TECHNOMARINE

INSPECTION/report

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TECHNOMARINE MANUFACTURING INC.
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High-Performance Docking Solutions

1032 HIGH BAR HARBOR YACHT CLUB / Site inspection January 23-25 2007
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Scope:
Inspection of docks and breakwall for maintenance/repair/replacement recommendations
by Patrick Melanson, Technomarine, Central Region

Foreword /
The purpose of the inspection is to propose cost effective options and timelines for the restoration of the floating docks and breakwall systems with the original manufacturer's accepted materials, methods & procedures.

The walk trough inspection has been done visually, without resistance testing or underwater observations, with Brian Roddy and Greg Weerheim .
The following observations were recorded for further comments by Technomarine Engineering Dept. pictures were taken of damaged areas.
This resulting report of recommended options to restore or replace parts of sections needing immediate attention, and a follow trough preventative maintenance program be created, with appropriate maintenance/repair/replacement reserve fund; the aim being to extend the expected lifespan of the existing floating systems, and seamlessly transform the marina to a good working state and a refreshed aesthetic condition in a gradual fashion.

INSPECTION OBSERVATIONS.

1.- Sections A B & C

All Mains and Finger docks in these sections, were checked for structural breaks and they seem in good condition; there are no vibration squeaking noise indicating possible truss failure.Pile end hoop missing at finger tip of berths C3-C5 All observed visible floats do not show water infiltration or reduced buoyancy.
The deck planks are starting to show their age, but 80% seem to be in sound condition.
A cedar color sealer has been applied to the surface a few years ago.

Recommendations:

a) Use penetrating wood oil instead of sealer as it would better extend the lifecycle of the existing deck.
b) Start replacing worse deck areas with composite (cedar color) long life planks, thus obtaining a consistent look trough-out, in the maintenance/replacement deck process..
c) Replace repair or correct larger gaps on pile guides and hoops.

2.- Bridge walkway

The sand accretion on the north side of this walkway is accumulating and the walkway at low tide touches bottom on the west side of the arc bridge. No resulting damage on the floats was observed. The fine sandy bottom would not rub abrasively the underside of the floats polyethylene shell; although perforation could occur over a longer time period.
No structural failure observed on this north walkway.
The anchoring pile hoops on the north side of this walkway are badly rusted (some are rusted trough-out) , these units are not Technomarine made, the membership's choice to go with lower quality (price) did not prove to be cost effective, as these (Sullivan made) pile hoops need replacement, Technomarine ones are in good working condition...
The decking planks are in fair condition (40% replaced already) but will need replacement attention on an on-going basis.

Recommendations:

a) The bridge is leaning due to grounding (sand accretion) of the supporting ends of the bridge: floats could be eroded due to rubbing bottom, rebalance both sides using environmentally accepted procedures (re-floating to level, sand removal). This type of occurrence could compromise the structural integrity of this section and become a much more expensive repair if not attended to before the start of the next boating season.

b) North side pile anchor hoops need immediate replacement, better quality Technomarine hoops have proven to last 3x longer than the slightly less expensive other hoops.

3.- Section D

The boat generated wakes coming from the unprotected marina entrance are the main reason for the resulting damage to the end of section D, the second reason is inappropriate anchoring.
Boats setting out from the south side of the bay, are not observing the ''no wake speed limit'' in the channel and generating regularly 3' and even 4' wakes during their passage in front of HBHYC entrance.

The problem is compounded by the length and tonnage of the 50' and 60' boats berthing on D section.

The end unit east corner of the main dock section is completely severed, and had been lightly repaired with temporary measures (wood braces) until the two end fingers were taken off and are waiting for repairs with the 4 fingers of K section on land in the north parking area.
A repair parts list has been drafted and waiting for the purchase order authorization.

The two removed D end fingers have broken off tip ends and pile hoop attachments.
The two end main units of D section must have sustained extreme loads because they were not properly anchored along the main dock spine of D section (to much space or gap between piles and their roller guides) the finger dock tip pile hoops are not working in concert with main spine roller guides.
The stress loads have severed the east side lateral main profile at its south end corner and severed off two finger tip structure D8 & D10 & their pile hoop attachments.

Recommendations:

a) The damaged D main units and finger units should be properly repaired & structurally reinforced under the controlled welding conditions at the plant with the K finger and main structure sections, together constituting a full truckload. Only appropriate 6061-T6 aluminum alloy materials and corresponding welding rods, with approved welding methods & procedures shall be used.
b) The floats should be detached and stored on site until beefed up structures with new composite (cedar color) decking are returned to site for re-installation.
c) Back on site anchor piles must work together in concert to spread the loads as per engineered calculations. The gaps between main dock piles and finger dock end piles must not be too wide (no more than 1 or 2 inches max) allowing as previously load moments that break off pile attachments parts one after the other. To prevent undue stress over-loads on finger end anchor pile hoops only, the main piles have to work in concert with them.
d) The above in order to prevent the re-occurrence of observed damage and useless, repetitive and costly repairs, that only weaken the aluminum. The gaps between anchor hoops must be the same on for all piles, for them to work together and spread the workload.
e) All galvanic corrosion should be repaired with aluminum reinforcement plates and connecting bolts These should be upgraded to stainless steel replacement bolts & nuts on new neoprene shock absorbers.

The result of above maintenance measures will assure the Club membership of an additional 10 to 15 years of useful life expectancy of a properly reinforced D section.
Plan B would require a complete replacement of said D section in a couple of years, adding-in the costs of the temporary repetitive on site repairs.

4.- Section E Wavescreen Break Wall

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The channel side timber 45 degree inclined ''beach'' has been replaced over the years, representing about 50% of the inclined wave dampener. The replacement timber has obstructed the designed openings between the original planks (3'' gaps) that created the white water turbulence dampening incoming waves. The gaps also helped disperse the underside sand accretion, the gaps obstruction has pulled-in under the break wall a sand bank formation over the years.
As observed even the replaced wood areas have rotted trough in some areas.
The angle iron replacement that was needed at E1- E2 is indicative of the observed rusted structural members that will need intensified repairs over the coming years.
The break wall seems to be resting on the bottom on some of its 256' length at low tide (sand bank accretion). The system is now stationary at low tides and will be so if not already at high tides.
After de-planking the connecting section to section assemblies, we observed that the cold tar epoxy treatment on the structural steel members is still in good condition and so are the neoprene connectors. Although most peripheral structural steel members more exposed to waves and UVAs are showing a higher degree of rusting.
Some exposed bolts are deeply rusted and fused to the steel members they connect together at the outer perimeter.
The finger docks on the protected side seem to be in fair working condition.
The vertical wall timber is rotted mostly underwater and requires replacement (composite replacement planks).

Recommendations:

a) Composite 3''x 6'' planks should be used as replacement of the existing rotted wood, to assure the Club of better life expectancy (3x the wood lifecycle) of the covered working surfaces. The inclined surface meeting the incoming waves must be re-fitted with 3'' gaps between planks as per original design, to create the white water turbulence and provide the wave arrest/ absorption & dampening characteristics this design is meant to produce.
b) Anchored in the sand bank the ''beached'' system will be difficult to tow it to deeper water by section for lifting & refurbishing, the fine sand could be blown away, by aerating under hosed air pressure jets to dislodge it should this procedure be permitted by authorities.

This situation prompts three options, depending on the Club's membership goals & priorities:

1. Proceed with a) as described above, and replace only the most rusted 4''x 4'' angle treated (with galvanized, cold tar
epoxy replacements) iron structural braces on a as need preventative failure basis.
This option would slow down the general entropy & should provide an additional 10 to 15 years of working lifespan to the existing break wall.
Extend the break wall protection for another two sections (100') to better protect D section + a new breal wall protecting south side of marina entrance and K section.
from wakes from the marina entrance (reduction to smaller S pattern entrance) and create new revenue in the process by adding new slips off the new break wall sections(new finger docks).
This would prevent recurring damages to exposed D and K sections.
Replacing K section by new break wall could be more feasible for permit approval.

2. Just replace rotted planks on working inclined and vertical surfaces and on walkway (existing break wall) for pedestrian safety and let the structure gradually erode until a total replacement is called for in the next 5 to 8 years.
Start building as soon as possible, a reserve fund for the complete replacement of break wall, as underside sand bank accretion continues.
As time erodes it, becoming less effective it could create some discomfort to the membership (+ negative aesthetic)

3. Do nothing if not for safety issues, and start saving a fund for a complete renewal of the break wall with new longer lasting composite materials and state of the art design fitting the channel wakes, in the next five years.

After reviewing observations and photo documents Technomarine's engineering dept. have the following comments and have calculated the following approximate projected costs on the above break wall options.

Of the three following options, #1 would prove to be the less expensive over the long term.

The projected costs of :

Option #1 : US $...275,000.oo would better protect harbor immediately and prevent recurring yearly repairs and save replacing D and K sections.

Option #2 : US $... 25,000.oo per year on 8 years + reserve fund build-up + inflation (this option implies> break wall + D & K replacement in about 8 years)

Option #3 : US $...560,000.oo + inflation in 5 years + replacement of major parts of D and K + yearly repairs (this option implies >break wall + D & K replacement in the next 3 to 5 years)

Sections F- G- H- I-

All Mains and Finger docks in these sections, were checked form top deck side only, for structural breaks and they seem in good condition; there are no vibration squeaking noise indicating possible truss failure.

At H5 a corner has been at the weld and needs repair .

All observed visible floats do not show water infiltration or reduced buoyancy.
The deck planks are starting to show their age, but 80% seem to be in sound condition.
A cedar color sealer has been applied to the surface a few years ago.

Recommendations:
a) Use penetrating wood oil instead of sealer as it would better extend the lifecycle of the existing deck.
b) Start replacing worse deck areas with composite (cedar color) long life planks, thus obtaining a consistent look trough-out, in the maintenance/replacement deck process…

Section J & K

The boat generated wakes coming from the unprotected marina entrance are the main reason for the resulting damage to the end of section K, the second reason is inappropriate anchoring.

Heavy tonnage fishing boats setting out from the south side of the bay, are not always observing the ‘’no wake speed limit’’ in the channel and generating regularly 3’ and even 4’ wakes during their passage in front of HBHYC entrance.

The K section has been acting as a break wall without the capability to attenuate any incoming wakes, it just rides them with their charges, accelerating the wear at connecting points between main and finger sections.

The problem is compounded by the length and tonnage of the 50’ and 60’ boats berthing on K section.

The end unit of K’s main dock section is completely inadequate to meet the wakes, it is worsening the wake motion by leveraging it and transferring the ondulating moments to the 1 to8 K berthing sections and damaging finger to main connectors and tip anchor pile hoops in the process.

As observed on D section there is too much space or gap between piles and their roller guides and hoops. The finger dock tip pile hoops are not working in concert with main spine roller guides.The stress loads of wakes are not properly spread between piles as they are not working together, in concert.

The 4 end fingers K were taken off and are waiting for repairs with the 4 fingers of D section on land in the north parking area.
A repair parts list has been drafted and waiting for the purchase order authorization.

Recommendations:

a) Backing the two last sections of K proper break wall sections of about 100’ should be installed.
b) The damaged K main units and finger units should be properly repaired & structurally reinforced under the controlled welding conditions at the plant with the D finger and main structure sections, together constituting a full truckload. Only appropriate 6061-T6 aluminum alloy materials and corresponding welding rods, with approved welding methods & procedures shall be used.
The floats should be detached and stored on site until beefed up structures with new composite (cedar color) decking are returned to site for re-installation.

c) Back on site anchor piles must work together in concert to spread the loads as per engineered calculations. The gaps between main dock piles and finger dock end piles must not be too wide (no more than 1 or 2 inches max) so not to allow load moments breaking off pile attachments parts one after the other. To prevent undue stress over-loads on finger end anchor pile hoops only, the main piles have to work together in concert, not one at the time, enduring full loads.
d) The above in order to prevent the re-occurrence of observed damage and useless, repetitive and costly repairs, that only weaken the aluminum. The gaps between anchor hoops must be the same on for all piles, for them to work together and spread the workload instead of reacting alone one pile at a time.
e) All galvanic corrosion should be repaired with aluminum reinforcement plates and connecting bolts These bolts & nuts assemblies should be upgraded to stainless steel bolts & nuts.

The result of above maintenance measures will assure the Club membership of an additional 15 to 20 years of useful life expectancy of a properly protected & reinforced K section.

Plan B would require a complete replacement of said K section in a 3 to 4 of years, adding-in the costs of the temporary repetitive on site repairs. Exposed new sections would result in similar shorten lifespans and repetitive repairs.

Section J

Although less exposed than D and K, section J is starting to weaken and the main section at J3 is broken and needs repair.
The two end pile guide hoops are not properly bolted in the aluminum tracks.

General observations

1. The power posts might be leaking electrical discharges at some wiring (abrasion stripping), and should be checked and repaired as these discharges precipitate galvanic corrosion at connecting bolts.

2. Replacement bolts should be Stainless Steel to help prevent further galvanic corrosion.

3. A power post replacement program should be phased in (long life new stainless steel units now available)

4. Composite boards (cedar color) should be the replacement deck of choice(3x lifecycle of wood at 1.5 price)

5. Repairs should be done correctly because repeat welding only weakens the aluminum and precipitates costly replacement. Appropriate measures should be respected: No wind welding environment, only proper alloy and rods must used, top and bottom reinforcement plates must be used on fingerdock tips and at bolting connections with new neoprenes (stainless steel replacement bolts & nuts only)

6. Piles alignement and small (1'' to 2'' max) gaps (evenness) between piles and their roller guides and hoops are the most important prevention measure against constant repairs (this measure results in loads being evenly spread between all piles of a section)

7. HBHYC marina's offshore entrance should be better protected against wakes with complementary sections of new break wall (extend E southward 120' and re-align K with main walkway & stop offending wakes with new 100' break wall anchored perpendicular to repaired and re-aligned K section.

Should you have any questions, please do not hesitate to contact us at your earliest convenience.

Best regards,

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