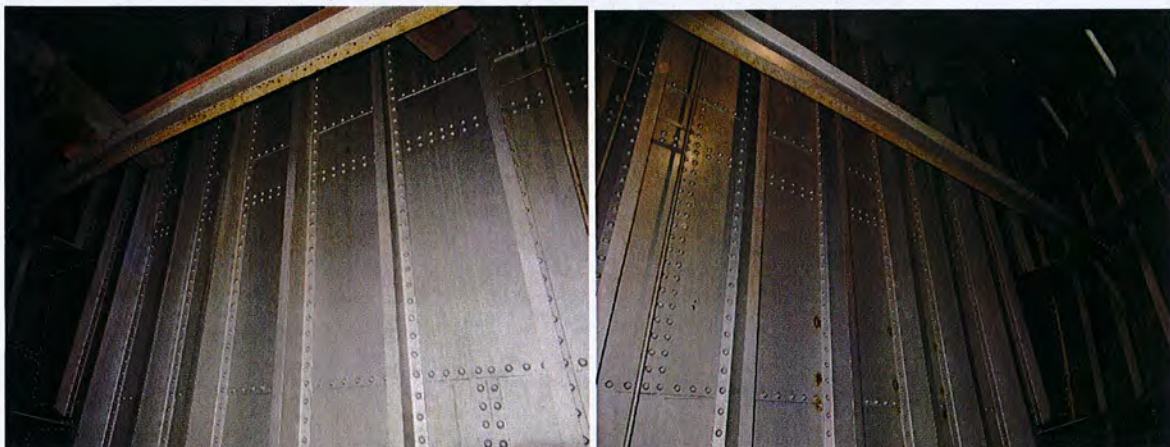
Ballast Tanks - Please note in photographs the light orange/red paint is lead based.

Forepeak

Forepeak stiffened with cant channel shell frames. Shell plate framing found in satisfactory condition. All structure very well coated with the exception of the lower 12" of the collision bulkhead.



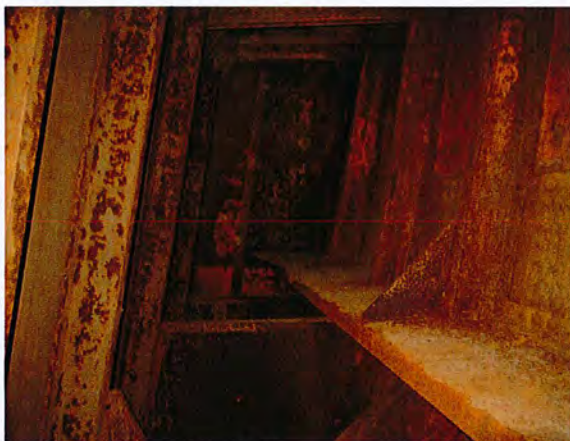
Looking forward



Looking aft – Collision Bulkhead

Number 1 Starboard Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck storm tunnel. Number one starboard ballast tank was found with two web frames and ten intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. There is 8" x 3" x 21.4 lbs. channel stringers extending from the side shell framing to the cargo slope stiffeners. The channel stringers were found in fair condition. The side shell frames were connected to 5'06" high floors. The floors were attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with square edges. Main deck beam flanges found square. Forward bulkhead found in satisfactory condition with the exception of a rough cut 24" x 24" access hole approximately 8" below the main deck. Aft bulkhead found in satisfactory condition with the exception of a rough cut 16" x 16" access hole just below approximately 8" below the main deck. The tank is not considered watertight.



Looking forward



Access hole in forward bulkhead



Looking aft



Access hole in aft bulkhead

Number 2 Starboard Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck storm tunnel. Number two starboard ballast tank was found with five web frames and eighteen intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. There is 8" x 3" x 21.4 lbs. channel stringers extending from the side shell framing to the cargo slope stiffeners. The channel stringers were found in fair condition. The side shell frames were connected to 5'06" high floors. The floors were attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with square edges. Main deck beam flanges found square. Forward bulkhead found in satisfactory condition with the exception of a rough cut 16" x 16" access hole approximately 8" below the main deck. Aft bulkhead found in satisfactory condition with the exception of a rough cut 24" x 24" access hole approximately 8" below the main deck. Tank considered non-water tight.



Forward bulkhead



Side shell and framing



Number 3 Starboard Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck storm tunnel. Number three starboard ballast tank was found with five web frames and eighteen intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. There is 8" x 3" x 21.4 lbs. channel stringers extending from the side shell framing to the cargo slope stiffeners. The channel stringers were found in fair condition. The side shell frames were connected to 5'06" high floors. The floors were attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with square edges. Main deck beam flanges found lightly tapered. Forward bulkhead found in satisfactory condition with the exception of a rough cut 24" x 24" access hole approximately 8" below the main deck. Aft bulkhead found in satisfactory condition with the exception of a rough cut 24" x 24" access hole approximately 8" below the main deck. Tank considered non-water tight.



Forward bulkhead to side shell



Floor with 22" diameter lightning hole



Aft Bulkhead



Access hole in aft bulkhead

Number 4 Starboard Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck storm tunnel. Number four starboard ballast tank was found with five web frames and eighteen intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. There is 8" x 3" x 21.4 lbs. channel stringers extending from the side shell framing to the cargo slope stiffeners. The channel stringers were found in fair condition. The side shell frames were connected to 5'06" high floors. The floors were attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with square edges. Main deck beam flanges found lightly square. Forward bulkhead found in satisfactory condition with the exception of a rough cut 24" x 24" access hole just below approximately 8" below the main deck. Aft bulkhead found in satisfactory condition with the exception of a rough cut 10" x 10" access hole just below approximately 8" below the main deck. It should be noted that the main deck storm tunnel has been converted to men/women's restrooms for the gift shop that is located at midship. That being said there is water supply and sewage piping penetrating the main deck and flowing aft into number 5 ballast tank. There was 0-1" of accumulated water in the aft end of number four ballast tank. It is unknown whether the water is from the restroom plumbing or a shell plate leak. Tank considered non-water tight.



Forward bulkhead



Restroom plumbing



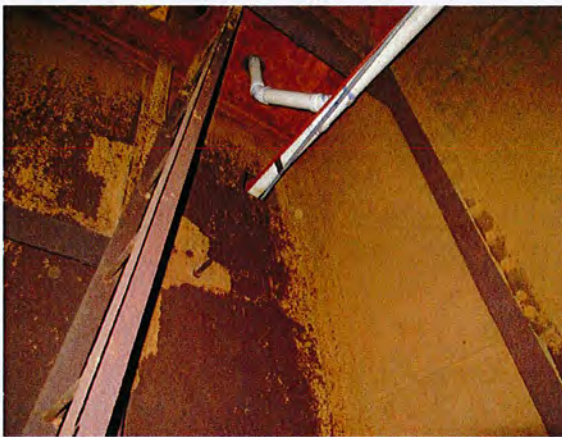
Restroom plumbing and access hole



Lightning hole and water accumulation

Number 5 Starboard Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck storm tunnel. Number five starboard ballast tank was found with five web frames and eighteen intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. There is 8" x 3" x 21.4 lbs. channel stringers extending from the side shell framing to the cargo slope stiffeners. The channel stringers were found in fair condition. The side shell frames were connected to 5'06" high floors. The floors were attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with square edges. Main deck beam flanges found lightly tapered. Forward bulkhead found in satisfactory condition with the exception of a rough cut 10" x 10" access hole just below approximately 8" below the main deck. Water supply and sewage drain passing through bulkhead access hole. Second access hole, 8" x 8", cut into cargo slope. Aft bulkhead found in satisfactory condition. Tank considered non-water tight.



Forward Bulkhead



Side shell plating and framing



Side shell plating and framing



Restroom plumbing and access hole

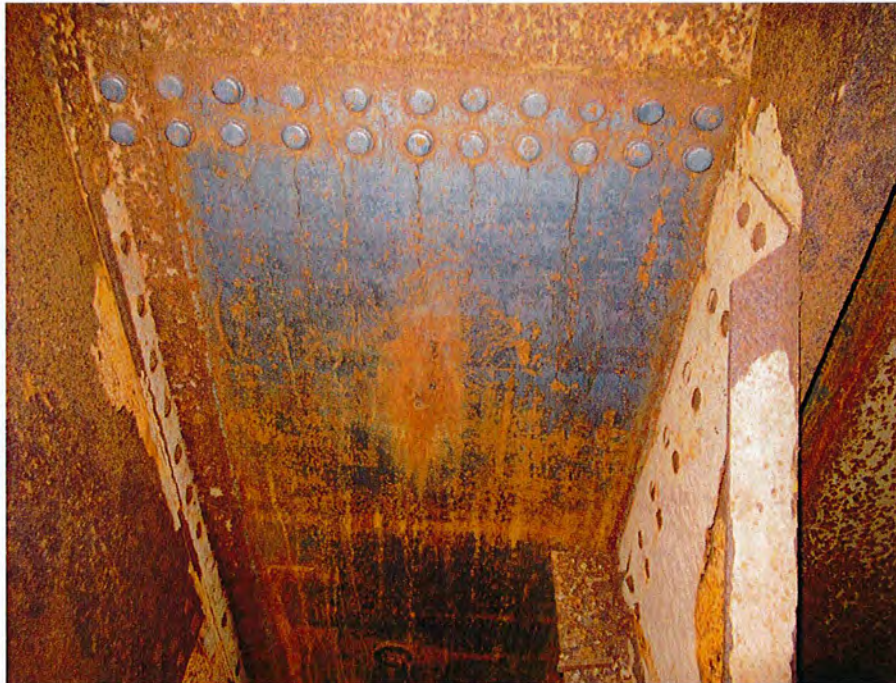
Number 6 Starboard Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck storm tunnel. Number six starboard ballast tank was found with five web frames and eighteen intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. There is 8" x 3" x 21.4 lbs. channel stringers extending from the side shell framing to the cargo slope stiffeners. The channel stringers were found in fair condition. The side shell frames were connected to 5'06" high floors. The floors were attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with square edges. Main deck beam flanges found square. Forward bulkhead found in satisfactory condition. Aft bulkhead found in satisfactory condition.

Commencing at frame 143 (ninth frame from forward) continuing aft through the bulkhead there is a bilge repair. This repair appears to have been made just prior to the end of the sailing career of the vessel. The repair is partially welded repair.



Please note that the steel is still mill blue, which is indicative of very little deterioration since the vessel has been out of service.



Upper bilge roll (flushed butt)



Aft Bulkhead to side shell connection

Number 7 Starboard Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck storm tunnel. Number seven starboard ballast tank was found with two web frames and ten intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. There is 8" x 3" x 21.4 lbs. channel stringers extending from the side shell framing to the cargo slope stiffeners. The channel stringers were found in fair condition. The side shell frames were connected to 5'06" high floors. The floors are attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with square edges. Main deck beam flanges found square. Forward bulkhead found in satisfactory condition. Aft bulkhead found in satisfactory condition. Bilge plating repair continues through the tank ending at frame 177.



Forward Bulkhead



Overhead



Upper bilge roll (flushed butt)



Bilge roll at aft bulkhead

Number 8 Starboard Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck in the boiler room compartment. Number eight starboard ballast tank was found with six intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. The intermediate channel frames were connected to floors. The floors are attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with tapered edges. Main deck beam flanges found square. Forward bulkhead found in heavily pitted. Aft bulkhead found in fair condition. Sounding pipes completely deteriorated.



Number 1 Port Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck storm tunnel. Number one port ballast tank was found with two web frames and ten intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. There is 8" x 3" x 21.4 lbs. channel stringers extending from the side shell framing to the cargo slope stiffeners. The channel stringers were found in fair condition. The side shell frames were connected to 5'06" high floors. The floors were attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with square edges. Main deck beam flanges found square. Forward bulkhead found in satisfactory condition. Aft bulkhead found in satisfactory condition. Sounding pipes in fair condition.



Looking forward



Web frame and channel stringer



Aft bulkhead to side shell connection

Number 2 Port Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck storm tunnel. Number two Port ballast tank was found with five web frames and eighteen intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. There is 8" x 3" x 21.4 lbs. channel stringers extending from the side shell framing to the cargo slope stiffeners. The channel stringers were found in fair condition. The side shell frames were connected to 5'06" high floors. The floors were attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with square edges. Main deck beam flanges found square. Forward bulkhead found in satisfactory condition. Aft bulkhead found in satisfactory condition.



Forward Bulkhead



Overhead (main deck)



Side shell



Aft Bulkhead

Number 3 Port Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck storm tunnel. Number port starboard ballast tank was found with five web frames and eighteen intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. There is 8" x 3" x 21.4 lbs. channel stringers extending from the side shell framing to the cargo slope stiffeners. The channel stringers were found in fair condition. The side shell frames were connected to 5'06" high floors. The floors were attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with square edges. Main deck beam flanges found lightly square. Forward bulkhead found in satisfactory condition. Aft bulkhead found in satisfactory condition. Sounding pipes intact.



Forward bulkhead



Side shell



Side Shell



Aft Bulkhead

Number 4 port Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck storm tunnel. Number four port ballast tank was found with five web frames and eighteen intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. There is 8" x 3" x 21.4 lbs. channel stringers extending from the side shell framing to the cargo slope stiffeners. The channel stringers were found in fair condition. The side shell frames were connected to 5'06" high floors. The floors were attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with square edges. Main deck beam flanges found lightly square. Forward bulkhead found in satisfactory condition. Aft bulkhead found in satisfactory condition. Sounding pipes intact.



Forward bulkhead



Overhead



Floor – Lightning hole



Aft Bulkhead

Number 5 Port Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck storm tunnel. Number five port ballast tank was found with five web frames and eighteen intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. There is 8" x 3" x 21.4 lbs. channel stringers extending from the side shell framing to the cargo slope stiffeners. The channel stringers were found in fair condition. The side shell frames were connected to 5'06" high floors. The floors were attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with square edges. Main deck beam flanges found lightly tapered. Forward bulkhead found in satisfactory condition. Aft bulkhead found in satisfactory condition.

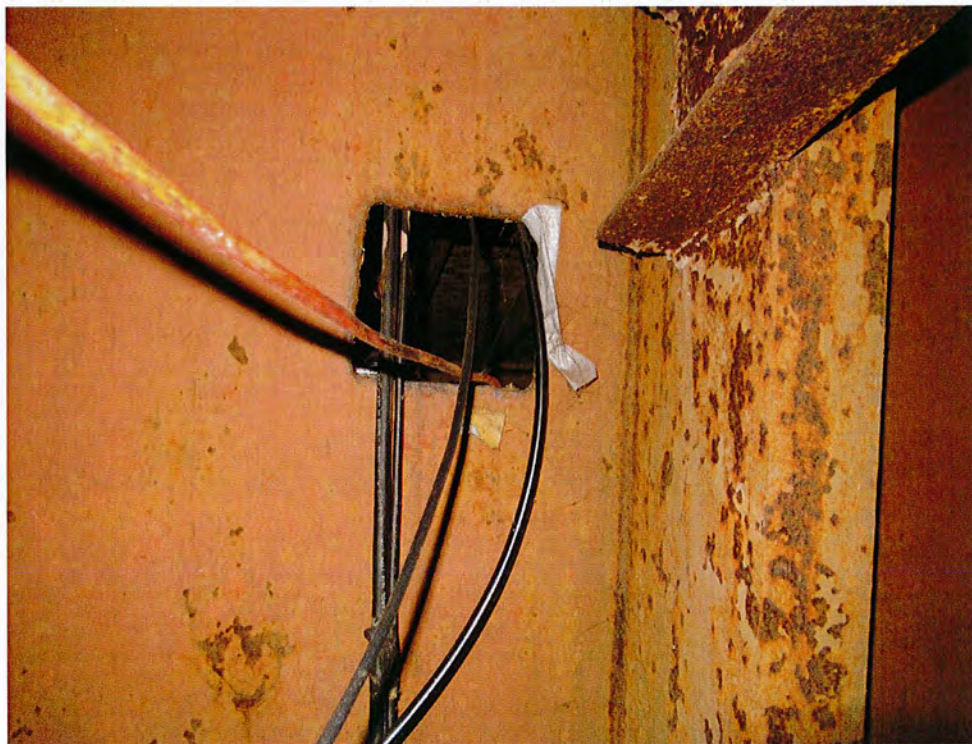
One 8" x 4" access hole cut into the cargo slope plating for pass through of flexible 3" green sewage line. That same line traveled through a another hole 4" in diameter cut into the "H" strake between frames 127 and 128. The sewage line shell plate hole is at approximately 13'00" waterline. A second cargo hold access hole had been cut into the slope plating 7" x 7" for a wiring pass through. The wiring cables penetrated the side shell plating through a piping nipple, 2" in diameter at frame 111. Tank considered non-water tight.



Cargo hold access hole



Shell plate access hole



Cargo hold access hole



Wiring side shell penetration.



Fore and aft bulkheads

Number 6 Port Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck storm tunnel. Number six port ballast tank was found with five web frames and eighteen intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. There is 8" x 3" x 21.4 lbs. channel stringers extending from the side shell framing to the cargo slope stiffeners. The channel stringers were found in fair condition. The side shell frames were connected to 5'06" high floors. The floors were attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with square edges. Main deck beam flanges found square. Forward bulkhead found in satisfactory condition. Aft bulkhead found in satisfactory condition. Tank considered non-water tight.



Hole burned in side shell



Hole cut through side shell with stick as plug



Forward upper bulkhead



Forward lower bulkhead



Aft lower bulkhead

Number 7 Port Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck storm tunnel. Number seven port ballast tank was found with two web frames and ten intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. There is 8" x 3" x 21.4 lbs. channel stringers extending from the side shell framing to the cargo slope stiffeners. The channel stringers were found in fair condition. The side shell frames were connected to 5'06" high floors. The floors are attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with square edges. Main deck beam flanges found square. Forward bulkhead found in satisfactory condition. Aft bulkhead found in satisfactory condition. Mid-tank tank one 7" x 7" access hole cut into the cargo slope. Tank considered non-water tight.



Forward Bulkhead



Aft bulkhead



Web frame and floor

Number 8 Port Ballast Tank

Access was gained from a man hole at the top of the tank from the main deck in the boiler room compartment. Number eight port ballast tank was found with six intermediate channel frames on 3'0" centers all of which were connected to the shell plate with rivets. Web frames were spaced every 12'00". There was no damage sighted to the frames. The intermediate channel frames were connected to floors. The floors are attached to the bottom shell plating with rivets. The floors have either 22" diameter round or 20" x 30" oblong lightning holes. The lightning holes were found with tapered edges. Main deck beam flanges found square. Forward bulkhead found in heavily pitted. Aft bulkhead found in fair condition. Completely deteriorated sounding pipes.



Completely deteriorated sounding pipes

Cargohold hatch covers

Hatch covers 1 & 2 constructed in leaf style. Remaining hatches constructed with riveted steel plate with I-beam strongbacks. Hatch covers in fair condition.



Leaf hatch covers



Plate hatch covers with dogs

RECOMMENDATIONS

1. Above lightship water line hull penetrations to be sealed.
2. Ballast tank tween tank bulkheads and cargo slopes to be made watertight and or sealed.
3. Mooring winches to be overhauled and made serviceable.
4. Steel cable mooring lines to be replaced where found parted and establish an annual documented examination schedule.
5. Tailshaft to be drawn out and stern tube to be blanked off.
6. Detailed fire plan to be developed for "Haunted House" cargo hold.
7. Vessel to be dry-docked in order to sandblast hull down to white metal from lightship waterline to lightship water line and painted with marine grade two-part epoxy paint.

SUMMARY

1. cursory above waterline shell plate examination for fractures, failed riveted seams and butts and coating breakdown. The aforementioned structures found in fair condition.
2. Cargohold examination of arches, tank top, transverse and longitudinal bulkheads for steel deterioration i.e. wastage. Structural members of the cargohold envelope found in fair condition.
3. Examination of all Port and Starboard ballast tanks including the forepeak, for knife edging of lightning holes, hammer test of water tight bulkheads, integrity of shell plate and framing rivets, ingress of seawater and lastly examination of water tight man hole covers. The aforementioned structures found in fair condition.
4. Inspect the cargo holds hatch covers for water tightness. The aforementioned structures found in fair condition.
5. As far as may be ascertained from a general examination of this vessel afloat, it is the opinion of the undersigned, as hereinafter qualified, that the vessel is in satisfactory condition. This examination has been made without making removals, or opening up to expose parts ordinarily concealed, or testing for tightness, or trying out machinery, except as detailed above, and is subject to any conditions which would have been revealed if such procedures had been accomplished.
6. Vessel found in satisfactory condition for its intended purpose of a museum ship.

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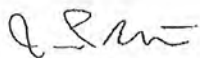
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Survey made without prejudice,



Jared P. Aquilla
Marine Surveyor