LEISURE ISLE BOAT CLUB

REPORT ON HARBOUR PILES

JULY 2016

1. **INTRODUCTION**

In January this year one of the timber piles (or poles) which support the jetties had to be removed after being dislodged by a boat. Examination of the pile revealed severe attack of the timber caused by marine organisms. Its condition was of concern because it indicated the possibility that LIBC would be faced with the cost of replacing all the piles in the harbour.

A detailed investigation has been carried out to determine the extent of the problem and how best to deal with it.

2. **BACKGROUND**

In 2003/4, at the time when the harbour was extended, all the timber piles were replaced. The replacement piles were sourced from a reputable supplier, but who, it is understood, is no longer in business. As far as can be established, the piles were all treated to the correct standard for permanently submerged marine applications, namely H6, in accordance with SABS standards. Although not all the markings are visible, it appears reasonably certain that all the poles were tagged with the SABS mark of approval and standard of treatment.

As a matter of interest, the H6 level of treatment requires a double treatment process, first with CCA (Tanalith) and then Creosote. A critical feature of the process is to ensure proper seasoning (drying out) in between treatments to ensure proper penetration.

The damage to the affected pile was clearly limited to that section which was above the harbour floor (mud), and below low water mark. The pile was reduced to about 50% of the original diameter and it was obvious that it was very close the end of its usable life. This was of concern, given the fact that it had been in use for only 12-14 years. Since there are over 200 piles in the harbour, the indications were that we were faced with a very high maintenance cost, and it was essential to ensure that whatever action was to be taken should be done in the most cost effective manner possible.

The picture depicts the lower damaged portion of the pole where the diameter has been reduced to approximately 50% of original. Note that the upper section was cut off to facilitate removal of the pole.

A number of persons with knowledge and experience with marina and jetty construction, as well as the application of timber in a marine environment, were consulted in order to gain a better understanding and to establish the best method of overcoming the problem.

This included the SA Wood Preservers Association (SAWPA) who provided valuable input and informed us that their opinion was that timber poles which are properly treated should definitely have a much longer useful life than the 12-14 years we are experiencing. Subsequent informal conversations with numerous other persons (such as Thesens Islands, KYC, local specialists, and timber suppliers) indicated that even the highest standard of wood treatment is no guarantee that marine borer attack will not take place.

It is clear that the damage to the poles is caused by gribble which is the common name used to describe a marine isopod from the family Limnoriidae, of which there are over 50 different species. There is a wealth of information about gribble available on the internet. Pictures of the culprit depict a small animal not unlike a shrimp about 1-2 mm long.

3. INVESTIGATION

In order to determine the extent of the problem, the first step was to appoint the local specialist company, Sea Services, to survey a random sample of the piles and to measure the amount of damage. The work was carried out by a diver using a scraper to remove marine growth and the amount of damage to each pile was then estimated. 70 piles out of the total 230 piles in the harbour were inspected. Owing to the nature of the damage to the piles, and the amount of marine growth covering every pile, the results of the survey are not intended to be precise, but they provide a very valuable indication of the extent of the problems.

The survey results were tabulated and from this three groups were determined as follows:

• Piles in good condition (less than 15% of damage to cross section	29 poles	40% of total
• Piles in fair condition (!5 to 35% damage to the cross section)	35 poles	50% of total
• Piles in poor condition (more than 35% damage to the cross section	6 poles	10% of total

Note: the pile in the worst condition was found to be reduced to about 40% of its original cross section.

The following pictures provide an indication of the problem:

This pile was in the worst condition of all piles examined with only about 40% of the original cross section area remaining

This pile is in a fair condition with about 20-25% damage

Another pile in fair condition with about 30% damage

4. REPLACEMENT PROGRAMME

From the above, it is clear that LIBC has to embark on a programme to replace to piles over a period of time. For reasons which are not clear, the marine borer damage appears to be random and inconsistent, and, indeed, many of the piles examined show little or no sign of damage, and should have a remaining useful life of several years.

Note that consideration was given to attempting to extend the life of the existing piles by protecting them with some form of sheathing and/or reinforcement, but after careful investigation it was decided that the cost of such an exercise could not be justified and the results would, in any event, be of dubious value.

Based on the results of the survey, it has been decided that the following action programme will be set in motion:

- Replace all piles in poor condition over the next 6-9 months – 20 poles
- Replace piles in fair condition over the next 12- 24 months – 110 poles
- Replace all remaining piles within the next 36-48 months.

For budget purposes, the following is proposed:

- Current (2015/6 financial year) Order first batch of piles.
- 2016/7 financial year 90piles
- 2017/8 financial year 60 piles
- 2018/9 financial year 60 piles
- 2019/0 financial year 20 piles

The above is a conservative programme and it is hoped that the actual process will extend beyond that.

5. REPLACEMENT METHOD

The most difficult decision has been the method of replacement of the poles. Treated pine timber poles are used extensively throughout SA and the rest of the world for jetty and marina construction. In Knysna, treated pine piles are used to support the jetties at Belvidere, Laguna Grove, Thesens Island, Costa Sarda and environs, and elsewhere. We have used treated pine piles at LIBC since the harbour was constructed in 1993.

Our current experience of marine borer damage has caused us to question whether this is the correct decision, and for this reason a considerable effort has been made to investigate various alternatives to ensure that we arrive at the most cost effective and satisfactory solution.

The following is a list of some of the alternatives which were considered and discarded:

- Concrete filled plastic water piping – cost and UV resistance
- Steel pipes - cost and corrosion
- Concrete streetlight poles – cost and strength
- Glass fibre (GRP) streetlight poles – cost
- Fibre cement pipes – cost and availability

Finally it was decided that there are only two alternative systems worth considering and these are tabulated on the following page showing the main characteristics and advantages and disadvantages of each.

	DESCRIPTION	TIMBER	PIPE	COMMENT
1	Material	H6 CCA/Creosote treated pine to SANS 10005	Plastic Soil Pipe to SANS 967 filled with steel rebar and concrete	
2	Size	6m tapered 190 to 140mm	160 mm OD	
3	Availability	3-4 months	Immediate	
4	Weight	150 kg	320 kg	May affect installation cost
5	Supply cost, delivered Knysna, per pole	R 1 230.00	R1 250.00	Pipe cost R 500.00 add estimated cost of material and labour to fill with concrete and rebar R500.00. Provide jetting pipe and plug R 250.00
6	Installation cost	R 1 000.00 per pole	Should be similar	Installation costs vary according to number of poles. Assume 20 poles per batch.
7	Installation	Considerable local expertise.	Weight may be a problem	Uncertainty around the concrete filling process.
8	Track record	Commonly used throughout the world	Little real examples of use in this same situation	
9	Useful life	10 Years plus	Should be indefinite	
10	Strength	Excellent	Reasonable	
11	Impact resistance	Excellent	Could be prone to cracking on impact	
12	Corrosion resistance	N/A	Possible corrosion of rebar after cracking	
13	Wear resistance	Good	Plastic pipe will wear through	Existing poles show rubbing against jetties causes wear.
14	Marine borer attack	Question mark	N/A	
15	UV resistance	N/A	Plastic is susceptible to UV	Plastic pipe manufacturers only recommend soil pipe above ground.
16	Aesthetics	In keeping with LIBC ambience	May look indusrial	Thesens Islands will only use timber poles for aesthetic reasons
17	Environmental	Good, timber is a carbon store	N/A	

6. **CONCLUSION**

It is clear from the above, that there are advantages and disadvantages of using timber piles as opposed to concrete filled plastic pipes.

The only real concern about timber piles is based on our current experience with marine borers, but we feel that this can at least be partially overcome by sourcing the poles from a reputable supplier who must provide acceptable guarantees. In addition, proposals have been made to sheath the susceptible portion of the pole between the low water mark and the mud with a suitable material such as stainless steel sheet metal or even aluminium roof flashing material. This needs to be followed up.

On the other hand, while concrete filled plastic pipes appear to be a very attractive option there are some question marks, such as the susceptibility to impact loads caused by boats, wear from rubbing against the jetties, and there is less local expertise with the installation of this type of pole. In addition the overall aesthetic impact of hundreds of plastic piles in the LIBC harbour must be questioned. Concrete filled pipes, including plastic pipes, appear to be an attractive option to support a static structure, but there are potential problems where dynamic loads such as caused by a boat striking a jetty is concerned.

Ultimately, it was felt that there are probably four basic factors to be taken into account in order to make a decision:

- ✓ COST: the installed cost of either a timber or concrete filled plastic pip pile should be very similar, with the plastic pipe option probably being slightly cheaper.
- ✓ DURABILITY (LIFESPAN): we believe that if the timber piles are sourced from a reputable supplier who will provide an acceptable guarantee, a lifespan of 15-20 years should be the minimum expected. Theoretically the life span of a concrete filled plastic pipe should be almost unlimited, but the effects of UV resistance, impact loads, and wear may dramatically affect this.
- ✓ TRACK RECORD: the use of treated timber piles is common world wide. They have a proven track record with well known and understood limitations as described in this report. We were not able to identify installations using concrete filled plastic pipes in exactly the same circumstances that prevail at LIBC.
- ✓ AESTHETICS: in our opinion, timber piles are more aesthetically and environmentally acceptable than plastic pipe piles.

It is therefore the conclusion of this report that LIBC should proceed with the replacement of the existing timber piles in the harbour, again using treated pine piles and following the programme described above.

Due to the specialised treatment process, the timber pole suppliers require LIBC to order the poles in batches of not less than 30 poles per batch. A deposit will be payable on order.

In consultation with the specialist contractors able to carry out this type of work, it has been established that it is essential that the work be carried out in batches of about 20 piles at a time, in order to reduce overhead costs. On this basis, the estimated cost for installing new piles will be R 2 500.00 per pole, excluding VAT and including a small contingency to allow for unforeseen costs.

Based on the expected replacement programme described above, this will result in the following costs (excluding any allowance for VAT or cost escalation):

- Current (2015/6 financial year) Estimated deposit on 1st batch = R 15 000.00
- 2016/7 financial year 90 piles = R210 000.00
- 2017/8 financial year 60 piles = R150.000.00
- 2018/9 financial year 60 piles = R150 000.00
- 2019/0 financial year 20 piles = R 50 000.00

It is hoped that the above is a worst case scenario and that it will prove possible to etend the replacement period. LIBC will continue to monitor the condition of the poles and will only replace batches of poles when it is clearly necessary.

7. JETTY MAINTENANCE

Apart from the timber piles, the other potential major maintenance issues facing LIBC are maintenance of the jetties and silting of the harbour and approach channels. The silting issue is something to be dealt with separately and as a long term issue.

Detailed inspections of the jetties have been carried out and it has been determined that, overall, the jetties are all in extremely good condition considering their age. Some of the planking appears to be cracked and warped and many of the fixing bolts and screws have corroded, but the jetties are structurally sound and safe to use. It would appear that there is no need for any major work or replacement of the jetties for the foreseeable future.

Jetty planks are replaced where they become severely warped and/or cracked, or if they are considered to be unsound. A proposed method of fixing the planking to the longitudinal runners will be put into practice when it becomes necessary but it is not expected that this will result in significant expenditure.

Some of the finger jetties are becoming a problem as the timber is warped and the jetties are unstable. This situation must be monitored and it may become necessary to replace some of them in the near future. It may also be possible to experiment with an improved method of attaching the finger jetties to the main jetties and this should extend their useful lifespan.

Overall, we believe that, apart from regular routine maintenance, and some minor upgrading, there should not be any need to embark on any major jetty maintenance or replacement for the next 4-5 years.