APPENDIX C

PRIMROSE MARINE, LTD.
MARINE SURVEYORS & CONSULTANTS

33 Albany Rd Paignton TQ31BZ
Telephone : 01803 392207
Mobile : 07496 838989 **E-Mail : mike@primrosemarine.co.uk**

Our Ref :ml/0022/6/16
Your Ref :Voyager Marine-PONTOON 19th March 2024

This is to Certify that
Mike Lyness

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did, on the 17TH March 2025, at the request of Voyager Marine Ltd, without prejudice inspect the pontoon floats now ashore and when in place create the tidal landing pontoon used by Plymouth Boat Trips for embarking and landing passengers which is connected to the shore in Saltash, Cornwall slightly North of the Tamar bridge, to inspect the associated piles and adjacent structure following being damaged in a recent storm.

The sections inspected at the above location supported on a hard standing that gave reasonable access externally, except in those locations where supported on blocks. Externally the areas below waterline were pressure washed and the majority of existing surface growth removed prior to survey and where they were not and in selected locations the applied 2 pack epoxy paint coating was removed to expose the shell plating for Ultra-sonic spot -thickness readings to be taken. Additionally, as required the shell plating was visually inspected for defect and selectively-randomly “hammer tested”, and if required additional areas were prepared and additional Ultra-sonic spot -thickness readings were taken.

Ultra-sonic spot-thickness readings are strictly point thickness recordings and there is no warranty that the adjacent or adjoining areas of plating share the same thickness reading, therefore the Ultrasonic spot-thickness readings should be considered as guidance only. An initial inspection was undertaken which identified several areas requiring attention.

UPON EXAMINATION FOUND

The pontoons are laid out in around three sections as a hammerhead/T Shaped formation with a pontoon access gangway, fixed gangway and hammerhead pontoon arrangement, the structure is supported and anchored by Five tubular piles set into the sea bed.

The arrangement is typical of this type of landing pontoon and is laid out for access to floating pontoons with an additional two fingers on either side of the main walkway leading to the main hammerhead landing pontoon, the arrangement allows for the rise and fall of the tidal height in the area and it appears to be in the region of between 0-50 degrees working angle with a articulation or roller for the variable tide heights.

The inspection was mainly to ascertain the general condition of the pontoon float sections, areas of which had become damaged during recent strong winds etc, this report embraces the general condition of the pontoon sections and refers to the damaged subframe sections.

INSPECTION

The Pilings

Previously reported upon and for reference within this report

The five piles are located as follows with a reference for each given

Two piles to the main hammerhead, on located at the southerly end the other at the northerly end
Pile 1 Being Southerly
Pile 2 Being Northerly

Two piles located a the base of the main pontoon adjacent to the gangway
Pile 3 being Southerly
Pile 4 being Northerly

One pile located below the articulated gangway supporting a concreter pad which allows the gangway to rest on when at low water, this being pile 5.

On each pile, at least five areas were suitably de-scaled and prepared to allow for ultrasonic thickness readings being taken as well as the minimum of five UTM readings, various other reading were taken in areas of more concern around significant scale and pitted corrosion.

We have not sighted the original specification of the piles with reference to the original wall thickness of the steel thickness however various readings were taken in what appeared to be sound material away from areas of corrosion which would suggest that the original material thickness was **16mm.**

Generally the piles appear in good order however significant scale was noted around the upper sections presumably the high water mark area, several areas did appear to show quite significant pitting although the surrounding material did show good material thickness the areas of scale in places were un readable due to the shear between layers of the rust scale. The area at the high water mark would suffer more from corrosion due to the effects of “wind and wave” which always has an effect on any structure in the water.

At present it would appear that the structures are in serviceable condition and fit for purpose however we are unaware of any on going maintenance regime, areas on each pile would benefit from de scaling where necessary and the application of suitable coatings to prevent further degradation, anode monitoring and changing on an annual or bi-annual basis as deemed necessary, we also consider it prudent to annually inspect surfaces and articulated joints as well as the surfaces of the piles themselves to help ensure a long working life of the structures.

The pontoon sections are broken down into three areas

- Hammerhead end
- Main walkway
- Pontoons to North and South sides

Hammerhead

The hammerhead pontoons were found in generally good serviceable condition however the areas of subframes as previously mentioned were damaged and form part of a weather related damage incident. The pontoons have had various previous repairs undertaken at some point with formed doubling sections continuously welded and the whole structure prepared and overcoated in a suitable preventative coating some areas of which are starting to wear and breakdown generally due to age and the effects of continued exposure. The main areas requiring addressing area as follows

- Tubular sections – Main Hammerhead made up of two sections to each side connected by way of welded endcap to each end and the flange bolted through to marry up with the opposing end plate.
  Sections generally found in good order, several welds appear to have corded allowing moisture penetration between section of over plating and original welded tube section
  Various brackets and fixing locations showing signs of fixing hole elongation due to wear
  Coatings have worn away of starting to detach from the underlying surface

  1. Thickness readings generally 5.5-5.9mm (original thickness believed to be 6mm) This suggests minimal diminution of the original sections that have not already been over plated.
  2. Areas over plated all found in reasonable order with the exception of various welds along each side of the tubular section, several welds have failed and the early signs of moisture penetration are present the shell thickness of the over plating appears to have been undertaken in 3mm plate with current UTM thickness readings between 2.5-2.8mm
  3. The sections are overcoated in an epoxy type primer, there areas of the coatings where the dry film thickness layers have become detached, the underlying substrate appears to have been suitably prepared by abrasive blasting and therefore it can only be presumed that the now defective coatings are due to age and exposure, several areas are showing signs of wear which have exposed the underlying surfaces.
  4. Damage to the sub frame which supports the walkway deck boards. Areas of this are due to a weather related incident however areas of the frame outside of the damaged areas are showing signs of wear, this is mainly around fixing locations where various fixing holes have become elongated due to continuous movement around fixing points with several are slightly deformed.
  5. Locating brackets which join the hammerhead to the walkway, slight deformation and elongation

Recommendations

- Grind out all defective welds and rectify by seam welding continuously with over weld extending at least 150mm to either side of the affected areas or to the horizontal / vertical joint to each affected plate.
- Abrasive blast the surfaces to remove existing coatings and provide a suitably prepared surface to SA 2.5 or equivalent, surfaces overcoated in a epoxy blast/holding primer any further areas requiring repair addressed and then overcoated in a suitable epoxy primer.
- Areas of supporting frame where holes are elongated, sections of frame replaced and new fixings supplied and utilised to re instate the frames to the pontoon sections.
- Remove and replace the deformed joining brackets, modify to accommodate additional rubber sacrificial washers, the dimensions of the washers to allow for the articulation of the joints to be discussed however there is no doubt the sections would benefit from being allowed to further articulate.

Walkway

The walkway pontoons were found in generally good serviceable order, however, as with the Hammerhead the pontoons previous repairs have been undertaken at some point with formed doubling sections continuously welded and the whole structure prepared and overcoated in a suitable preventative coating scheme areas of which are starting to wear and breakdown generally due to age and the effects of continued exposure. The main areas requiring addressing area as follows

- Tubular sections – Main walkway made up of two sections to each side connected by way of welded endcap to each end and the flange bolted through to marry up with the opposing end plate.
- Sections generally found in good order, several welds appear to have corded allowing moisture penetration between section of over plating and original welded tube section
- Various brackets and fixing locations showing signs of fixing hole elongation due to wear
- Coatings have worn away of starting to detach from the underlying surface
- Endcap joining plates when exposed found in good order with minimal diminution of original material thicknesses
- Thickness readings generally 5.4-5.8mm (original thickness believed to be 6mm)This suggests minimal diminution of the original sections that have not already been over plated.
- Areas over plated all found in reasonable order with the exception of various welds along each side of the tubular section, several welds failed and the early signs of moisture penetration are present the shell thickness of the over plating appears to have been undertaken in 3mm plate with current UTM thickness readings between 2.5-2.8mm
- The sections are overcoated in an epoxy type primer, there areas of the coatings where the dry film thickness layers have become detached, the underlying substrate appears to have been suitably prepared by abrasive blasting and therefore it can only be presumed that the now defective coatings are due to age and exposure, several areas are showing signs of wear which have exposed the underlying surfaces.

Recommendations

1. Grind out all defective welds and rectify by seam welding continuously with over weld extending at least 150mm to either side of the affected areas or to the horizontal / vertical joint to each affected plate.
2. Abrasive blast the surfaces to remove existing coatings and provide a suitably prepared surface to SA 2.5 or equivalent, surfaces overcoated in a epoxy blast/holding primer any further areas requiring repair addressed and then overcoated in a suitable epoxy primer.
3. Areas of supporting frame where holes are elongated, sections of frame replaced and new fixings supplied and utilised to re instate the frames to the pontoon sections.
4. Remove and replace the deformed joining brackets, modify to accommodate additional rubber sacrificial washers, the dimensions of the washers to allow for the articulation of the joints to be discussed however there is no doubt the sections would benefit from being allowed to further articulate.

Finger pontoons

The Four finger pontoons were found in generally good order however the lower sections at each end of each pontoon have suffered from material diminution and not previously rectified. The pontoons have had various previous repairs undertaken at some point with formed doubling sections continuously welded and the whole structure prepared and overcoated in a suitable preventative coating scheme areas of which are starting to wear and breakdown generally due to age and the effects of continued exposure. The main areas requiring addressing area as follows

- Thickness readings generally 5.5-5.9mm (original thickness believed to be 6mm)
- This suggests minimal diminution of the original sections that have not already been over plated.
- Areas over plated all found in reasonable order with the exception of various welds along each side of the tubular section, several welds failed and the early signs of moisture penetration
- have been undertaken in 3mm plate with current UTM thickness readings between 2.5-2.8mm
- The sections are overcoated in an epoxy type primer, there areas of the coatings where the dry film thickness layers have become detached, the underlying substrate appears to have been suitably prepared by abrasive blasting and therefore it can only be presumed that the now defective coatings are due to age and exposure, several areas are showing signs of wear which have exposed the underlying surfaces.
- Areas to each end of each pontoon showing signs of significant corrosion some being historic and some areas are more recent, all the fingers require rectification in similar areas, wear present to the nylon type mounting block in place

Recommendations

1. Grind out all defective welds and rectify by seam welding continuously with over weld extending at least 150mm to either side of the affected areas or to the horizontal / vertical joint to each affected plate.
2. Abrasive blast the surfaces to remove existing coatings and provide a suitably prepared surface to SA 2.5 or equivalent, surfaces overcoated in a epoxy blast/holding primer any further areas requiring repair addressed and then overcoated in a suitable epoxy primer to a recommended wet film thickness, film thicknesses monitored and recorded as well as application temperature and humidity
3. Areas of fixing brackets are elongated, sections of frame required to be replaced and new fixings supplied and utilised to re instate the frames to the pontoon sections.
4. Remove and replace the deformed joining brackets, modify to accommodate additional rubber sacrificial washers, the dimensions of the washers to allow for the articulation of the joints to be discussed however there is no doubt the sections would benefit from being allowed to further articulate
5. Prepare surfaces and form sections of plate to overlap the areas at each end of the tubular sections, continuously seam welding as required in a method previously mentioned within this report.

Coatings Requirements

The pontoons in question, including the hammerhead, walkway, and finger pontoons, all have a protective coating system in place, which has played a significant role in preventing further deterioration of the structures over time. However, the coatings now show signs of wear and degradation, primarily due to age, environmental exposure, and the harsh conditions of the marine environment. These coatings are critical for protecting the underlying steel surfaces from corrosion, saltwater exposure, and mechanical wear. As the coatings continue to degrade, the risk of corrosion and material degradation increases, potentially compromising the structural integrity of the pontoons.

Observed Coating Issues

Coating Detachment and Wear: In several areas, the dry film thickness of the coatings has detached or worn away completely, exposing the underlying steel. The abrasive action of wind, water, and mechanical forces has led to the breakdown of the coatings, making the steel vulnerable to corrosion. This is particularly noticeable in areas exposed to the most wear, such as the high-water mark areas and locations that receive heavy foot traffic.

Coating Breakdown

The epoxy primer, which was originally applied to prevent corrosion, has begun to show signs of wear and detachment in various sections. The primer was originally designed to provide a durable bond to the steel surface, but over time, continued exposure to the elements (including UV light, saltwater, and temperature variations) has caused the coating to lose its effectiveness. As a result, water and moisture are more likely to penetrate the steel surface, accelerating corrosion processes.

Abrasive Blasting and Re-Coating

Abrasive Blasting is a key part of the necessary maintenance process. Abrasive blasting is a technique used to remove the deteriorated coatings, rust, and other contaminants from the surface of the pontoons. This process provides a clean surface for re-coating, ensuring that the new coatings adhere properly and provide the desired level of protection.

Why Abrasive Blasting Is Necessary

Surface Preparation: The primary goal of abrasive blasting is to ensure that the steel surfaces are thoroughly cleaned and prepared for the application of new coatings. This is essential for creating a strong bond between the steel and the new coating. A clean, rough surface allows for optimal adhesion of the new layer of paint, ensuring the longevity of the coating.

Removing ContaminantsAbrasive blasting effectively removes not only old coatings but also rust, scale, and other contaminants that could interfere with the adhesion of the new coating. This is especially important in marine environments, where saltwater corrosion and marine growth can accelerate deterioration.

Achieving the Correct Surface Profile

After abrasive blasting, the surface of the steel will have a specific texture (often referred to as a "surface profile") that helps the new coatings bond securely. The process is typically carried out to a standard such as SA 2.5, which is a high-quality surface preparation that is ideal for re-coating in harsh marine environments.

Re-Coating

Once the surfaces are properly prepared, the pontoons should be coated with an appropriate protective layer to safeguard them from future damage.

Epoxy Primer

An epoxy-based blast primer is recommended as it provides excellent corrosion resistance and adhesion properties. The blast primer should be applied over the prepared steel surface to create a durable and protective barrier against moisture and corrosion. The Blast primer also acts as a bonding agent for the topcoats, which are solvent based epoxy coatings applied over the initial blast primer.

Following the blast primer, a high-quality epoxy topcoat should be applied to further protect the structure. This coating should be chosen based on the specific environmental conditions (saltwater exposure, UV rays, etc.) and should be capable of withstanding long-term exposure to the harsh marine environment. The topcoat should

be formulated to resist abrasion, UV degradation, and moisture penetration, helping to extend the life of the structure.

Key Considerations for Re-Coating

Film Thickness: The application Wet film thickness (WFT) resulting in a suitable dry film thickness (DFT) of the coatings should be carefully monitored and maintained within the recommended range. Too thin a layer may not provide adequate protection, while too thick a layer can cause issues such as cracking or peeling. The optimal film thickness should be applied to ensure maximum protection against corrosion.

Environmental Conditions

Coating should only be applied when the environmental conditions are favorable, including appropriate temperature and humidity. Application during adverse weather conditions can result in improper curing and adhesion of the coatings, which could lead to premature failure.

Application Monitoring: Throughout the re-coating process, it is important to monitor the application carefully. This includes keeping track of the temperature, humidity, and the actual wet film thickness during application. Coating manufacturers typically provide guidelines for these conditions, and strict adherence is necessary to achieve the desired durability.

Summary of Coating Recommendations

Complete Removal of Existing Coatings: All existing coatings should be removed using abrasive blasting.

Surface Preparation

The surfaces should be blasted to achieve a clean, contaminant-free steel surface with a rough profile to ensure proper adhesion of new coatings.

Re-Coating

After abrasive blasting, apply a high-quality epoxy primer followed by a topcoat, ensuring that the correct dry film thickness is achieved to provide long-lasting protection.

Regular Inspections

As part of ongoing maintenance, it is recommended that inspections be conducted annually to assess the condition of the coatings, with re-coating and touch-ups as necessary.

Conclusion

By abrasive blasting and re-coating the pontoons, the structural steel will be protected from further corrosion and wear, extending the operational life of the pontoons and minimizing the risk of significant damage. Proper surface preparation and application of high-quality coatings will ensure that the pontoons remain functional and serviceable for many years.

Summary

The sections in general were found in generally serviceable order with the exception of the areas of incident related damage, there are areas around the pontoon sections which do require attention, these are generally age related wear issues and could be considered as ongoing maintenance however the layout of the articulation of the various joints connecting the various sections could be improved with the addition of hard wearing rubber washers and Hardened (A2) locating through bolts, various other areas such a locating and fixing lugs which have become elongated should be replaced along with other areas mentioned. Anodes require replacement to all pontoons and should be of sufficient size and type as well as being replaced annually.

The coatings appear to be showing signs of age and we would recommend all coatings are removed, areas requiring attention are addressed and the sections suitably overcoated.

We would consider that if all the above recommendations are undertaken, the pontoons should have a working life in excess of 15 years subject to annual continued maintenance.

REMARKS

1. This report is for the sole use of the commissioning client only and we are not legally liable to any future holder of the report.

2. This survey is carried out on the understanding that it does not constitute a full survey for design condition and does not take into account any undisclosed defects that may be revealed by more in depth studies which may have a bearing on the pontoons and there usability.

3. This report does not express or imply in any form any opinion regarding the original design, fitness for purpose, structural integrity or stability characteristics of the structure.

Signed .....……

Primrose Marine Ltd

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