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Wyndham Boat Ramp Floating Jetty.Doc

Mr. Russell Williams
Senior Projects Manager
Shire of Wyndham - East Kimberley

Dear Russell

WYNDHAM BOAT RAMP FLOATING JETTY
OPTIONS FOR MAINTENANCE AND REPLACEMENT

WorleyParsons was engaged by Shire of Wyndham East Kimberley (SWEK) to provide advice in relation to a recent pile failure at the Wyndham Boat Ramp Floating Jetty.

DESCRIPTION AND CONDITION OF EXISTING STRUCTURE

The Wyndham Boat Ramp Floating Jetty (refer Photo 1) was built in 1998. A visual inspection of the floating facility was undertaken on 17 March 2011.

Photo 1: General view of structure

A description of the main components of the facility as well as general comments is given below.

Concrete abutment

A small concrete abutment is located at the entrance to the floating facility. The abutment was observed to be in fair condition.

Pontoon system

The main walkway is approximately 70m long by 1.8m wide, restrained by 10 steel piles. The "L" shaped head of the jetty is approximately 11m long by 2.0m wide, restrained by an additional 2 steel piles. The individual pontoon units are approximately 2.5m x 1.8m for the main walkway and 5.5m x 2.0m for the "L" head.

The floatation components on each pontoon unit consists of 3 aluminium box sections, and each pontoon unit is connected to one another via a hinge type connection (refer Photo 2). The hinge connection typically has a rubber cover strip however several of the cover strips were observed to be missing. The trafficable surface of the pontoon system is an extruded aluminium mesh.

Photo 2: Hinge joining pontoon units with rubber cover strip

The freeboard (height of trafficable surface above water level) of the pontoon system is approximately 250mm.

Small lengths of handrailing are located alternately along each side of the main walkway. The handrail fixings were observed to be flimsy and would not comply with Australian Standards for applied horizontal loading.

Many of the pontoon units are leaning (not sitting horizontal in the water), due to the light nature of construction. It is noted that the pontoon units and system would not comply with stability requirements of AS 3962 - Guideline for the design of Marinas.

Small bollards are also located along the edge of the pontoon system with poor structural connection to the pontoon deck.

Piling and pile guides

The pontoon system is connected to piles via pontoon guides which are fabricated out of small diameter aluminium bar and plate. Most of the pile guides are bent and flimsy (refer Photo 3), indicating over stressing of the structural components, and not fit for purpose.

Photo 3: Pile Guide with repair in place

There are 12 pontoon restraint piles on the structure, which are constructed from galvanised steel water pipe, ranging from approximately 200mm to 300mm in outside diameter. The top of pile level has been surveyed at RL +9.854m Chart Datum (CD) (Where Lowest Astronomical Tide Level (LAT = -0.260m CD, and Highest Astronomical Tide Level (HAT) = +8.700m CD). There is a risk that at a very high tide level with increased water level from rain events or wind wave, that some of the pontoon units will lift off the top of the piles. Any new piles should be constructed at a higher cut off level.

It is understood from SWEK that the original wall thickness of the galvanised steel piles was 6mm. Six of the piles are missing a top cap which decreases durability by allowing the piles to corrode from the inside and outside, thus doubling rate of corrosion. Typical corrosion rates for steel in a salt water splash zone are approximately 0.1mm per annum. For corrosion on the inside and outside, this could equate to a loss of 2.4mm of wall thickness since construction.

The existing piling is under designed (not fit for purpose) and does not comply with AS 4997 – Guidelines for the Design of Maritime Structures in terms of durability in the marine environment.

It is understood that several piles were replaced following a large debris event approximately 7 years ago (refer Photo 4 showing a small amount of debris caught on structure).

Photo 4: Debris caught on structure

On 15 December 2010, a pile failed due to corrosion through the welded splice connection (refer Photos 5 and 6), and corrosion through holes in the steel piles (refer Photo 7 for example of corrosion through holes in piles).

Photo 5: Broken pile (15 December 2010 failure)

Photo 7: Broken pile (15 December 2010 failure)

Photo 7: Corrosion on steel pile

Given the number of pile failures over the past 7 years due to debris loading and corrosion, it is highly likely that further, more frequent failures will continue to occur, particularly given the poor welding observed in the 15 December 2010 pile failure and the presence of holes in the steel piles allowing corrosion to accelerate.

RECOMMENDATIONS

Piling

SWEK has two main options as follows:

1. Undertake repairs to the piles when failures become obvious, that is on a reactive basis. Pile failures are expected to occur more frequently given the observations made during the 15 December 2010 pile failure of poor welding. There is a risk that the public may be injured when a pile failure occurs. There is also a risk of resulting damage to the pontoon system.
2. Replace the existing piles with larger, thicker walls steel piles (for example a 457mm diameter by 12.7mm wall thickness Circular Hollow Section (CHS) pile – section size is an estimate only and would need to be confirmed by calculations), with welded caps at the top and an epoxy paint or high density polyethylene (HDPE) sleeve corrosion protection. This option would be more expensive that Option 1 in the short term but would likely lead to a lesser overall life cycle cost. It is noted that Maritime Constructions currently has a piling barge mobilised at Anthon Landing and as such there is an opportunity to upgrade the piling on the facility for a reduced cost as mobilisation / demobilisation costs are covered by the Wyndham Community Jetty project.

Pile guides

SWEK has two main options as follows:

1. Continue to repair the pile guides when failures becomes obvious, on a reactive basis.
2. Replace the pile guides with larger, fit for purpose structural members. This option would be particularly appropriate if the existing piles were to be upgraded.

CONCLUSION

A number of issues were identified where individual components of the pontoon system are in non-compliance with Australian Standards.

Failure of the existing piles and pile guides will continue to occur on the Wyndham Boat Ramp Floating Jetty due to inappropriate existing piles, which are under designed for strength and have a short design life due to poor corrosion protection, poor welding during splicing and holes located within the tidal zone.

It is recommended that a design for new pile guides and piles be undertaken and the existing piles be replaced with new steel piles with adequate corrosion protection detailing.

We trust the above addresses your needs and is acceptable. Should you have any queries or wish to discuss any matter, please do not hesitate to Simon Batt on 0413 461 540 or 02 8456 7280.

Yours sincerely
WorleyParsons

Simon Batt
Coastal & Marine Operations Manager