CONSERVATION OF THE FORMER NEPTUNE ISLAND LIGHTHOUSE AT PORT ADELAIDE

Bruce Harry

BACKGROUND

Until the full development of an overland transport system in the late 19th century, coastal and overseas shipping played a vital part in the economic history of South Australia. The first lighthouse erected to protect that shipping was therefore built very early, in 1840 (only four years after settlement began) and in 1869, another was erected at the entrance to the main harbour at Port Adelaide.

A prefabricated design (by Moreland & Sons, of Newcastle) of cast and wrought iron, it served the harbour of Adelaide well, until it was dismantled in 1901 and re-erected on South Neptune Island, in Spencer Gulf. There its new light by Chance Bros. of Birmingham (with a kerosene lamp, hand ground crystal lenses and a rotation mechanism floating in mercury) was visible for 25 miles.

After a further 80 years service, the time for its replacement by a more modern, unmanned automatic light, arrived and plans for its demolition began. However, the lighthouse had by then been recognized as a unique and significant piece of our past and been placed on the S.A. National Trust Classified List and recommended for inclusion on both the National Estate Register and the State Heritage Register. This realization presented its owners, the Commonwealth Department of Transport, with some obstacles to their intentions.

Generally, only in situ preservation of items is supported by heritage authorities; relocation and reconstruction are not. As the lighthouse had previously been located at Port Adelaide, its attachment to Neptune Island seemed the less significant and its re-siting was therefore considered practical and appropriate in this instance. Registration of the lighthouse as both a South Australian and national heritage item therefore proceeded and an alternative to demolition developed. This was the proposal to dismantle the lighthouse and transport it to Port Adelaide, so that it might be restored and stored, until a new site could be found for its re-erection.

With the lighthouse's functional life nearing its end, very little maintenance of the structure had been undertaken by the Department of Transport for some years. Practical questions now arose regarding its structural condition and suitability for restoration and re-erection. An inspection by helicopter was arranged and an assessment of likely conservation costs upwards of $110,000 resulted, leaving considerable concern as to where this level of funding might be found.

Coincidentally, the Australian Government had granted substantial funds for the establishment of a Maritime Museum and Park in South Australia and the lighthouse, still deteriorating on Neptune Island, was immediately embraced as a part of the Maritime Museum project. Suddenly its future looked surer, although there were still no specific funds available for its restoration.

After several postponements the Department of Transport announced in mid 1984, that tenders had been called from crane rigging firms for the dismantling of the lighthouse and that a merchant ship had been chartered to return the structure to Port Adelaide in.March 1985.

A joint working party representing the various Departments and interests involved was hastily formed to consider the following questions:

- Who could fund/how?
- Who would store/where?
- Who would restore/where?
- Who would re-erect/where?

The Department of Transport wished to hand over the dismantled lighthouse (the biggest single piece of which would weigh 2 tonnes) at the Port Adelaide Wharf, straight off the ship onto waiting trucks. The storage area thought to be required was 10,000 sq.ft., plus a suitable yard. The estimated time required in store was around 18 months for the conservation process of descaling, grit blasting, repair and/or recasting of components and repainting to take place, before it could be transported and re-erected on new footings at a site yet to be chosen.

Consideration by the Working Party, comprising representatives from the Department of Transport, State Heritage Branch, the Premier's Department and the newly appointed Director of the

Maritime Museum soon highlighted the following further difficulties:

- The conservation process was too specialized for C.E.P. labour.
- All large bolts and many rivets would be destroyed in the dismantling process and would have to be replaced.
- Until dismantling, descaling and grit blasting had been undertaken, the full extent and cost of restoration would not be assessable.
- A detailed identification/marking system would be needed, capable of withstanding the grit blasting process, if the integrity of the re-erection was to be maintained.
- The input of specialized technical and scientific advice would be essential.

At about this time the Department of Transport confirmed that the valuable kerosene lamp, pedestal and hand ground lenses would also be given with the structure, to be placed in working order in the restored and re-erected lighthouse to make it a truly unique object. Enthused by the prospect of having a working lighthouse as the focal point of his new Maritime Museum, the newly appointed Director, Dr Kevin Fewster, immediately took up the responsibility for urgently finding storage facilities. He approached the Department of Marine and Harbors at Port Adelaide for assistance and he also began approaching potential sponsors.

Very quickly, Dulux Paints offered to supply a special purpose recoating system for the restored steel structure and the Department of Marine and Harbors agreed to store the lighthouse/components and undertake some of the repair and fabrication work. The Department of Transport also agreed to do the tagging if someone else designed the marking system. The State Heritage Branch reallocated $7,000 from the National Estate Grants program to this purpose and to fund a technical and scientific study of the lighthouse structure upon its arrival at Port Adelaide.

Under the pressure of imminent dismantling, the project was coming together. A marking system was devised, a sequential program of activities established and responsibilities allocated among the Department of Transport, the South Australian Maritime Museum, the Department of Marine and Harbors and the State Heritage Branch. The South Australian Maritime Museum, now well established with a staff and offices, took up the leadership of the project team as part of the overall Maritime Museum project.

In January 1985 Gary Page from the South Australian Maritime Museum and Paul Bunney from the Department of Transport, flew to Neptune Island to implement the marking system and supervise the dismantling, identifying and packing of the lighthouse by Southern Steeplejacks Pty. Ltd., the successful tenderers for the dismantling. To assist with the reassembly later, a detailed photographic record was also kept of the dismantling process including details of the assembled sub-elements of the structure.

In March of that year the M.V. **Cape Don** arrived at Port Adelaide. The disassembled and crated lighthouse was loaded onto waiting trucks and removed to the Department of Marine and Harbors store nearby. Inspection revealed a large variation in the degree of degradation of the disassembled metallic components, from negligible to obviously requiring replacement. Some additional damage and cracking had occurred as a result of the dismantling and transporting process, particularly to the curved glass of the lantern house windows.

INVESTIGATION AND ANALYSIS

It was decided that an in-depth overall inspection of components, chemical analysis of metals (and the chlorides of the corrosion products) and tensile and harness tests, would be essential if appropriate treatment was to be undertaken. AMDEL was commissioned to proceed with this and MacDonald Wagner, Structural Engineers, were engaged to critically examine the lighthouse components for structural integrity.

As these investigations proceeded a Project Management Committee was established to take over from the initial working party and see the project through the detailed conservation process. This Committee comprised:

- Chris Loan as Project Controller for the South Australian Maritime Museum;

- Doug Alexander as Project Manager;

- Doug Smart as Supervising Engineer (MacDonald Wagner);

- Geoff Cousins and Ron Rowe as Department of Marine and Harbors Workshops Co-ordinators;

- Don Thorpe as Volunteer Co-ordinator;

- Bruce Harry representing the Lighthouse's owners, Department of Environment and Planning (State Heritage Branch) and the legislative approval process.

The Committee began to meet on a regular basis to consider and plan the details of the project. A number of important questions had to be addressed.

The AMDEL research technique undertaken by Peter Kentish, involved X-ray diffraction analysis of corrosion products, metallographic examination (of up to 400 x) of selected cut and polished metal sections and testing for acid soluble chlorides, as well as detailed visual inspection.

The results indicated:

- the presence of corrosion products up to 25mm thick in places but with sufficient sound metal beneath most elements;

- an extensive metal loss to roof panels and cappings and the bottom edge of the roundhouse outer walls, suggesting the need for complete replacement;

- extensive attack at joints and brackets of the tower sections;

- the external walls and roof were of wrought iron, whilst the stairs, balusters and pedestal were of grey cast iron;

- some structural items (eg. platform I-beams) were of low carbon steel;

- chloride percentages of up to 1.5 were present in the corrosion products.

On the positive side, the AMDEL research also indicated that the interior was generally in good condition and that where fractures or cuts existed in wrought iron or cast iron, some welding would be possible. C.I.G. advised using higher temperatures and lower speeds for wrought iron and oxy welding with nickel bronze rods or arc-welding with pure nickel, for cast iron.

Recommendations by AMDEL included:

- the further dismantling of components and their descaling before giving all elements a class 2.5 abrasive blast clean (per AS1627);

- acid pickling to remove any chloride traces (phosphoric acid for iron, citric acid for copper) followed by washing and brushing;

- a second grit blast followed by a first sealing coat within 4 hours;

- subsequent coating with a 3 pack epoxy based system.

The Committee decided that the AMDEL recommendations should be adopted as far as practical and any variance would only be the outcome of due consideration and not spur of the moment, cost, difficulty or other superficial bases.

The MacDonald Wagner investigation confirmed that ... although significant corrosion had occurred in many load bearing members, the original design had clearly allowed a significant margin for corrosion (which is still current practice for inaccessible structures in hostile environments) and that there was indeed generally sufficient sound metal to carry the expected loads in the relocated position. It further established:

- the turnbuckle threads were in excellent shape for re-use despite their age and exposure;

- some 'T' section struts required replacement;
- the collar around the base of the roundhouse walls, the roof and cappings would also have to be replaced;
- the main support columns were generally sound although one third of the column splices would require replacement;
- platform I-beams would have to be replaced (salvaged RSJ's from the demolished Birkenhead wharf were subsequently used);
- platform hand rails would have to be replaced for public safety;
- due to the cost of re-riveting in the large sizes originally used, bolts might be used instead;
- further disassembly could be limited to external points where a higher probability of inner corrosion existed, such as the doubler plates on the tower, cleats, collars etc.

CONSERVATION

Almost immediately after the lighthouse's arrival at Port Adelaide, hand descaling of the major components was commenced using volunteers from the Largs Bay Rotary Club and the Aboriginal Community College, under the guidance of Don Thorpe of the South Australian Maritime Museum. This was an obvious and necessary preliminary to grit blasting because of the excessive build-up of corrosion products over many years. With the descaling of components well advanced and the results of the scientific and technical analyses to hand, fabrication of replacement sections, grit blasting and repair welding now began in the Department of Marine and Harbors workshops.

As this work accelerated, the need to consider the re-erection process (the likely costs and the possible extent of pre-assembly), the final selection of a site and a means of transporting the restored lighthouse thereto, became pressing.

A site near the Docks at the end of Commercial Road, the main approach road to the Port from the city was duly settled upon by agreement among the South Australian Maritime Museum, the Premier's Department and the Port Adelaide Council. Here, it would be visible on the approach along Commercial Road, be near to the Maritime Museum at the edge of the Historic Precinct and also be visible from the water. It would also be the focal point of a new Civic Square to be opened by the Queen in just seven months.

With total funding for the project still unobtained and only hope that Department of Marine and Harbors might absorb most of their costs, the State Heritage Branch granted $40,000 from the State Heritage Fund to ensure that the grit blasting process would not be delayed and the recoating process could be completed. As Dulux had agreed to donate and apply the coating system and would carry the responsibility of its performance, it was decided at this stage to adopt their requirement for preparation over AMDEL's.

Thus the steps in the treatment of the metal components of the lighthouse finally were as follows:

- manual descaling and degreasing;
- abrasive dry grit blast to Class 3 finish;
- high pressure water blast using Nalco (a phosphate based cleaning agent) with water, in ratio 1 :100;
- another dry grit blasting;
- priming with zinc galv. 6 (a 2 pack polyamide cured zinc rich coating) within 4 hours, to 77um thickness;
- a second coat of Dulux Durepon Chromate Primer with 50% epoxy thinner, to 50um;
- a third coat of Dulux Durebild, to 200um;
- a fourth coat Dulux Acran (a 2 pack acrylic /polyurethane finish for marine environments), to 50um.

The copper dome, after removal of oil and grease and the hand removal of paints, was treated with wet and dry paper and white spirits before being primed with Durepon chromate primer. It was also coated with Durebild HSI (white) and a top coat of white acran acrylic/polyurethane.

During the metal preparation process, further corrosion was uncovered, particularly of the tower walls. Some discussion of the use of fillers to rebuild a smooth surface for recoating took place. However, due to time constraints, the extra costs involved when sufficient funds were still not available and the non-essential nature of the problem (from Dulux's viewpoint), this course was abandoned. In effect this is an irreversible decision.

For similar reasons, it was decided that the replacement of the galvanized sheet internal wall linings of the tower would not be undertaken at this stage. This decision is not irreversible; new linings can be installed at any time in the future, if funds become available.

Considerations of this nature arose frequently. The Committee dealt constantly with the tensions between the often competing demands of conservation integrity, public safety, cost and the increasing demands to treat the lighthouse as a tourist attraction (which it is) and as a totemic logo for the South Australian Maritime Museum (which it is, but need not have been).

The outcome of these considerations is presented.

Safety

It was realized early on, that 100% public safety would be essential if the lighthouse was to be a hands-on experience for tourists. This led to a higher, though not significantly higher, level of parts replacement. It mainly affected balustrades and platform supports.

Integrity

This proved a constant dilemma and inevitably caused some friction between the parties involved. The State Heritage Branch, the substantive owners of the de-manned lighthouse and the lessees of the lamp and equipment being reinstalled, wanted the lighthouse (a National Estate and State Heritage

item) treated as a genuine museum piece in its own right rather than as a tourist novelty. The tensions between this desire and the available resources of restoration skills and funds were unavoidable and were compounded by the later, added pressure of time.

Cost

It could be said that the biggest thief of integrity was the continuing uncertainty regarding the funding of the work; this pervaded consideration of all things, in particular:

- the degree of sophistication in the marking and tagging system and the extent to which it was followed in the re-erection process;
- the degree to which cast and wrought iron sections were replaced with reproduction elements fabricated from mild steel;
- the use of contemporary profile bolts rather than large, traditionally shaped rivets;
- the non-replacement of the internal linings of the tower;
- a new concrete base somewhat different to the base it had on Neptune Island;
- the need to minimize as far as possible, the requirement for ongoing maintenance.

As far as was finally practical the principles of ICOMOS were followed. Strictly speaking however, the outcome was probably closer to rehabilitation than restoration.

On completion of the repair and recoating stages, portions of the lighthouse were reassembled in the Department of Marine and Harbors workshops. Early in 1986 these portions were transported to the newly prepared concrete base waiting at the end of Commercial Road.

Re-erection was managed by South Australian Maritime Museum staff, in particular Don Thorpe, aided by Frank McGillon, who had been involved some years before with the dismantling of the Cape Jaffa Lighthouse and its re-erection at Kingston in

the south east of South Australia. These two gentlemen developed and prepared the reassembly sequence, diagrams and program and oversaw the work of the riggers who were hired in conjunction with a mobile crane.

In February the 15 tonne roundhouse section was floated on a pontoon across the harbour and lifted by crane onto the pre-prepared concrete base. Re-assembly followed over the next one and a half months, with furious work on the new Civic Square proceeding all around. The re-erected lighthouse (without its lamp) was officially opened by the Queen during a civic ceremony on 13 March 1986, after which the Department of Transport set up the kerosene lamp and equipment. The light was finally lit at 8.00p.m. of Friday, 13th June, 1986.

The final cost

Repair and restoration of steelwork	100,000
Re-erection costs	22,000
Miscellaneous expenses	10,000
	$132,000

To this must be added the following donations

Paint system	10,000
Concrete base	7,000
Consultants fees paid	8,000
TOTAL DIRECT COSTS	$157,000

Other unaccounted costs included

Department of Transport: dismantling and shipping ($20,000 for riggers), setting up lamp;	160,000
South Australian Maritime Museum staff time and some 600 volunteer hours.	2,000

Funds came finally from the following sources

Donations by sponsors:

$100,000	National Australia Bank
40,000	State Heritage Fund
4,000	National Estate Grants Program
10,000	Dulux (Paint)
7,000	Pioneer (Concrete)

The probable overall cost was in excess of $400,000.

CONCLUSION

1. The Committee system was effective; not all decisions in the conservation process are clear-cut and few conservation projects can be autonomously led. This was one that required much consideration and ultimately benefited from the consensus approach adopted.

2. The ICOMOS Charter was relevant, but as a guide rather than a bible. This attitude was not presumed but evolved because of:

3. Cost constraints: the seeking of sponsorships and donations as work was proceeding had a debilitating effect upon the consideration of conservation options, as too did the

4. Time constraints: which were essentially arbitrary and led to some corner cutting in the conservation process, with a consequent diminution of the lighthouse's integrity as a heritage item.

All of this was ameliorated to some extent by its removal and relocation to a site which is not the original. In retrospect, I think everyone involved now believes the project to have been a worthy and successful one given the context summarized in this paper.

Restoration Architect
State Heritage Branch
Adelaide S.A. Australia