2024

Palm Cove Jetty – options to improve vessel berthing

FEASIBILITY INVESTIGATION

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Risk level

☐ GACC major ☐ GACC minor ☐ High risk (but not GACC) ☐ Medium risk

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Background

Palm Cove Jetty located (North of Cairns, Far North Queensland (refer **figure 1**) was constructed in 1986 and is a Department of Transport and Main Roads (TMR)/ Maritime Safety Queensland (MSQ) asset. The jetty was historically constructed for tourism vessel access to offshore islands and reef day trips. Due to Double Island resort ceasing operations and the jetty's exposure to the prevailing wave climate, in recent years the jetty has primarily served a tourism role as a popular fishing platform and promenade, with limited vessel berthing use.

Recent changes to the management of Double Island resort, has the potential to generate increased demand for passenger vessel transfers between the island and the mainland. On this basis, the Queensland Government requested MSQ to undertaken a feasibility investigation of options for jetty upgrade works, to improve vessel berthing conditions.

Figure 1 – Location of Palm Cove Jetty (MSQ Asset No. MG99)

Investigation Objectives

The primary objective of the potential upgrade works are to provide improved vessel berthing conditions from Palm Cove Jetty as follows:

- Provide improved operational (less than 1 in 1 year ARI event) berthing conditions including –
    - Increased protection from wave and wind conditions

    - Improved/updated berthing facility – including consideration of improved disability access
    - Protected berth to provide minimum water depth -2.5m LAT
- Consider new infrastructure that can survive a minimum design 1 in 50 year ARI combined storm tide and wave condition, with suitable Sea Level Rise (SLR) allowance, consistent with a 25 year design life in AS3962.
- To consider all options but with a focus on cost-efficient options.
- Provide an upgrade which minimises ongoing maintenance costs.
- Upgrade elements to have negligible impacts on existing community promenading and fishing use of the jetty.
- Upgrade elements to minimise impacts on scenic amenity.
- Upgrade elements to minimise impacts on natural coastal processes and existing habitat/environmental values.
- Upgrade elements to avoid Cultural Heritage and Native Title impacts.

Scope

The scope of this feasibility investigation includes the following elements:

1. Review of existing jetty infrastructure
2. Capture current hydrographic survey of the jetty and offshore areas
3. Desktop coastal processes and metocean conditions review
4. Upgrade options consideration
5. Desktop assessment of Cultural Heritage and Native Title considerations/constraints
6. Desktop assessment of environmental considerations/constraints and approval requirements
7. Initial consultation with state and federal regulating agencies regarding options
8. Cost estimates and risk
9. Limitations/constraints
10. Discussion/recommendations

It is important to note that this investigation is an internal technical government document, so community/stakeholder feedback has not been part of this investigation. However, this would be a key element in the event an upgrade project was to progress.

Existing Infrastructure

Palm Cove jetty was a Queensland Government initiative in the 1980's, being one of many tourist jetties funded throughout the State to encourage Queensland as a tourism destination.

The existing Palm Cove Jetty was first constructed in 1986. A copy of the original design plans is located in **Appendix A**.

Major repair works occurred to the jetty in 2020 at a cost of $750,000. The repair works included treating corrosion of piles and deck support structure, replacement of timber whalers and removal of failed fender piles. These works were primarily to extend the life of the structure and make it safe for its primary current use as a public fishing platform and recreational promenade.

The notional jetty asset life when constructed was 50 years. The jetty is currently 38 years old. With the recent repair works and scheduled maintenance, the jetty should last for another 30 years under its current usage.

The jetty structure was not designed to support a wave screen structure and given its age and the high horizontal loads associated with design storm waves impacting a solid screen, a preliminary engineering assessment indicates that any affective wave screen needs to be designed as an independent structure (ie, not connected to the jetty).

The existing main jetty structure however is in good condition and provides a suitable accessway to any potential new or upgraded berthing arrangements.

Current Berthing Arrangements

The original structure included a total of 4 berthing locations, one single level large vessel berth at the jetty head (berth 1), a lower berth on the back of the main jetty head berth (berth 4) and then two multi-level stepped landings on the northern side of the jetty stem (berths 2 and 3). See layout **figure 2.**

The fender piles for all berths were in a significant state of disrepair and many had to be removed in the recent maintenance works. The berth 1 fender piles were updated in the recent maintenance works, while berths 2 and 3 had the majority of the fender piles removed given they were beyond repair and replaced with strip fendering along the edge of the platform to accommodate smaller vessel use. Berth 2 has had the bottom landing and fender piles removed (because of damage beyond repair), with some fendering installed on the two remaining platforms for small vessel access. Berth 3 similarly has had most of the fender piles removed and replaced with strip fendering to facilitate small vessel access on its three stepped berthing levels. Berth 4 has also had its fender piles removed. Berth 1 is at the jetty deck level and is subsequently only suitable for large multi-level vessel access. Figures 3, 4 and 5 show photos of berth 2, 3 and 4 respectively.

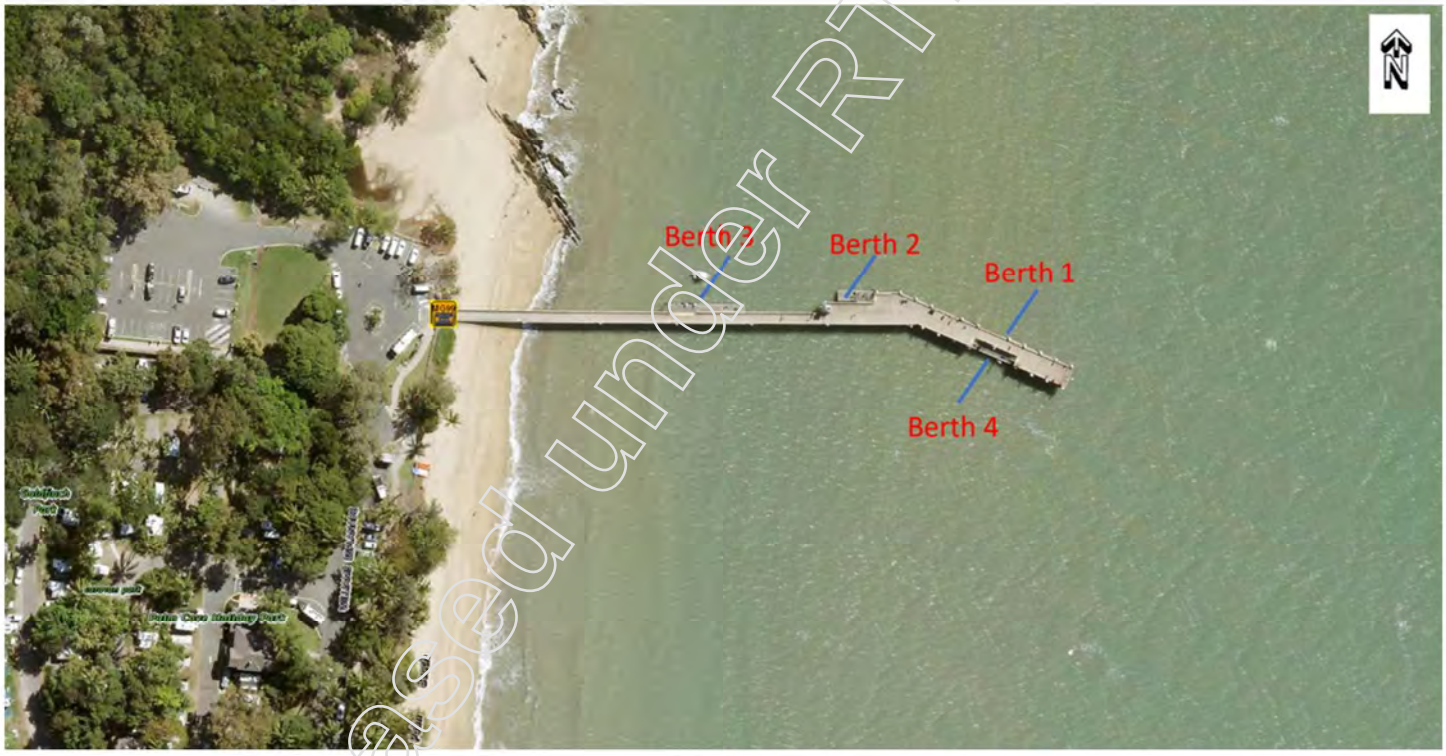


Figure 2 – Existing Palm Cove Jetty has four berthing faces as indicated.

Figure 3 – Berth 2 stepped aluminium berth with lower landing removed and strip fendering

Figure 4 – Berth 3 stepped aluminium landings with strip fendering

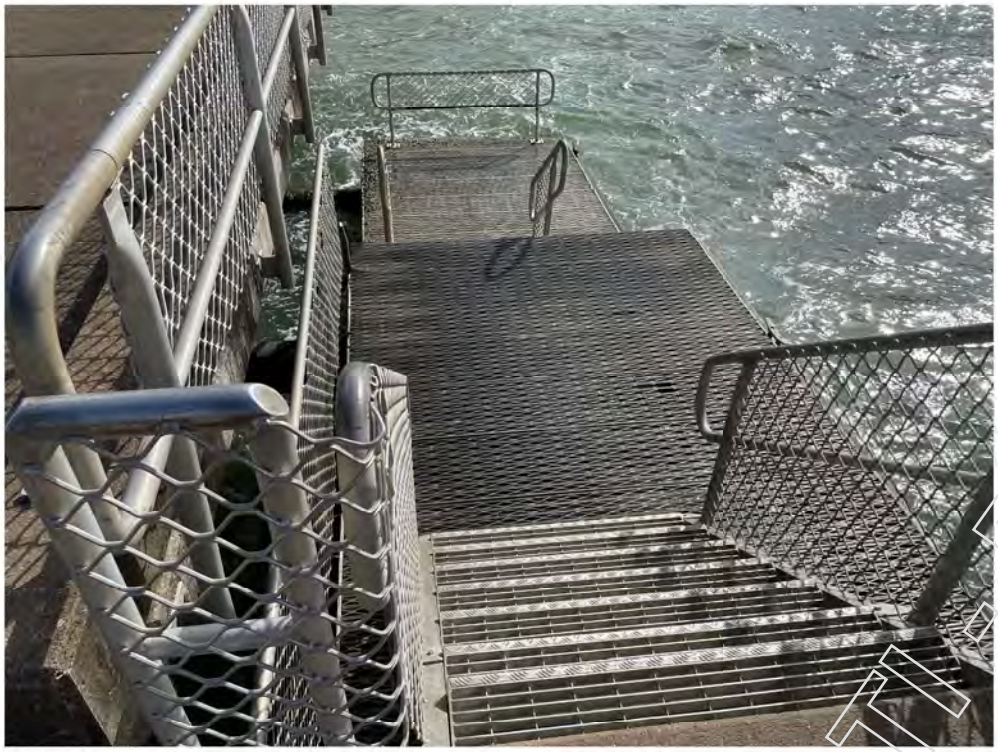


Figure 5 – Berth 4 single level aluminium landing with strip fendering

The existing jetty is designed for heavy vehicle access loads, and subsequently is suitable to support passenger transfers and heavy luggage and likely day to day island supplies. However, given the proximity to the Cairns Port and Yorkey's Knob Boat Harbour, it is unlikely the jetty would need to be utilised for construction material transfers/refuelling and so on. For this reason this feasibility investigation has focused on servicing passenger transfers only.

From an accessibility perspective, Berth 1 is the only berth that can facilitate disabled access given it is at the jetty deck level. However, such access would require a large multi-level vessel which would be able to provide access during specific tide windows. MSQ would consider it unlikely that passenger transfer demand from Palm Cove to Double Island is likely to be enough to support such a large vessel in the short term, however this would need to be confirmed via stakeholder feedback and a detailed business case. The remaining berths (2,3 and 4) are all stepped landings and do not service disabled access in their present configuration.

Bathymetry Conditions

MSQ's Hydrographic Services team undertook a detailed survey of the seabed surrounding the jetty area in January 2024 a copy of this survey can be found in **Appendix B**. **Figure 6** below includes the area of the survey overlaid on an aerial photo of the Jetty.

From review of this survey it can be concluded that berth 1, 2 and 4 all have natural water depths suitable for all tide berth access with depths below -2.8m LAT. However, berth 3 is part of the adjacent lower beach profile and subsequently is naturally tidally restricted with the inner landing shoreline edge at 0m LAT graduating to the outer edge at -2.3m LAT.

Generally the water depth offshore of the jetty is on average -3.6m LAT with the -3m LAT contour in the vicinity of the Berth 2 location on the jetty.

From review of the design plans against the updated survey, the seabed contours are largely unchanged since the jetty was built in 1986, representing a fairly stable seabed profile.

Figure 6 – Bathymetry Survey J370-003, 27 January 2024, vertical datum LAT.

Coastal Processes and Metocean Conditions

This feasibility study has included a desktop review of existing coastal process and metocean information available on which to frame the likely site conditions. Key sources of information include:

- the Options Investigation Report - Yorkey's Knob Boat Ramp Facility (BMT(2019);
- Mulgrave Shire Beaches, Beach Protection Authority Report (1984) and Cairns Wave Buoy Data.

Tidal Conditions

While there is a slight variance in tidal conditions between Cairns north to the Palm Cove Jetty site, for the purpose of this feasibility investigation the tidal amplitudes of Cairns have been adopted as shown below:

HAT = +1.83m AHD

MHWS = +0.93m AHD

MSL = 0m AHD

MLWS = -0.92m AHD

LAT = -1.74m AHD

This indicates a tidal range of 3.57m, which represents a challenge to the design of any wave protection structure and associated impacts on scenic amenity. BPA (1984) reports no significant offshore currents in the region, wind driving some currents but no significant tidal signal to -5m AHD (depth at end of the jetty). Based on this data, ambient tidal currents are not expected to be a design constraint.

Wave Climate

Cairns wave buoy was installed in May 1975 and continues to operate through to the present day. The wave buoy is located approximately 4.5km due east of the Palm Cove Jetty location (shown in **figure 7)**.

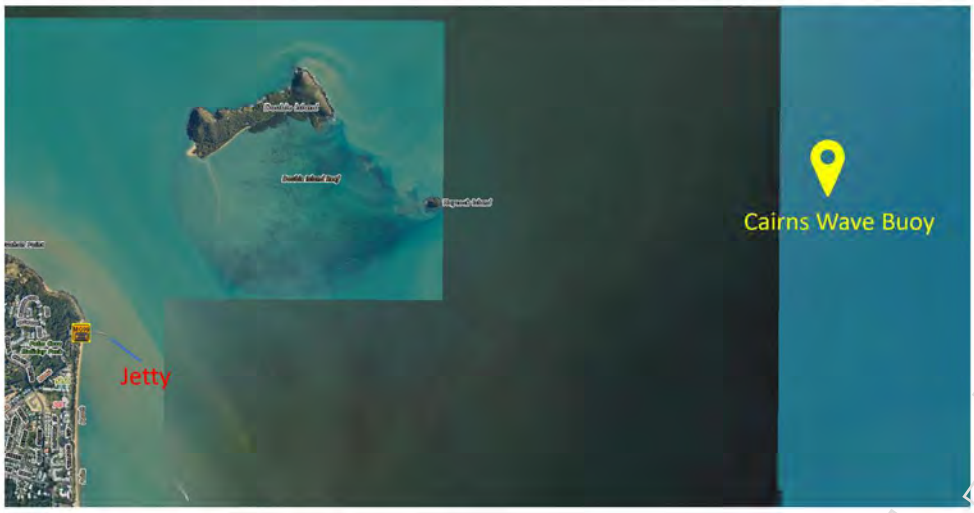


Figure 7 – Cairns Wave Buoy Location

Figure 8 represents typical wave conditions at the Cairns wave buoy site from BMT (2019). Key features of this indicate that the dominant wave climate is from the East South-East, however with the top ten storm wave events coming from the NE sector. **Figure 7** shows that the jetty location has some natural protection from the NE sector from Double Island and its associated reef system.

While detailed modelling of wave transmission to the jetty site is required to define specific design parameters/constraints this data suggests that a wave screen providing protection just from SE conditions may provide a suitable improvement to berthing conditions. However, an assessment of negative berthing conditions during northerly conditions and stakeholder acceptance would have to be part of any such option being adopted.

A direct northly wave or north easterly wave may diffract and impact the jetty from between Double Island and the mainland. During a major storm/tropical cyclone event there is also a chance that large storm waves that come from the NE sector could diffract around either side of Double Island and meet in the vicinity of the jetty and magnify wave conditions there, which is something that would require detailed investigation during any future detailed design processes.

If it was shown that the magnified wave conditions were going to damage any wave protection structure, the obvious solution would be a mini harbour option protecting the berth from the north around to south.

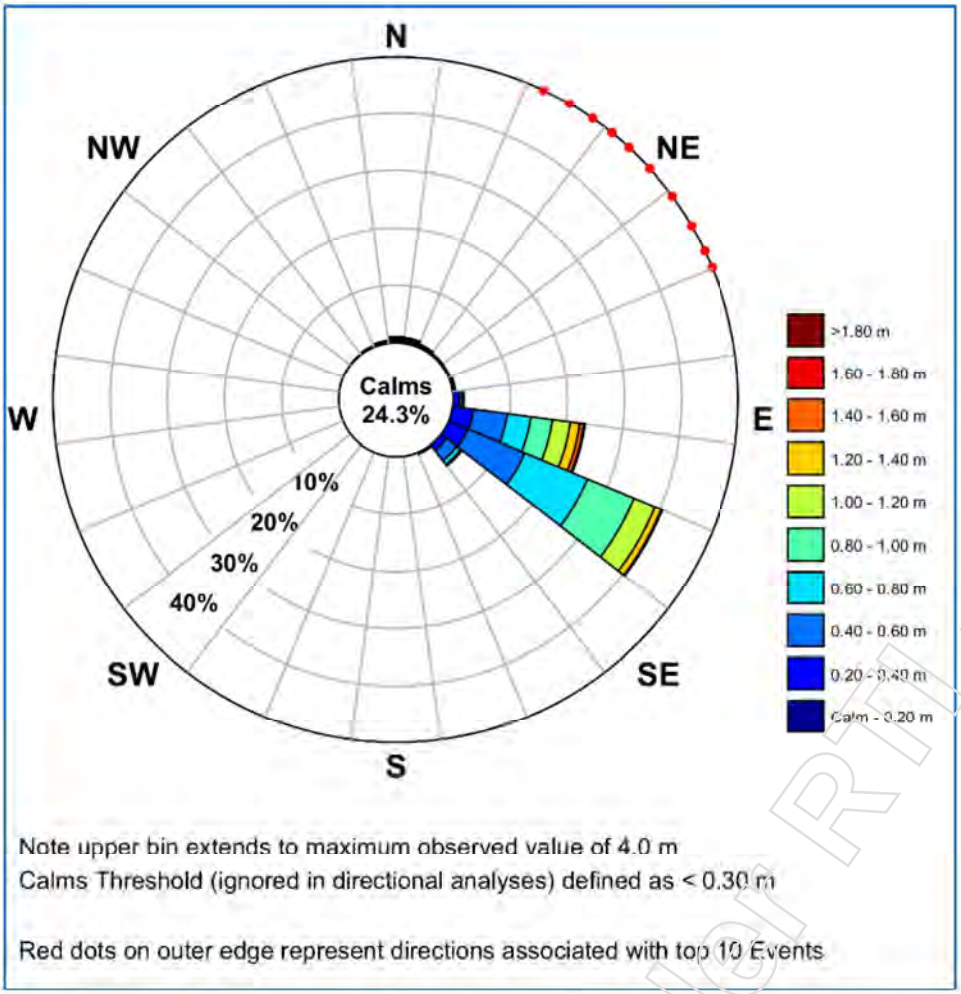


Figure 8 – 11 year Hindcast Wave Rose at Cairns Wave Buoy location used for design of the Yorkey's Knob Facility figure 3-9 BMT (2019)

BMT (2019) reports 1 in 50 year ARI event wave conditions of Hs = 2.33-2.82m and Tp 8-9s and 1 in 1 year ARI event in Hs=1.32-1.4m and Tp 5-6s to a water depth of approximately -3.5m LAT offshore of Yorkey's Knob, from statistical analysis of combined wave and water level conditions.

"On a more local scale, Cape Grafton shelters the Cairns northern beaches from the south-easterly waves generated within the GBR lagoon. Fetches within the GBR lagoon are generally limited to 30-50 km by the large mid shelf reef complexes. Non-cyclonic winds rarely exceed 25 knots and locally generated sea wave heights are typically less than 1.4 m. East-south-easterly sea waves within the 3-5 second period band are the most prevalent wave energy component measured at the Cairns Waverider buoy" (BPA. (1984)).

Based on the information above adopting a wave screen operational design condition of Hs=1.4m and Tp=5-6s has been adopted for the purpose of this investigation, accepting that the ultimate design condition 1 in 50 year ARI event would be subject to a further detailed modelling investigations.

Sediment Transport Trends

BPA (1984)'s detailed coastal processes investigations concluded that the net longshore sand transport out the northern end of Palm Cove Beach is estimated at 13,000 m^3/year. The rocky headland immediately north of Palm Cove Jetty acts as a coastal control and subsequently any upgrade works are not expected to have negative local shoreline impacts. Typically the planning and design of a wave screen structure would look to be as small and as offshore as possible to minimise its influence on wave energy reaching the shoreline and subsequently minimise changes to natural coastal processes. However given the shoreline erosion risk along the northern beaches of Cairns, there may be a desire for such a structure to interrupt sediment transport to provide improved coastal management outcomes, however this is beyond the scope of this investigation.

Upgrade Considerations

Any proposed upgrade to Palm Cove Jetty to improve tourism access requires two primary elements. Firstly, the need for improved protection from prevailing wave conditions and secondly, the need for an upgraded berth to service expected usage. The following two sections discuss the ways in which these two outcomes may be achieved.

Practicalities of wave protection

Broadly there are four primary wave attenuation design options

1. Rubble mound rock or concrete unit breakwaters
2. Floating breakwaters
3. Light weight batten screen
4. Engineered piled wave screens

Rubble mound rock breakwaters make up the vast majority of wave attenuation structures in Queensland, they represent a very reliable and low maintenance design in open coast environments, which are exposed to large waves and cyclone generated storm surge conditions. The other three wave screen options are largely applied to enclosed waters or more protected sites, or in situations where rubble mound breakwaters are not feasible due to excessive water depths (Engineered piled wave screens).

Table 1 - Pro's and Con's of the four wave barrier types:

Wave Attenuation Option	Pro	Con	Constraints
Rubble mound rock breakwaters	Proven Design – attenuating all wave energy and survivability in cyclone events Can be relied upon to provide a level of protection during cyclone events Slope and rock voids naturally dissipates wave energy Low Maintenance	Larger seabed and spatial footprint Greater coastal process impact (than other options) Visual amenity impact	Requires suitable rock source Logistics of transport and placement (costly and social impacts) Large volumes of material required in deep water environments

Wave Attenuation Option	Pro	Con	Constraints
Floating Breakwaters	Potential lower-capital cost option for disrupting small period waves Allows coastal processes underneath Low seabed and spatial footprint Low visual amenity impact – given it goes up and down with the tide	Wave attenuation only effective for small period waves – typically used to address boat wash and wind chop **PIANC(1994)** Significant damage expected from cyclone events with associated potential impacts on the GBRMP Significant ongoing maintenance liability	Infrastructure has narrow window of wave attenuation benefit which needs to align with user expectations Floating infrastructure is not suitable for exposed wave climates, so would need to be removed or sunk prior to cyclone events both of which are typically not practical. Given above, the berth it is protecting would need to be cyclone resistant
Light weight baffle screen	Potential very low-capital cost option for disrupting wind chop Allows coastal processes underneath Low seabed and spatial footprint May include elements to encourage marine growth and increase habitat values	Limited wave attenuation capacity Significant damage expected from cyclone events with associated potential impacts on the GBRMP Ongoing maintenance liability	This option would require significant design and ongoing management complexity In order for it to provide any wave attenuating function the structure would need to be as solid as possible but equally it would need to be porous enough so it doesn't fail under operational conditions. In addition at this location the screen would need to be designed to lay down flat on the seabed (certain elements fail) or be manually removed to deal with avoiding structural damage during major storm events.

Wave Attenuation Option	Pro	Con	Constraints
Engineered piled wave screens	Low seabed and spatial footprint Provides improved wave attenuation compared to floating options and baffle screen options Allows some coastal processes underneath	Vertical face reflects most wave energy and results in significant overtopping from wave runup Disrupts wave energy but does not block all wave energy with wave transformation being greater with larger period waves and varies based on specific design parameters. Custom engineering design required for specific site represents significant cost risk Visual Amenity impact, although narrow, wall needs to be as high or higher than a rubble mound breakwater to attenuate waves Ongoing Maintenance costs dependent on design	Challenge designing a permanent structure to achieve the desired wave attenuation and design storm survivability in this location Depending on final design may not provide any sheltering capacity during cyclones Preferred to have wave screen offset from area it is protecting Beadle et al. (2019)

Palm Cove Jetty represents an open ocean location that is exposed to waves and storm tides associated with cyclonic events. PIANC (1994) indicates that locations with an operational wave climate over 1m are not suitable for floating breakwaters and MSQ's previous experience with floating infrastructure in exposed locations concurs with this. On this basis, floating breakwaters are not considered feasible and will not be considered further. Given this exposed location a lightweight baffle structure is also unlikely to be effective and presents extensive management/maintenance constraints.

Subsequently this option is not likely to be feasible as a permanent solution, however may be applied as part of a lower cost trial to better understand potential benefits from a small footprint wave screen to provide a basis for a more longer-term solution. On this basis, while a lower-cost baffle screen trial may provide data to better understand if a short section screen provides berthing improvements, only two wave screen options have been considered further as feasible permanent solutions at this site, as detailed below.

Rock Rubble Mound Breakwaters

MSQ has significant experience with the construction of rubble mound rock breakwaters and is aware of suitable rock sources in the local area for such a project. Key items of consideration associated with adopting such an option are as follows:

1. Seabed and spatial footprint impacts – environmental and design layout
2. Visual amenity impacts
3. The likely need for barge-based transport of rock to site and marine based construction with associated costs

Engineered Piled Wave Screens

There are numerous types of piled wave screen designs, which are typically located in largely protected waters. Such designs can be anything from steel, timber or FRP baffles fixed via a frame to existing jetty piles up to highly engineered stand-alone heavy duty precast concrete structures.

The tidal range and the wave heights at Palm Cove Jetty mean that the wave loadings are expected to far exceed the existing structures pile capacity if a screen structure was directly fixed to them, particularly given the current condition of the structure. In addition the configuration of the existing jetty does not lend itself to providing the required extent of protection from the E – SE wave climate. While a wave screen option (subject to more detailed investigations) may be potentially designed to utilise some bracing assistance from the jetty structure, for the purpose of this investigation it has been considered that a stand-alone structure will be required to meet the desired objectives, of survivability in a cyclone.

MSQ has identified the following examples of stand-alone engineered piled wave screens for comparison purposes.

Marlin Marina Wave Barrier, Cairns Inlet – fixed piled structure with attached wave baffles – constructed in 1999, with a contract value of $11.03M, and an estimated 3% maintenance cost (to be recovered by berthing fees of vessels within the marina). **PWC No. 67 (2000)**

Tawau Ferry Terminal, Malaysia – tidal range 3.86m, water depth 10m,1% AEP = tidal currents 1.9m/s, waves Hs = 0.52m, Tp = 5s. **Atkins. (2019)**

Snug Cove, Eden, NSW – tidal range 2m, water depth 10m, 1 in 50 year ARI waves Hs = 0.7-1.1m, Tp = 3-4s, design limit based on 200 year ARI H1% with 0.4m SLR allowance. **Beadle et al. (2019)**

The later two examples primarily utilised engineered piled wave screens because of the relatively small wave climate and significant water depth at over 10m. To give context to this decision the volume of rock material required per metre of breakwater constructed at the end of the Palm Cove Jetty in -3.6m LAT would be 30% of that required if the water depth was -10m LAT. It is this difference that was most likely the driver for the custom concrete wave screen being considered as more cost efficient. The Eden project delivered a 366m long wave screen with a final media reported cost of $32m following an initial budget allocation of $10m. MSQ cannot comment regarding the accuracy of these figures and what they include, however this experience does indicate that there is a significant cost risk associated with a custom engineered piled breakwater.

Equally the Marlin Marina wave barrier project in Cairns was subject to a Public Works Committee inquiry in January 2000 regarding its purpose, suitability and value for money, following its construction in 1999. This inquiry concluded favourably and Cairns continues to benefit from this investment. The cost recovery model associated with a structure to protect a marina such as this however differs from an upgrade to berthing at Palm Cove Jetty. However, the Marlin Marina example does support a conclusion that a wave screen structure is feasible in the region.

Key items of consideration associated with adopting such an option are as follows:

1. Cost risk with custom design
2. Visual amenity impacts
3. How critical is space
4. Assess wave attenuation achieved with specific design
5. What coastal process benefits are gained (if any over a rock breakwater)

Indicative wave screen design parameters adopted for this investigation

While the above covers the wave dissipation characteristics of these two wave attenuation options associated with a virtual infinite structure, a key part of the design is the spatial length and orientation of the structure. These variables will influence how much wave energy diffracts around the structure and has the potential to impact the berthing area. In addition, if a wave screen is just designed to protect against specific wave directions for cost efficiency purposes then it

must be considered how waves from other directions may interact with the wave screen and subsequently impact the berth, given such interactions may have unintended negative consequences.

A key component of progressing such a project with either wave protection option, is the essential need for extensive numerical wave modelling to define the optimal dimensions and orientation of the structure to gain the most efficient design solution to meet user expectations. Also, physical modelling is a key component that should be included. Physical modelling was utilised by MSQ as part of the Clump Point project to reduce the breakwater height to gain cost efficiencies, but more importantly meeting community expectations by ensuring visual amenity values were retained to the greatest extent possible.

For the purpose of providing preliminary cost estimates the following concept design dimensions have been assumed based on previous designs and assumed site metocean conditions.

WAVE PROTECTION 1 - Rubble Mound Rock Breakwater (**Figure 9** is a sample typical breakwater cross-section)

Crest width 5m

Crest elevation 4m AHD (2.17m HAT, based on structure being overtopped during extreme events)

(note: Jetty Deck level +4.5m AHD)

Batters 1:2

Seabed founded -4m LAT (assume 400mm settlement allowance)

WAVE PROTECTION 2 - Custom Engineered twin pile wave screen (**Figure 10** is a cross-section of the design from the Atkins. (2019))

Crest elevation 4m AHD (2.17m HAT, to minimise overtopping during operational conditions)

(note: Jetty Deck level +4.5m AHD)

Assumed duel 610mm x 19mm steel piles @ 4m spacings

Assumed 4m x 7m precast wave screen panels

Assumed 1.5 x 1.5 x 2.5m external dimensions of precast headstock buckets

Assumed 4.5m3 of insitu concrete pour in each headstock

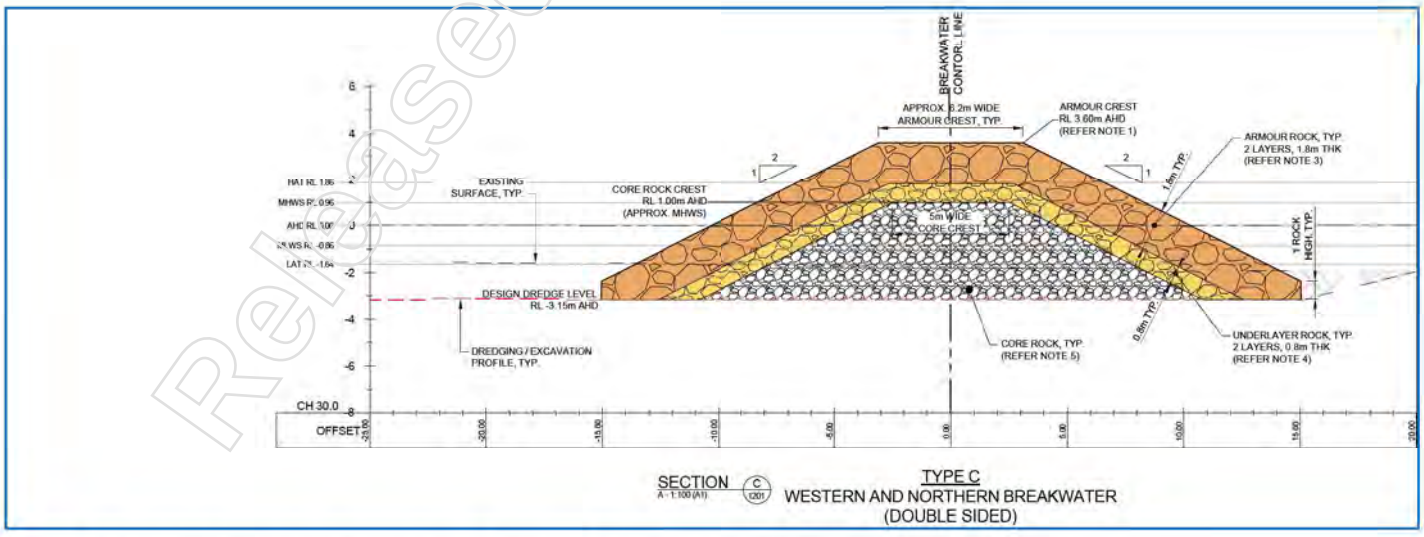


Figure 9 – Sample breakwater detail from Yorkey's Knob Boat Ramp Project

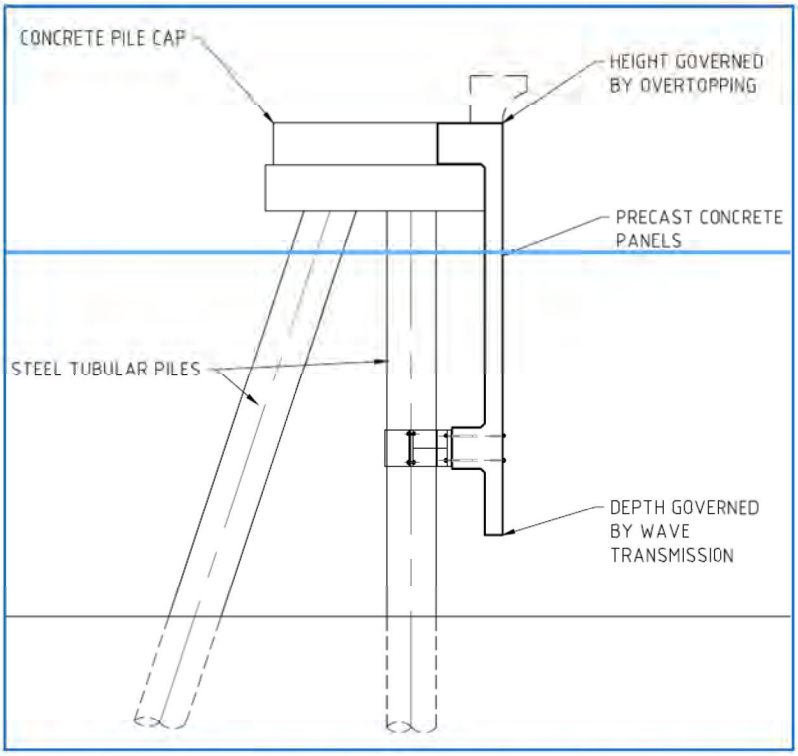


Figure 10 – Example precast Concrete piled wave screen from Tawau, Malaysia (Atkins. (2019))

Improved Berth Access

MSQ has identified 3 options to provide improved berthing access detailed below:

BERTH UPGRADE A - Return existing stepped landing to original condition

The original investigation request indicated a primary intention of considering a cost-efficient wave protection improvement for the existing inner northern berths (Berth 2 or 3). This initial primary option is to undertake repair and replacement works to return either berth 2 or berth 3 to its original condition to service vessel access in combination with a wave barrier (options discussed above). These works would include replacement of berthing piles, fendering, replacement of the missing platform (if Berth 2 chosen) and associated handrails and elements to meet existing design standards. However the chosen berth would remain a stepped landing facility.

BERTH UPGRADE B - New multilevel fixed ramp berth providing improved disability access

Given berth upgrade A does not represent any improvements to disability access, this option proposes the demolition of an existing berth(or berths) and the construction of a new fixed ramp landing facility which would provide improved disability access at two landing levels below jetty deck level (subject to detailed design). Such an option proposes to provide a cyclone resistant structure that would not relay on the wave barrier for protection during the design storm event. Such an option represents a significant new piled structure which will take up a much increased footprint and come at significantly increased cost with the need to meet disability accessibility ramp slope and landing requirements. A sample concept design of a similar structure is shown in figure 11.

BERTH UPGRADE C - New Pontoon berth providing improved disability access

Following MSQ experience delivering the Clump Point project, in the event a suitable wave protection structure is part of an upgrade, that can provide the berth adequate protection during the design storm event, then a Pontoon berth is a feasible option that will provide improved disability access and likely represents the most preferred berthing option by tourist operators. A sample of such a pontoon configuration is provided in figure 12.

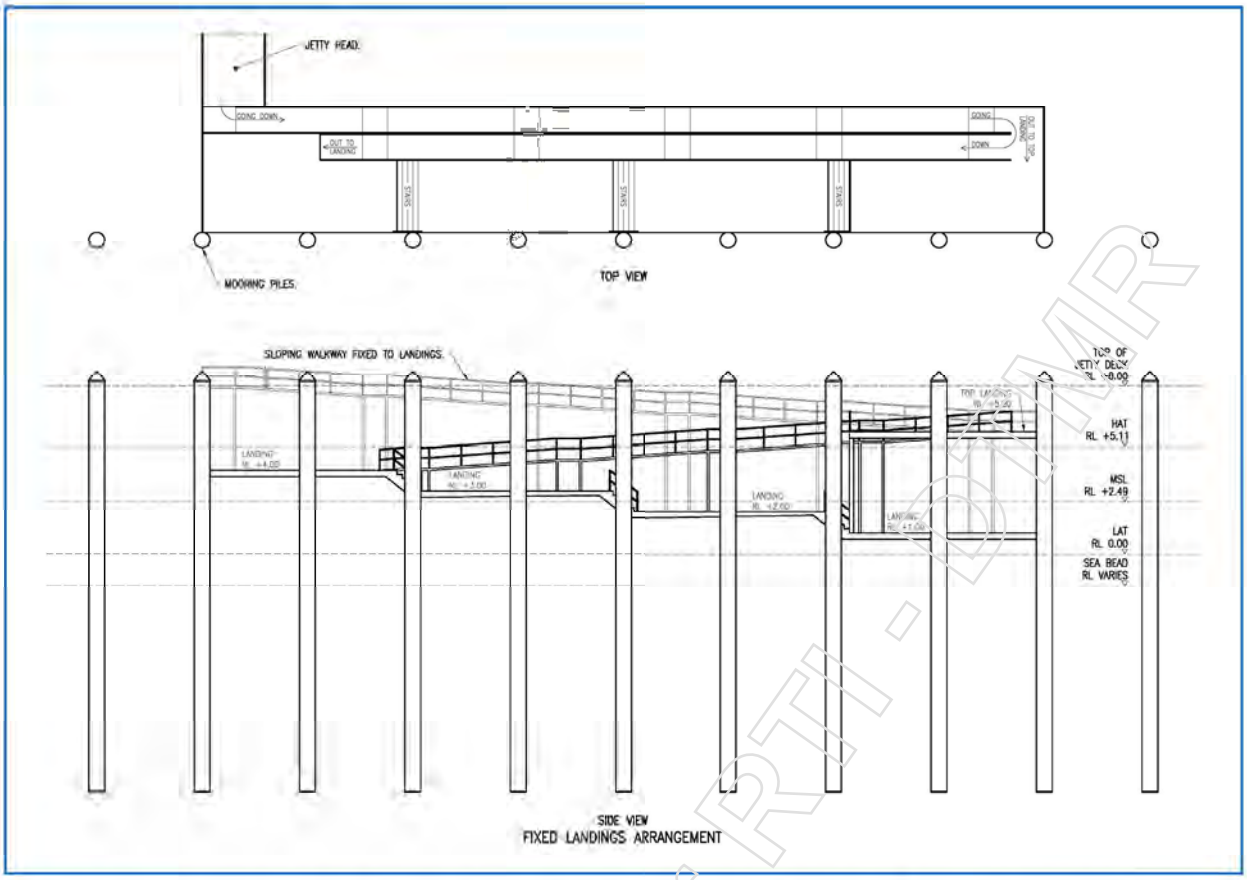


Figure 11 – example fixed ramp berthing facility, note this sample is a concept design for a location with much greater tidal range so a more efficient design is viable

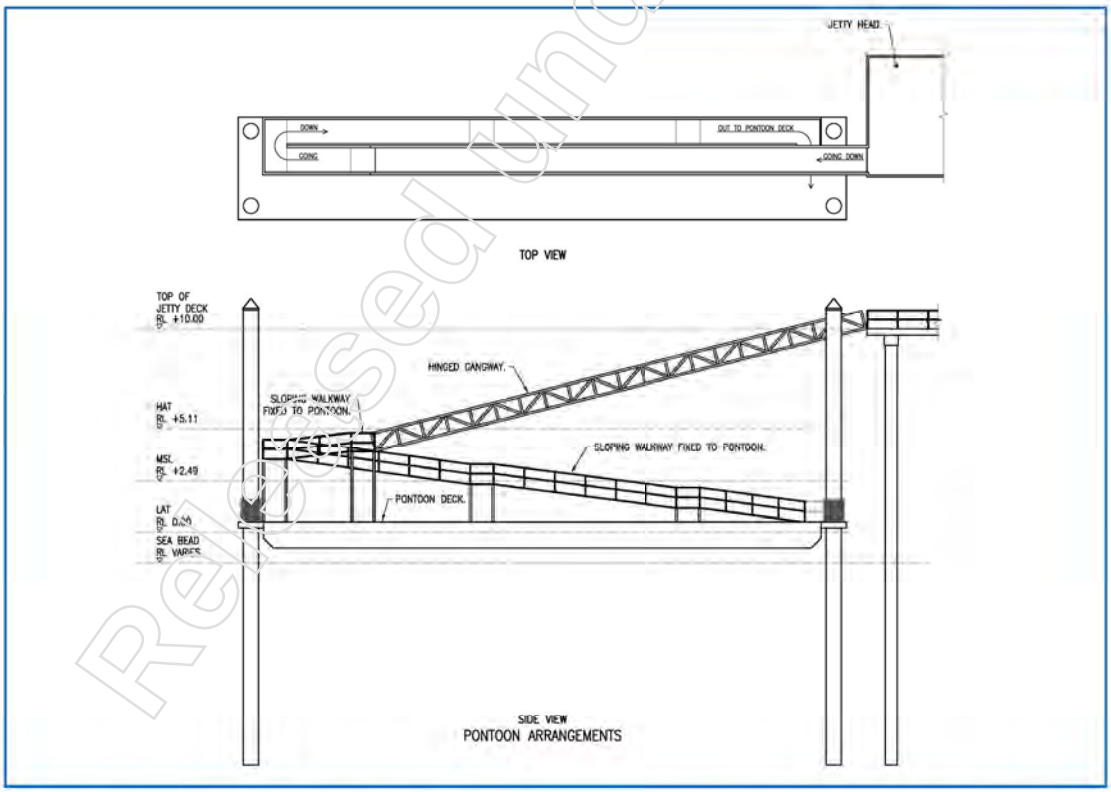


Figure 12 – example pontoon berthing facility, providing improved disability access. Note this sample is for a larger tidal range. MSQ has delivered similar pontoons at Thursday Island and Mission Beach

Combination Upgrade Options

The above investigation identified two viable types of wave protection infrastructure and 3 types of berth upgrade for further consideration, subject to the wave protection provided. Based on the historical wave climate shown in the wave rose **figure 8** two general layout options have been identified.

1. A wave screen or rock breakwater is constructed to protect a fixed landing berth from the dominant East South-East wind and wave conditions. Such an option would require the shortest length and hence lowest cost protection structure, however the berth would still be exposed to north and diffracted north eastern wind and waves. In this case the berth would have to be a fixed (not floating infrastructure so BERTH UPGRADE C would be excluded). Stakeholder feedback would be key to such an option progressing, given the need to accept that the berth upgrade would still be exposed to operational waves from the north.
2. Create a mini harbour either via an engineered wave screen OR a rubble mound rock breakwater to provide a level of protection from all wave directions. Such an option could utilise any of the berthing options identified. Subject to the level of protection provided during the design storm event.

Dredging

Bathymetry data indicates that existing Berth 3 is tidally restricted and would require dredging to facilitate all tide access. Dredging of the historically stable lower beach profile in this location is expected to result in rapid infill and significant ongoing maintenance liability to the State. On this basis MSQ would not support any upgrade option associated with Berth 3, when options further offshore are feasible without the need for dredging, a position supported by approval authorities.

Options

Following discussions above, MSQ has identified 6 key options summarised below and indicated conceptually in figures 13-17:

Option 1 – Do nothing at Palm Cove Jetty, provide tourism access to Double island via facilities at Yorkey's Knob

Option 2 – Undertake a wave screen baffle trial, by designing a temporary Fibre Reinforced Polymer (FRP) baffle structure that would be fixed to the existing piles south and east of the Berth 2 and monitoring its performance. This option would be of particular benefit in giving users an experience of the likely benefits and constraints of a South East only screen structure. Note: This option would only ever be a trial, given its limited design life, that would need to be replaced by a more permanent solution if acceptable benefits were realised.

Option 3 - Upgrade Berth 2 to its original design condition (stepped landing) and install the shortest wave barrier feasible to protect it from the dominant east and south-east conditions. This option would require extensive modelling to refine the design to minimise length and subsequently cost, and also minimise negative impacts from north and north easterly waves and ensure that the structure can survive the design cyclone event. This is a particularly complex exercise given wave screens are typically designed to resist waves from one direction. Part of the jetty deck would need to be temporarily removed for construction and then replaced.

Option 3A – Option 3 but utilising a rubble mound rock breakwater

Option 4 – Demolish berth 3 and build a new fixed ramped access berth facilitating two levels of disability access with a separate OR combined wave screen structure to provide protection to the berth from the dominant east and south-east wave conditions. As above this option would require extensive modelling to define the right orientation and layout to meet its objectives and to minimise negative impacts from north and north easterly waves and ensure that the structure can survive the design cyclone event.

Option 5 – The smallest mini harbour possible utilising an engineered piled wave screen to provide suitable protection from operational waves conditions from all directions, protecting one upgraded fixed ramp landing berth

Option 5A – Option 5 but with a wave screen protecting a heavy duty pontoon berth. Noting that during the design storm event significant overtopping of the structure may be unavoidable and subsequently may prohibit the pontoon option.

Option 5B – Option 5A but utilising a rubble mound rock breakwater which will provide suitable protection to a heavy duty pontoon berth.

Option 6 – Construct a half moon harbour around the jetty head and a heavy duty berthing pontoon. Such an option presents other opportunities but comes at significant cost.

Note: these are all concept ideas with orientations, locations and dimensions subject to detailed modelling investigations and stakeholder feedback. The list has been limited in order to present a finite list of options that have been indicatively costed for further consideration.

Figure 13 - OPTION 2 – FRP Baffle Wave screen Trial (35m) – note: this is not considered a feasible permanent solution, given its limited design life.

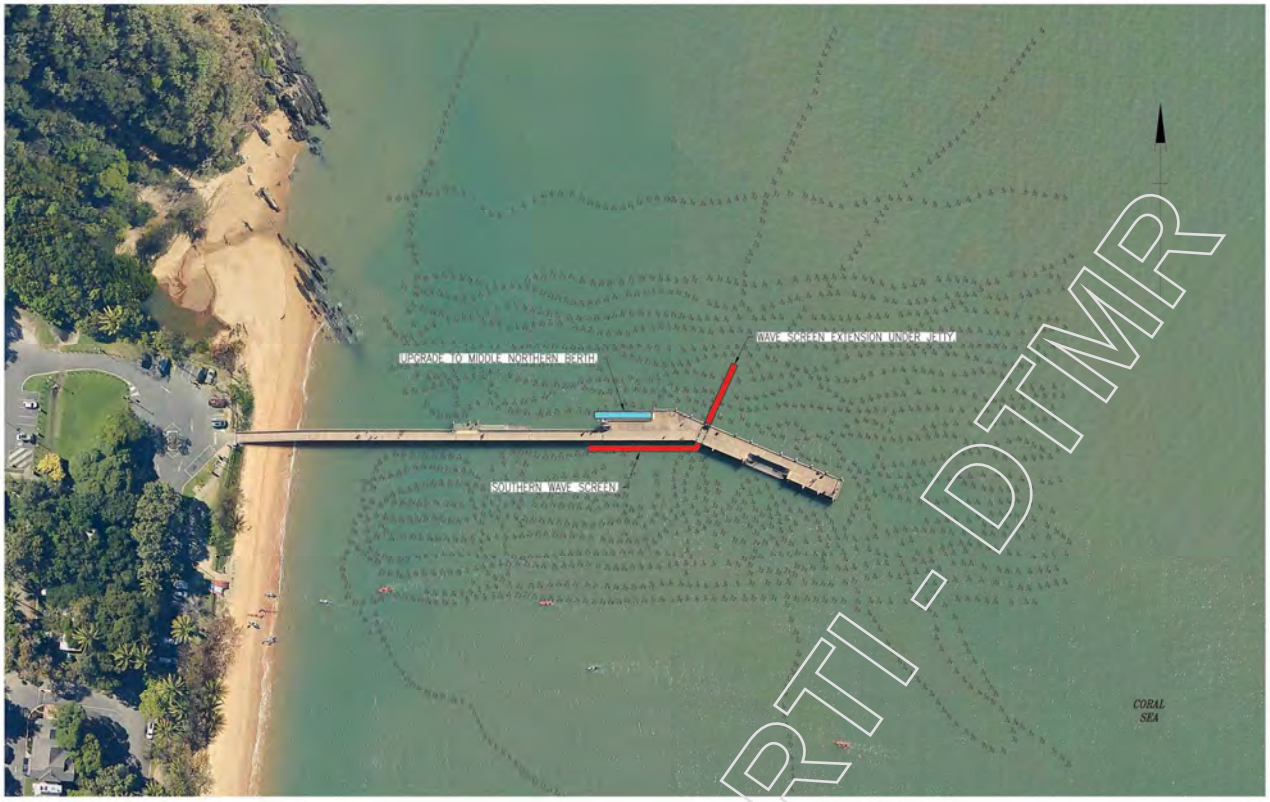


Figure 14 - OPTION 3 – Wave screen (60m) and upgrade of Berth 2 stepped landing, OPTION 3A – Rock breakwater alternative

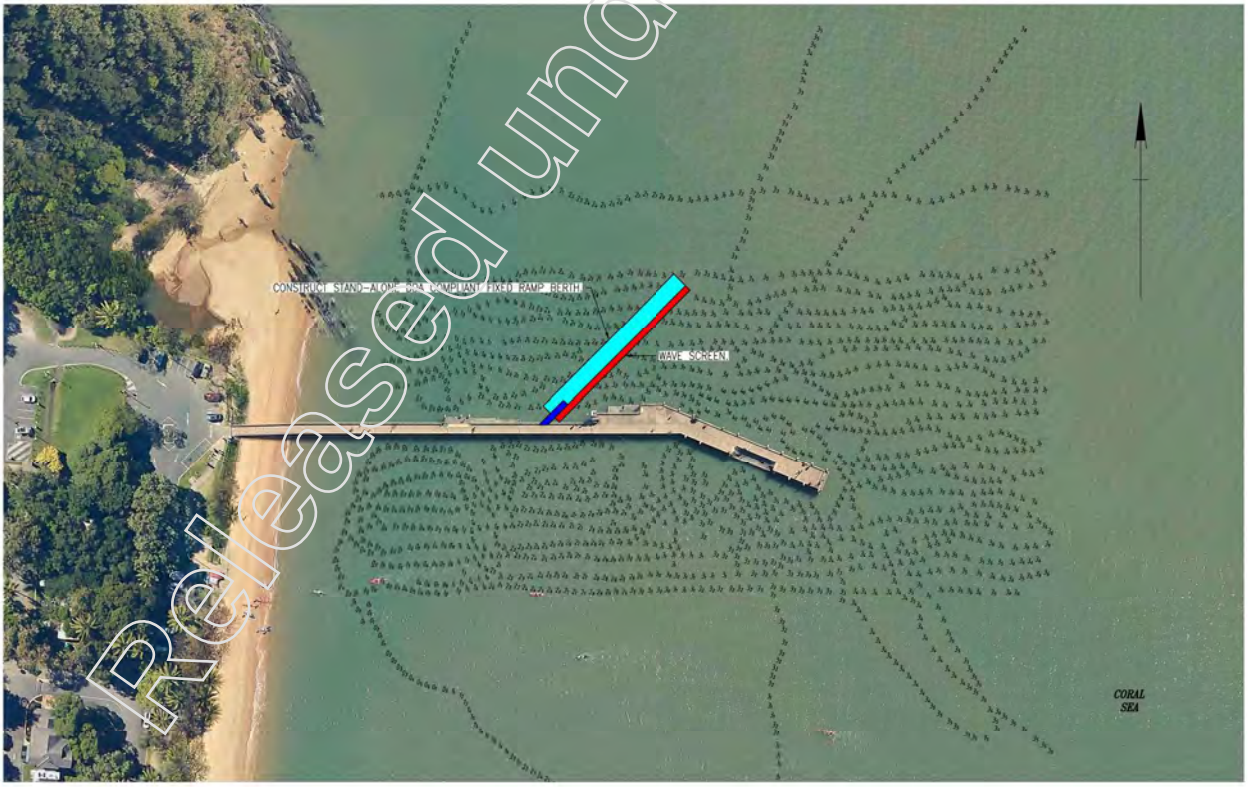


Figure 15 - OPTION 4 – DDA fixed ramp berth (60m) with connected wave screen 70m with berth facing north-east, so into sea from the exposed side

Figure 16 - OPTION 5 - Mini harbour wave screen + fixed landing ramp berth, Option 5A - Mini harbour wave screen + heavy duty DDA pontoon berth and Option 5B – Mini harbour rock breakwater + heavy duty DDA pontoon berth.

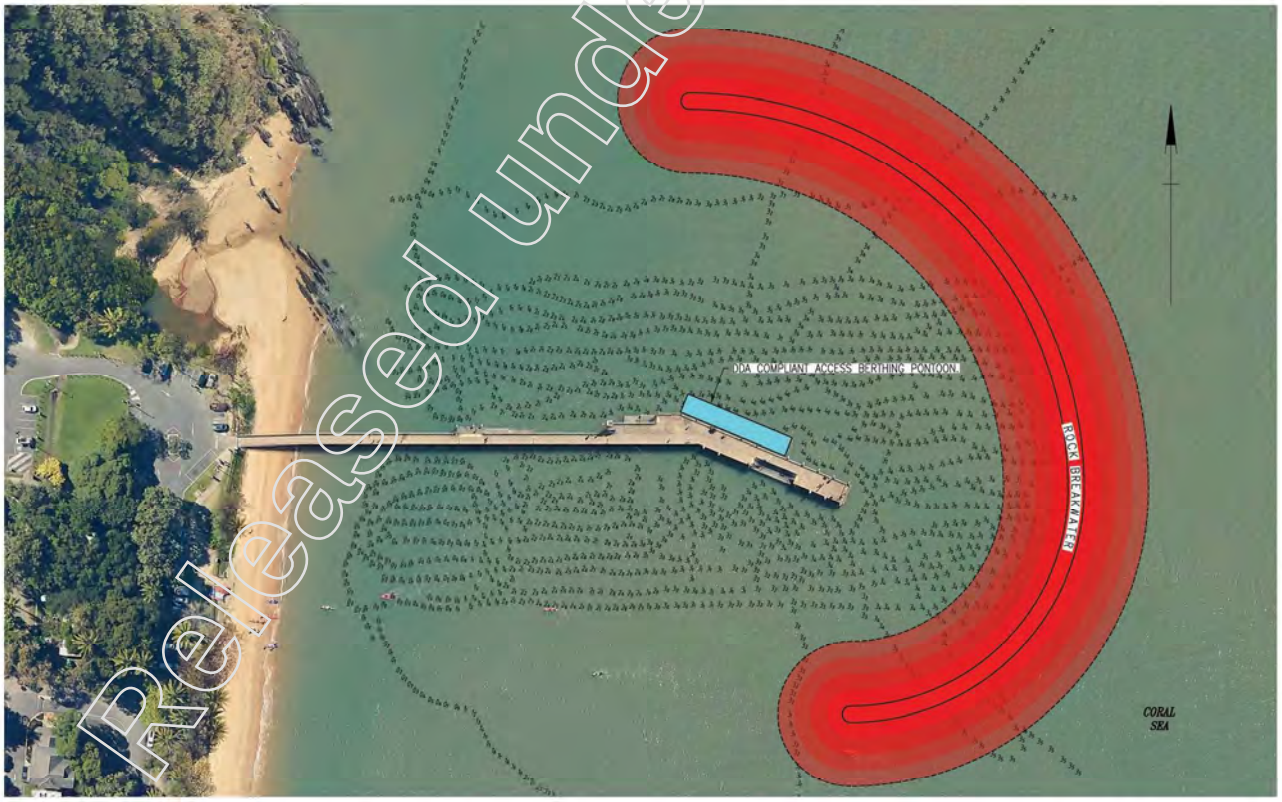


Figure 17 - OPTION 6 – Half Moon Rock Breakwater Harbour protecting heavy duty DDA pontoon berth in berth 1 location

Assessment of Cultural Heritage and Native Title

TMR has undertaken a desktop Cultural Heritage Risk Assessment for this potential project, this assessment did not identify any known cultural heritage sites that would be impacted by the proposed works and has identified that the previous act of constructing the Jetty has modified the existing marine environment. However as with the majority of MSQ projects because of their location in foreshore or seabed areas they represent a higher risk of Cultural Heritage sites being identified and subsequently engagement with the Djabugay Nation Traditional Owners will be a key part of further investigations if an upgrade project was to proceed.

TMR has undertaken a preliminary native title assessment based on a relatively small scale wave screen/breakwater and berth upgrade in the location of the existing Palm Cove Jetty, scale to option 1. In summary this assessment concluded that the proposed works were outside the claim boundary of the Djabugay Nation native title claim QUD692 of 2016 filed with the Federal Court of Australia on 02-09-2016 and in addition the Palm Cove Jetty meets the definition of a public work under s.253 of the Native Title Act (A valid public work, constructed or established on or before 23 December 1996, and hence is a Previous Exclusive Possession Act (PEPA) under s.23B(7) of the Native Title Act. Subsequently Native title is wholly extinguished over the dealing area proposed (for the small scale work considered). Given the potential works area is immediately adjacent to the Djabugay Nation native title claim area, native title may be an issue for a larger scale project and/or in areas nearby which may need to be utilised during construction. Subsequently engagement with the Djabugay Nation traditional owners regarding native title during engagement on Cultural Heritage should occur if a project was to proceed from this investigation.

The desktop assessments above did not identify known significant constraints with respect to Cultural Heritage or Native Title associated with a relatively small wave screen and berth upgrade to Palm Cove Jetty, however engagement with Djabugay Nation Traditional Owners is key to avoid delivery risks associated with any future project.

Assessment of Potential Environmental Impacts and approval requirements

. The primary environmental impacts identified associated with a potential project are as follows:

1. Direct infrastructure habitat impact footprint

Discussion/Mitigating measures:

The potential upgrade works area is part of the dynamic inshore beach system and subsequently is unlikely to support significant permanent habitat from aerial photos and from historical coral mapping as shown in **figure 17**. On this basis while any project always aims to minimise footprint area a decision on the design of the wave barrier - wave screen or breakwater is likely to be based on other factors other than just footprint. However if a project was to proceed a habitat mapping investigation would be completed to confirm insitu habitat and associated impacts.

2. The impact of the wave screen/breakwater interrupting existing wave transmission and subsequent coastal process impacts (erosion/accretion trends)

Discussion/Mitigating measures:

Because of the headland immediately north of the jetty acting as a coastal control point the wave screen/breakwater if kept to an efficient length and located well offshore of the beach is likely to still allow wave driven sediment transport to continue and subsequently minimise coastal process changes. However detailed hydrodynamic and sediment transport modelling is essential to assess the actual impact of specific options and refine them to minimise coastal process impacts and at the same time gain cost efficiencies in the design

3. Noise impacts of pile driving and/or rock dumping during construction – on both marine life and residents of Palm Cove

Discussion/Mitigating measures:

MSQ has to manage marine noise risks to marine megafauna with all marine projects and has best practice methods to mitigate these. Management of noise impacts to adjacent residential and tourist accommodation properties however is likely to be more challenging at this location given construction works would ideally be planned in winter to avoid cyclone risks.

4. Scenic Amenity impacts of the proposed works. The wave screen or rock breakwater will likely need to be 4m above Mean Sea Level having a potential significant impact from the foreshore beach at lower tides, with its length being a key factor.

Discussion/Mitigating measures:

Refinement of design (using tools like physical modelling) to minimise the size of structures and ensuring stakeholders are aware of the expected changes via using 3D renders on existing vista photos are key to ensuring the best scenic amenity outcome is achieved.

5. Increased risk of potential boat strike of marine fauna associated with construction and additional vessel usage associated with the potential upgrade.

Discussion/Mitigating measures:

Avoiding impacts of boat strike is always part of MSQ's Environmental Management Plan's for project delivery and would be at front of mind for tourist operators similarly, however it is expected that if such an upgrade project was progressed it would be supported by demand for improved.

6. Potential negative impacts resulting from reflected wave energy – particularly from vertical wave screens

Discussion/Mitigating measures:

Detailed hydrodynamic modelling can be utilised to refine the design to avoid/mitigate these potential impacts.

7. Potential negative water quality impacts from dredging -- capital and maintenance (if dredging included)

Discussion/Mitigating measures:

MSQ always seeks to avoid dredging when alternatives exist, which is a key objective in State and Federal Environmental protection legislation. On this basis no dredging options are being considered given alternatives exist.

8. Negative impacts on the environment from structural failure of any wave screen option

Discussion/Mitigating measures:

Any permanent wave screen structure would need to be designed to meet Australian standards, and any temporary trial structure would need to include suitable management strategies to avoid failure and associated impacts.

The following Environmental Assessments are likely to be triggered:

- Site is located within the Great Barrier Reef Marine Park – Habitat Protection Zone. So will require a joint State and Federal Marine Park Permit
- Site is Mapped as World Heritage Declared Area – which is a key assessment item in all state and federal legislation assessments and may require EPBC Act referral.
- Mapped as having Potential Acid sulfate soils / and Actual ASS – testing and close consideration of management options if dredging is included in scope
- It is located within a Coastal Management District zone – So will require a tidal works approval under the Coastal Protection and Management Act 2003.
- If any marine plants are found in the proposed works area - an operation works approval will be require to remove or damage marine plants
- Coastal Vegetation mapped as – State significant wetland vegetation – not within the proposed works area but a factor with respect to land access to the site
- Mapped as an "Ecological Communities of National Environmental Significance Database (ECNES) – Endangered Lowland tropical rainforest of the Wet Tropics" – given this project is entirely marine based no

impacts are expected to terrestrial rainforest – however as above this may be a factor with respect to land access to the site

- Mapped as "High Ecological Significance Wetlands - Matters of State Environmental Significance" (Commonwealth) AND also as "High Ecological Value Waters – Wetlands - Matters of State Environmental Significance". Also mapped as DIWA Nationally Important Wetlands. – impact on wetlands

Figure 18 – Reef extent Allen's Coral Mapping

Based on above the justification for the scale of any proposal to meet the identified need will be a key factor of the environmental approval process, however this preliminary assessment does not identify any red flag constraints from MSQ's perspective to the development of a suitably sized and designed upgrade from an environmental impact perspective.

Consultation with State and Federal Regulating Agencies

MSQ had two teams meetings with the following approval authorities SARA, DAF, DES (Coastal), DES (Marine Parks), GBRMPA regarding the potential proposal.

Primary outcome of these meetings was any proposed project would have to be adequately justified in scope and scale. No project red flag elements were identified however the regulators concurred with MSQ regarding a preference to avoid dredging and the associated impacts where alternatives exist consistent with state and federal environmental protection policy.

Feedback as with all development works was to minimise the environmental footprint as much as possible required to meet the project objectives, on this basis it was considered that the scale of option 5 would be much harder to justify.

Regulators did not disagree with MSQ's assessment that the proposed smaller scale options were unlikely to have significant coastal process impacts and that the dynamic sandy location of the proposed works were unlikely to support

permanent sensitive habitats. However, regulators concurred with MSQ's assessment that approval applications would require extensive modelling and habitat mapping to confirm these conclusions given the intended works location in the Great Barrier Reef World Heritage Area and Marine Park.

As with any project just because no red flags were identified at a concept level, until all the details are gained and assessed by regulators there is no guarantee of an approval outcome.

Note: MSQ did not gain approval authority feedback on consideration of a temporary FRP baffle trial (Option 2).

Cost Estimate of Options

MSQ has significant recent experience with breakwaters, jetties and pontoon berths. MSQ however has had no experience with the construction of wave screens and research would suggest that these structures are an exception rather than the norm with significant uncertainty surrounding cost risk, with the majority of projects exceeding original budget estimates significantly. Given this uncertainty the costings below include a cost range for custom designed wave screens with 30% to 50% risk contingency.

Table 2 – Indicative Cost Estimates

Options	Description	Project Cost Estimate ($)
Option 1	Double Island Transfers from Yorkeys Knob	$0
Option 2	Fibre Reinforced Polymer (FRP) baffle screen – TRIAL	$1.2M
Option 3	Custom piled wave screen (60m) protecting existing berth 2 renovated to original design standard (exposed to N-NE waves)	$6.57-7.57M
Option 3A	Option 3 with a rubble mound breakwater (70m) instead of wave screen	$9.45M
Option 4	Demolish berth 2 and replace with fixed ramp berth providing 2 disability access landings and a 70m wave screen	$10.98M
Option 5	Mini harbour with 160m wave screen and fixed ramp berth providing 2 disability access landings.	$15.05M-$17.36M
Option 5A	Option 5 with disability access heavy duty Pontoon berth (30m x 5m) – note: design constraints and subsequent overtopping of wave screen may prohibit this option.	$13.96M-$16.12M
Option 5B	Option 5A with 170m rock breakwater	$19.42M
Option 6	320m half-moon rock breakwater and disability access heavy duty Pontoon berth	$32.52M

Comparison of Options Considered

Table 3 – Options Pros and Cons

Options	Description	Pros	Cons	Comments
Option 1	Double Island Transfers from Yorkeys Knob	$ savings	No Jetty berthing improvement	N/A
Option 2	Fibre Reinforced Polymer (FRP) baffle screen – TRIAL	Low-cost trial of partial wave screen concept	Not a permanent solution given limited design life in this location Will likely be destroyed by a storm event Baffle screen may not provide wave attenuation to meet stakeholder expectations	This option does not represent a permanent solution in this location it would just be a trial on which to base a permanent solution given its limited design life.
Option 3	Custom piled wave screen (60m) protecting existing berth 2 renovated to original design standard (exposed to N-NE waves)	Lowest cost permanent option Protection from dominant waves E-SE Small footprint – spatial and visual	No Disability access Exposed from N-NE Potential wave reflection issues Maintenance costs	Only considered temporary solution if no disability access improvement
Option 3A	Option 3 with a rubble mound breakwater (70m) instead of wave screen	Lower cost option Protection from dominant waves E-SE More effective wave dissipation Negligible maintenance	No Disability access Exposed from N-NE Larger footprint Marine construction constraints	Only considered temporary solution if no disability access improvement
Option 4	Demolish berth 2 and replace with fixed ramp berth providing 2 disability access landings and a 70m wave screen	Provides Disability access improvement Enables new berth and wave screen to be one structure just accessed from jetty Protection from dominant waves E-SE Small footprint Can orient into the N-NE storm waves and reduce wave loads and reflection issues	Exposed from N-NE Additional cost Maintenance costs	Option provides the lowest cost disability access solution

Options	Description	Pros	Cons	Comments
Option 5A	Option 4 with disability access heavy duty Pontoon berth (30m x 5m) – note: design constraints and subsequent overtopping of wave screen may prohibit this option.	Provides Disability access improvement Protection from all wave conditions Small footprint for benefit	Significant increase in cost Maintenance costs	Option feasibility relies on wave screen design providing a suitable level of cyclone event protection
Option 5B	Option 4A with 170m rock breakwater	Provides Disability access improvement Protection from all wave conditions Breakwater option will provide pontoon required protection Limited maintenance	Certainty comes at greater cost Larger footprint and visual impact Marine construction constraints	Better design certainty with a rock breakwater
Option 6	320m half moon rock breakwater and disability access heavy duty Pontoon berth	Provides Disability access improvement Protection from all wave conditions Breakwater option will provide pontoon required protection Limited maintenance Option would provide other marine access opportunities	Greatest cost Largest footprint and visual impact Difficult to justify environmentally from scale perspective	Included as a comparison baseline

Discussion, Limitations and further work

Discussion

This investigation has identified that no low-cost wave barrier solutions are suitable for this exposed location at Palm Cove Jetty and subsequently a significant capital investment is required to provide some level of wave protection and improved berthing access at Palm Cove Jetty.

Yorkey's Knob Boat Harbour (8km south of the site) could service tourist transfers to Double Island with a slightly longer trip time (approx. additional 10 minutes) without the capital investment. MSQ recommends that the Department responsible for tourism would be best placed to collate the benefits of any upgrade option against the provided preliminary cost estimates given this is not MSQ's area of expertise. Other wave screen projects completed in Australia that were considered in this investigation were all constructed based on a cost recovery model (given they were protecting marina berths). Wave screen options appear to represent a much higher maintenance liability when compared

to rock breakwaters with PWC 67 (2000) factoring in a 3% (of capital) annual maintenance cost for their structure. The maintenance requirements will be subject to the final design, however it needs to be considered that a slightly more expensive rock breakwater with very small future maintenance costs may be a preferred whole of life option.

In the event an engineered wave screen option is chosen, MSQ would need an additional funding allocation to cover the required ongoing maintenance for the additional structure and subsequently it is recommended that any business case consider a usage fee designed to cover this.

This investigation has identified 4 indicative options (options 3-6) for permanent upgrade works to provide an improved wave attenuated berth at Palm Cove Jetty, if funding is available and if stakeholder feedback supports them. It must be noted that stakeholder feedback is a key element in the final assessment of viability for all options, along with the need for extensive modelling to refine designs to provide the most cost-efficient outcome (specifically detailed further below). Of particular note is all wave screen and rock breakwater elements will be required to have a finish height within 1m of the jetty deck level and subsequently represent a solid wall, approximately 5m above the spring low tide level for their length. While these structures will not interrupt views from the jetty deck they may impact existing views from the northern end of Palm Cove beach and could represent an unacceptable impact for some stakeholders.

Option 3 and 3A represent the lowest cost feasible permanent upgrade options, however still represent an estimated investment of $7.57m and $9.45m respectively to provide a wave screen that still leaves the berth exposed during north and north-easterly conditions and does not provide disability access. MSQ does not recommend supporting such an investment that does not provide improved disability access.

Option 4 comes at a significantly increased cost of an estimated $11m in order to provide improved disability access, with the remaining elements of scenic amenity and northerly wave exposure requiring due consideration by stakeholders.

Option 5, 5A and 5B provide a much more wholistic one berth solution protected by a mini harbour, which represents an associated increase in cost and impact on scenic amenity, the latter being a likely element of key importance to stakeholders.

Option 6 represents a traditional harbour protecting a heavy-duty disability accessible pontoon with an estimated cost of $32m, which represents opportunities for other uses, however it is likely to be difficult to justify the scale of such a project.

The Key reasons for the high project costs are the following:

- The bespoke nature of custom engineered wave screen designs,
- their varying effectiveness,
- vulnerability to cyclone damage and
- subsequent capital and maintenance costs (associated with how well they manage the former two items)

These items represent a challenge in trying to meet stakeholder expectations, however can provide a more space efficient solution.

Rubble mound rock breakwaters constructed from land are the most cost-efficient wave barrier structure in locations where suitable quarry rock is locally available. However in locations where land-based construction is not feasible, such as this, costs are expected to be double.

As indicated above, MSQ has identified that all feasible options represent a significant capital investment, with high cost risk and potential scope change associated with stakeholder feedback. It has also been identified that engineered wave screens can represent a risk of high maintenance costs.

Path Forward

This investigation has narrowed what is feasible for an upgrade project at Palm Cove Jetty, however a significant number of questions need to be answered before a suitable level of certainty can be gained in which to define a detailed scope. A number of these key items have been listed below:

Stakeholder Feedback/Consultation

1. What vessels are likely to use an updated berthing facility?
2. Does an upgrade project need to retain the berth 1 face unhindered? Do larger vessels use the jetty?

3. Does an assumption of just providing E-SE wave protection (options 2 and 3) meet stakeholder/user expectations?
4. Under what wave conditions can users operate? Based on this the design can be optimised. For extreme conditions could they shift the operations to Yorkeys Knob harbour?
5. What downtime during North and NE wave events can users absorb into their operation - again can Yorkeys Knob be part of the solution during such conditions.
6. Confirm acceptable outcomes with respect to disability access of any upgrade.
7. Is berthing currently primarily hindered by wave chop (short period waves) or do long period waves impact berthing? This will greatly influence the fit for purpose wave barrier design
8. Gain feedback on scenic amenity impacts of options
9. Feedback on layout options based on expected usage, including current jetty usage (for example, fishing)
10. Identify if any option could have dual benefit of positively contributing to Coastal Erosion Management, require consultation with Cairns Region Council and DES.

Numerical and Physical Modelling Investigations

1. Detailed Numeric Modelling to assess the wave climate operationally and during cyclone events that reaches the jetty (particularly to better understand the diffraction of waves and potential magnification of two wave fronts). This issue is a key aspect of the detailed design orientation and sizing of the upgrade elements, to provide the most cost-efficient solution.
2. Assess the preferred wave screen and berth location/orientation to provide the required berth protection most cost efficiently and to avoid/minimise negative wave reflection impacts on the berth - particularly for options 3 and 4.
3. Undertake modelling and analysis to ensure the final wave screen design meets wave transmission expectations and can survive design cyclone conditions.
4. Undertake physical modelling to refine wave screen/breakwater design to minimise cost and minimise impact on scenic amenity.
5. Accept that if modelling indicates wave screen design limitations result in unacceptable outcomes and/or costs exceeding that of a rock breakwater, then the latter should be adopted.
6. Confirm coastal process impacts via sediment transport modelling.

Potential Next steps

1. Department of Tourism and Sport (as the state agency best positioned to define benefits) undertake a cost benefit analysis and investigate a cost recovery model, utilising the indicative costs in this report to guide a decision on whether an upgrade should progress.
2. Subject to a positive outcome from the above investigation, the government fund a body of work to undertake stakeholder consultation, modelling and detailed design and costing for government consideration to fund a wave screen project.

Recommendations

1. Note that, in MSQ's view, wave barrier options are feasible for Palm Cove Jetty, however significant capital investment is required for such a solution as discussed in the body of this report. In addition, extensive stakeholder feedback and additional technical investigations are essential to gain the most cost efficient fit for purpose solution.
2. Recommend Department of Tourism and Sport (or another appropriate agency) – utilise these report outcomes and complete the following:
    a. Undertake a Cost Benefit Analysis – using the above capital costs and an indicative 3% annual maintenance allocation.
    b. Assess likely demand – number of operators, capacity of operators and likely number of users to understand the viability of a cost recovery model for such an upgrade.
3. Subject to positive outcomes of the above process, consider funding detailed technical investigations and broad stakeholder engagement to refine the most cost-efficient option for future government funding consideration.

References

Atkins, Tom (2019) *Design of a partial depth wave screen to protect Tawau Ferry Terminal, Malaysia.* Australian Coast and Ports 2019 conference - Hobart 10-13 September 2019

Beach Protection Authority Queensland (1984) *Mulgrave Shire Northern Beaches – A detailed study of coastline behaviour in north Queensland, Australia*

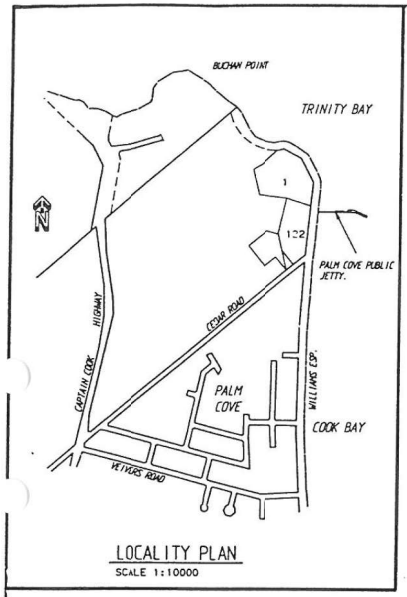
Beadle.C, Treloar.D, Morgan.B (2019) *Design of a Fixed Wave Screen at Snug Cove, Eden.* Australian Coast and Ports 2019 conference - Hobart 10-13 September 2019

BMT Eastern Australia Pty Ltd (2019) *BMT Yorkeys Knob Boat Ramp Facility – Investigation Report, May 2019*

PIANC - The World Association for Waterborne Transport Infrastructure (1994) *PIANC – Floating Breakwaters – a practical guide to design and construction*

Public Works Committee Report No. 67 (2000), *Cairns Seaport Development, Marlin Marina Wave Barrier Protection System – Legislative Assembly Queensland*

Appendix A – Existing Jetty Design



LOCALITY PLAN
SCALE 1:10000

NOTES:

1. ALL DIMENSIONS ARE IN METRES.
2. ALL RL'S AND SOUNDINGS ARE IN METRES AND HAVE BEEN REDUCED TO L.V.D., DATUM FOR THESE LEVELS WAS ESTABLISHED FROM PM 45070.RL 4.300 L.V.D..
3. CO-ORDINATES ARE IN METRES AND ARE TO THE AUSTRALIAN MAPPING GRID (AMG).
4. BEARINGS SHOWN ARE REFERED TO AMG.
5. SURVEY INFORMATION ON THIS DRAWING WAS DERIVED FROM H & M SURVEY PLAN No. 8370-1.

5-1-31	FIRE HOSE / EXTINGUISHER CABINET DETAILS
6-1-30	MISCELLANEOUS SERVICES DETAILS
CH-5-1-29	SERVICES DETAILS - SHEET 2
CH-5-1-28	SERVICES DETAILS - SHEET 1
CH-5-1-27	SERVICES LAYOUT
CH-5-1-26	LANDING AREAS 2 & 3 - FENDERING ARR. & DET.
CH-5-1-25	JETTY HEAD - FENDERING ARRANGEMENT & DETAILS
CH-5-1-24	STEP & HEAD - HANDRAIL LAYOUT AND DETAILS
CH-5-1-23	LADDER DETAILS
CH-5-1-22	PRECAST CONC KERB UNITS - DETAILS
CH-5-1-21	PRECAST CONC DECK UNITS - DETAILS
CH-5-1-20	PRECAST CONC DECK & KERB UNITS - LAYOUT & DET
CH-5-1-19	ABUTMENT AND COVER PLATE DETAILS
CH-5-1-18	LANDING AREAS - GIRDER DETAILS
CH-5-1-17	LANDING AREAS - GIRDER LAYOUTS
CH-5-1-16	LANDING AREAS - STAIRWAY AND DECKING DETAILS
CH-5-1-15	LANDING AREA No.3 - ARRANGEMENT AND SECTIONS
CH-5-1-14	LANDING AREA No.2 - ARRANGEMENT AND SECTIONS
CH-5-1-13	LANDING AREA No.1 - ARRANGEMENT AND SECTIONS
CH-5-1-12	STEP & HEAD - GIRDER DETAILS - SHEET 2
CH-5-1-11	STEP & HEAD - GIRDER DETAILS - SHEET 1
CH-5-1-10	STEP & HEAD - GIRDER & ATTACHMENT PLATE LAYOU
CH-5-1-9	HEADSTOCK DETAILS - SHEET 3
CH-5-1-8	HEADSTOCK DETAILS - SHEET 2
CH-5-1-7	HEADSTOCK DETAILS - SHEET 1
CH-5-1-6	HEADSTOCK AND GIRDER LAYOUT
CH-5-1-5	STRUCTURAL PILE DETAILS
CH-5-1-4	STRUCTURAL AND FENDER PILE LAYOUT
CH-5-1-3	SECTIONS
CH-5-1-2	GENERAL ARRANGEMENT
Drawing No.	Associated Drawings

Amend.	Description	Date	Approved

File No 19-38-20
Job No
Aperture Card No

Ratio Scales (Before Reduction) mm
1:1 0 10 20 30 40 50 60
1:2 0 20 40 60 80 100 120
1:2.5 0 50 100 150
1:5 0 100 200 300

DEPARTMENT OF HARBOURS & MARINE

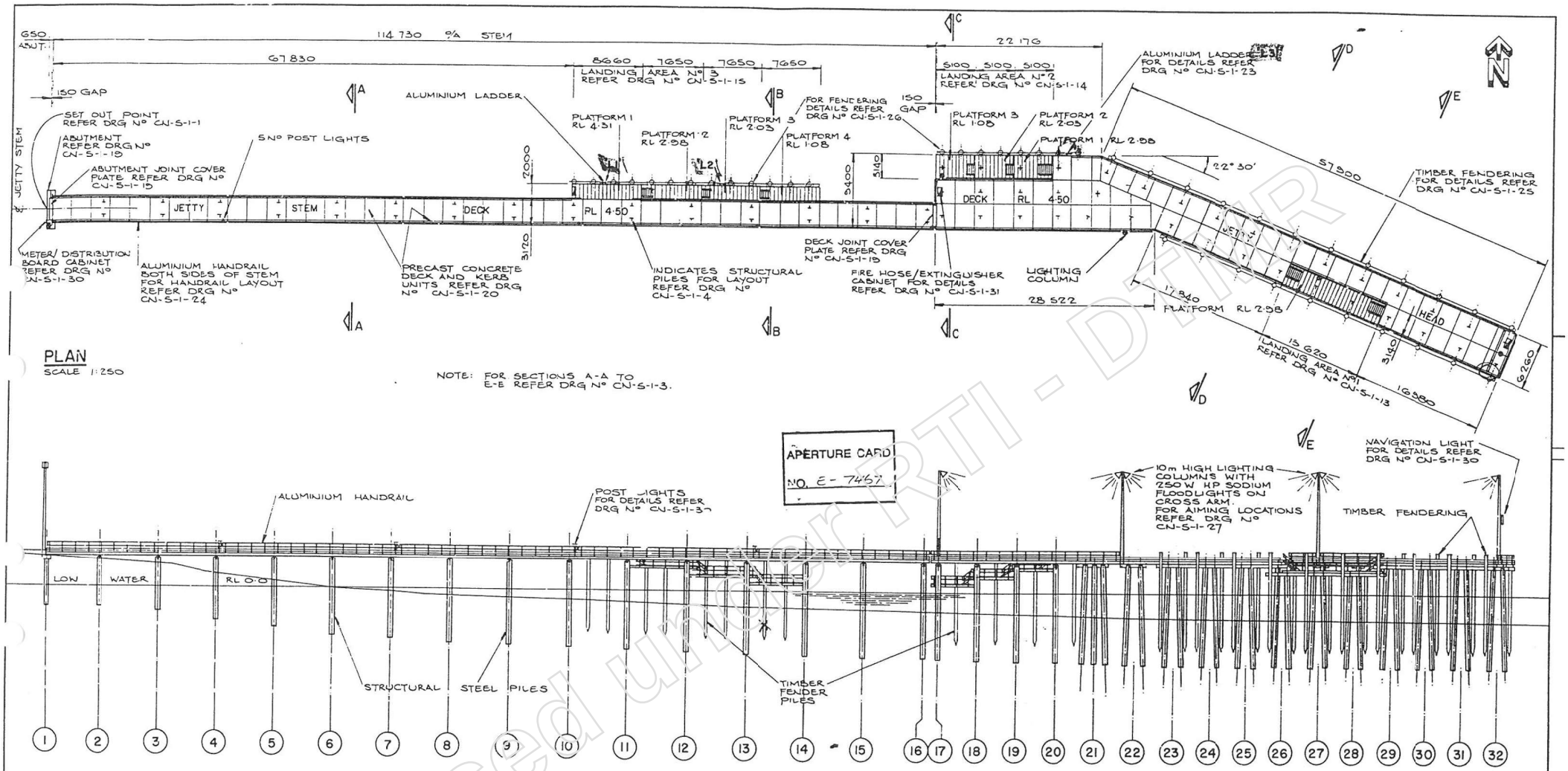
Design	Prep. NR	Chd. NR	
Drafting	Prep. G.J.Hill	Chd. A.L.T.	Snr Engr. Harbour Works / Assistant Director Works
Supervising Draftsman			
Principal Draftsman		Date 13-10-86	

PALM COVE
PUBLIC JETTY
SITE AND LOCALITY PLAN

Drawing Number
CN-5-1-1.

APERTURE CARD
NO. E-7466

SITE PLAN
SCALE 1:500



PLAN
SCALE 1:250

NOTE: FOR SECTIONS A-A TO E-E REFER DRG N° CN-5-1-3.

LONGITUDINAL ELEVATION
SCALE 1:250

NOTES:

GENERAL

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. ALL LEVELS ARE IN METRES AND REDUCED TO LOW WATER DATUM REFER DRG N° CN-5-1-1.
3. DATUM FOR LEVELS WAS ESTABLISHED FROM PM 45070.
4. ALL CODES REFERED TO SHALL BE CURRENT SAA CODES INCLUDING ALL AMENDMENTS
5. FOR ASSOCIATED DRAWING LIST REFER DRG N° CN-5-1-1.

DESIGN LOADING

1. VESSELS BERTHING - MAXIMUM 35m LONG TWIN HULL VESSEL OF 12.5 TONNES DISPLACEMENT AT 0.3 METRES PER SECOND NORMAL TO BERTH.
2. STEM - NAASRA T44 STA JOARD VEHICLE.
3. HEAD - 5kPa.

STRUCTURAL STEEL

1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 1250.
2. MILD STEEL SHALL BE GRADE 250 TO AS 1204, EXCEPT SHS WHICH SHALL BE GRADE 350 TO AS 1163.
3. ALL WELDING SHALL BE IN ACCORDANCE WITH AS 1554.
4. WELDING CONSUMABLES SHALL BE MANUAL TYPE - E41XX OR E48XX TO AS 1553 AUTOMATIC TYPE- W40X OR W50X TO AS 1858 OR AS 2203.
5. ALL WELDS SHALL BE CATEGORY GP UNLESS NOTED OTHERWISE.
6. ALL WELDS SHALL BE FULLY SEALED WITH EITHER 3mm FILLET OR INCOMPLETE PENETRATION BUTT WELD.
7. ALL WORK SHALL BE NEATLY FINISHED AND ALL SHARP EDGES GROUND SMOOTH.
8. ALL EDGES OF STEELWORK SHALL BE GROUND TO A MINIMUM 3mm RADIUS.

CRES (STAINLESS STEEL)

1. ALL PLATES, FLATS AND ANGLES DESIGNATED CRES SHALL BE CORROSION RESISTANT STEEL GRADE 304.
2. ALL BOLTS, NUTS AND WASHERS DESIGNATED CRES SHALL BE CORROSION RESISTANT STEEL GRADE 316.
3. CRES BOLTS SHALL HAVE ROLLED THREADS AND SHALL BE COATED WITH A NICKLE BASED GREASE ANTI-SEIZE LUBRICANT PRIOR TO ASSEMBLY.
4. WELDING OF CRES SHALL BE AS FOR MILD STEEL EXCEPT THAT AUSTENITIC CRES FILLER MATERIAL SHALL BE USED AND WIRE BRUSHING MUST BE CARRIED OUT WITH A CRES BRUSH.

STEELWORK PROTECTION

1. ALL STEELWORK EXCEPT GALV STEEL AND CRES ABOVE RL 3.30 SHALL BE COATED WITH A FLAKE FILLED POLYESTER REFER SPEC.
2. ALL STEELWORK EXCEPT CRES BETWEEN RL 0·2 AND RL 3·475 SHALL BE WRAPPED WITH TAPE WRAPPING SYSTEM REFER SPEC.
3. AN IMPRESSED CURRENT CATHODIC PROTECTION SYSTEM SHALL BE PROVIDED REFER SPEC.

INSULATION

1. INSULATION BETWEEN CONTACT FACES OF DISSIMILAR METALS SHALL BE PROVIDED BY EITHER 3 THICK NYLON OR 12 THICK NEOPRENE.
2. BOLT INSULATION SHALL BE PROVIDED BY 1 THICK NYLON SLEEVE ON SHANK AND 3 THICK NYLON WASHERS UNDER HEAD AND NUT.

NEOPRENE

1. NEOPRENE BEARING PADS SHALL HAVE A SHORE DUROMETER HARDNESS OF 40, AND NEOPRENE INSULATION SHALL HAVE A SHORE DUROMETER HARDNESS OF 70-80.

Amend	Description	Date	Approved

File No. 19-38-20
Job No.
Aperture Card No.

Ratio Scales mm
1:1 0 10 20 30 40 50 60
1:2 0 20 40 60 80 100 120
1:2.5 0 50 100 150
1:5 0 100 200 300

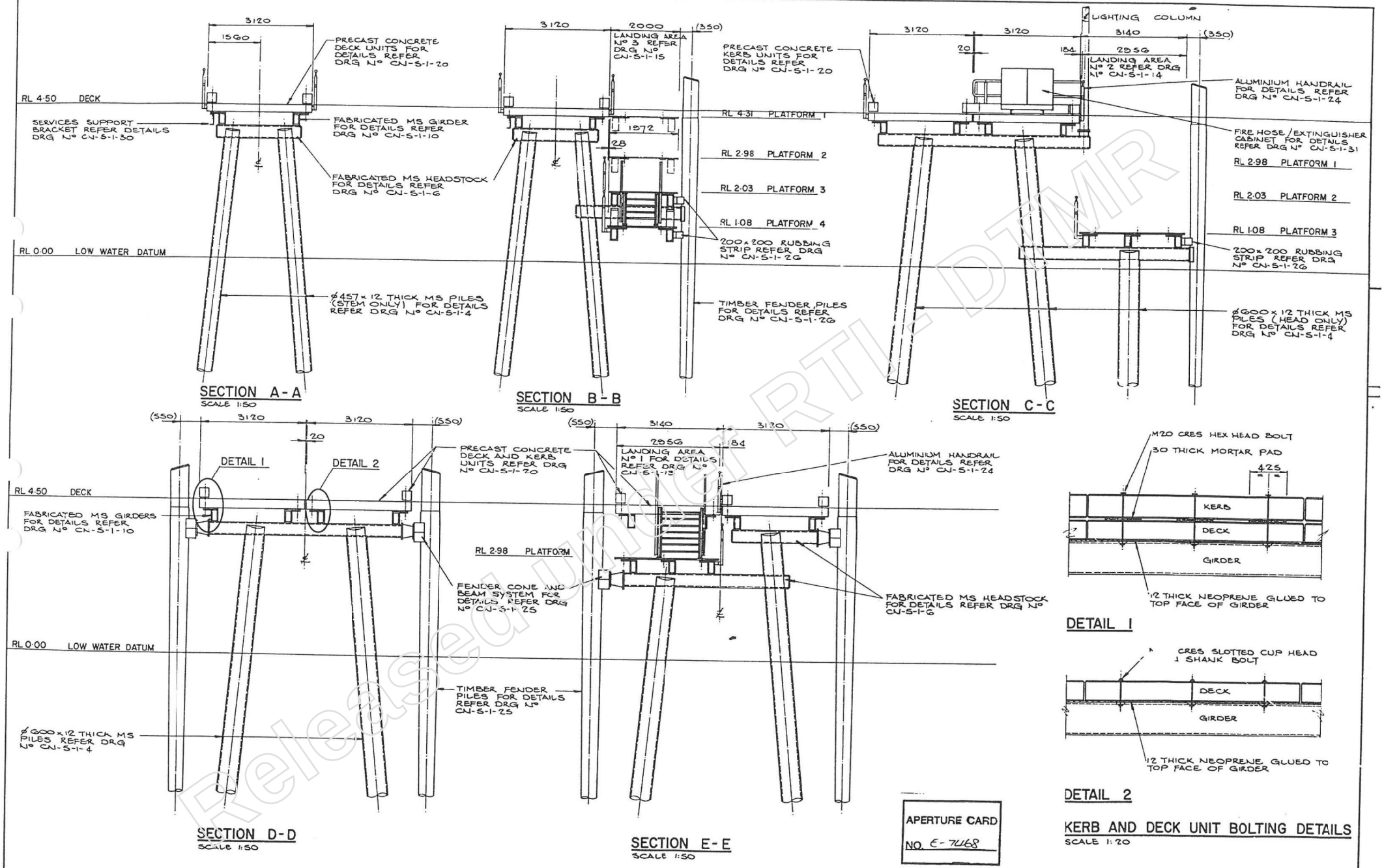
DEPARTMENT OF HARBOURS & MARINE

Design	Prep.	NR	Ckd.	NR	
Drafting	Prep.		Ckd. A.L.T.	Senior Eng. Harbour Works	Assistant Director Works
Supervising Draftsman		NR		NR	
Principal Draftsman				Principal Engr.	Date 13-10-86

PALM COVE
PUBLIC JETTY

GENERAL ARRANGEMENT

Drawing Number
CN-5-1-2



DETAIL 1

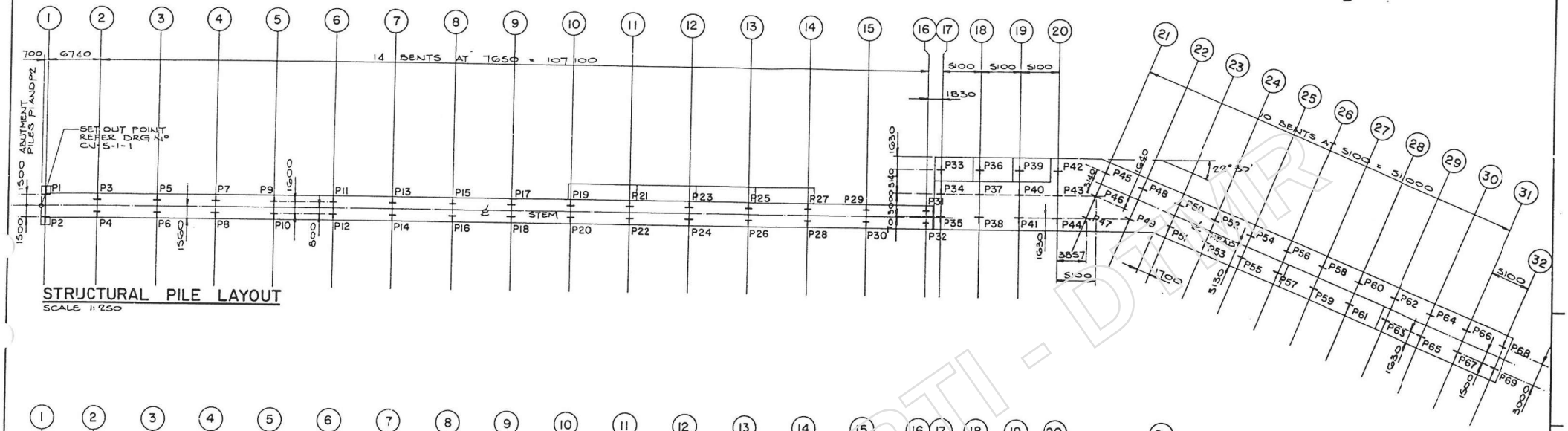
DETAIL 2

KERB AND DECK UNIT BOLTING DETAILS
SCALE 1:20

APERTURE CARD
NO. E-7468

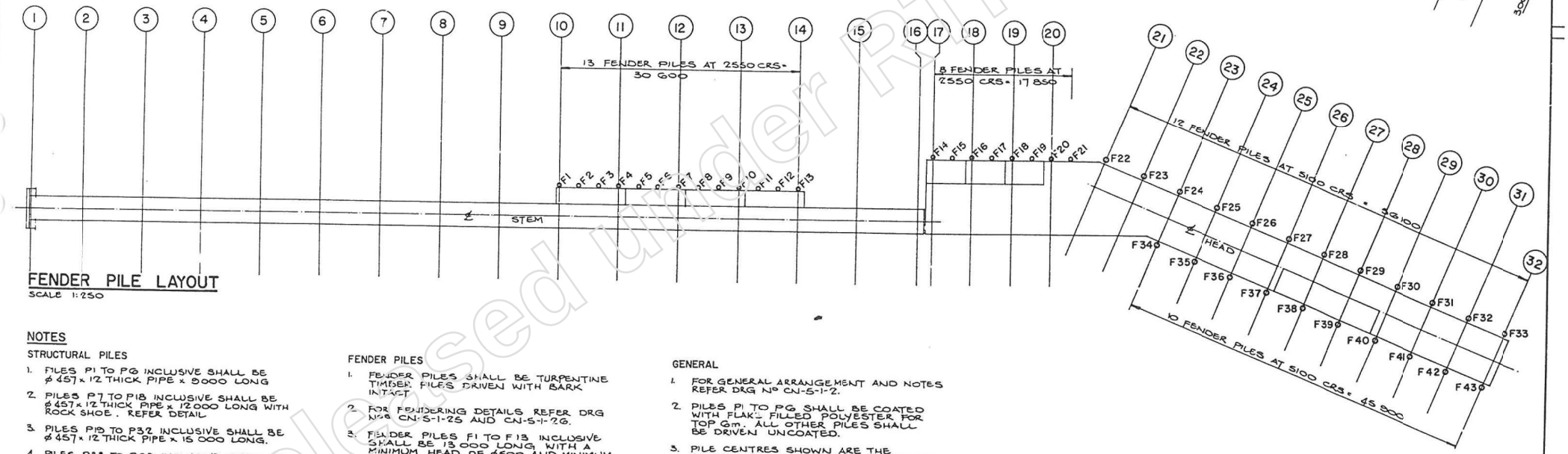
FOR LOCATION OF SECTIONS REFER DRG Nº CN-S-1-2

Amend.	Description	Date	Approved	File No. 19-38-20	Ratio Scales 1:1, 1:2, 1:2·5, 1:5	DEPARTMENT OF HARBOURS & MARINE	PALM COVE PUBLIC JETTY
				Job No.		Design Prop. NR; Drafting Prop. NR; Supervising Draftsman; Principal Draftsman NR	Senior Eng. Harbour Works; Assistant Director Works; Principal Eng. NR; Date 13-10-86
				Aperture Card No.			SECTIONS
							Drawing Number CN-5-1-3



STRUCTURAL PILE LAYOUT

SCALE 1:250



FENDER PILE LAYOUT

SCALE 1:250

NOTES

STRUCTURAL PILES

1. PILES P1 TO P6 INCLUSIVE SHALL BE ϕ 457 x 12 THICK PIPE x 5000 LONG
2. PILES P7 TO P18 INCLUSIVE SHALL BE ϕ 457 x 12 THICK PIPE x 12 000 LONG WITH ROCK SHOE. REFER DETAIL
3. PILES P19 TO P32 INCLUSIVE SHALL BE ϕ 457 x 12 THICK PIPE x 15 000 LONG.
4. PILES P33 TO P69 INCLUSIVE SHALL BE ϕ 600 x 12 THICK PIPE x 15 000 LONG.
5. ALL STRUCTURAL PILES SHALL BE DRIVEN OPEN ENDED.
6. ⊢ INDICATES A PILE RAKED 1:10
   \+ INDICATES A VERTICAL PILE
7. MINIMUM DESIGN PENETRATION OF STRUCTURAL PILES (P1 TO P69) SHALL BE 6000. REFER ALSO TO SPECIFICATION.
8. FOR STRUCTURAL PILE DETAILS REFER DRG No CN-S-1-5.

FENDER PILES

1. FENDER PILES SHALL BE TURPENTINE TIMBER PILES DRIVEN WITH BARK INTACT
2. FOR FENDERING DETAILS REFER DRG Nos CN-S-1-25 AND CN-S-1-26.
3. FENDER PILES F1 TO F13 INCLUSIVE SHALL BE 13 000 LONG WITH A MINIMUM HEAD OF ϕ 500 AND MINIMUM TOE OF ϕ 250.
4. FENDER PILES F14 TO F21 INCLUSIVE SHALL BE 14 000 LONG WITH A MINIMUM HEAD OF ϕ 500 AND MINIMUM TOE OF ϕ 250.
5. FENDER PILES F22 TO F43 INCLUSIVE SHALL BE 14 000 LONG WITH A MINIMUM HEAD OF ϕ 600 AND MINIMUM TOE OF ϕ 500.
6. MINIMUM DESIGN PENETRATION OF FENDER PILES (F1 TO F43) SHALL BE 4000. REFER ALSO TO SPECIFICATION

GENERAL

1. FOR GENERAL ARRANGEMENT AND NOTES REFER DRG No CN-S-1-2.
2. PILES P1 TO P6 SHALL BE COATED WITH FLAKE FILLED POLYESTER FOR TOP 6m. ALL OTHER PILES SHALL BE DRIVEN UNCOATED.
3. PILE CENTRES SHOWN ARE THE INTERSECTION OF THE PILE CENTRELINE AND RL 3.498 BEING THE UNDERSIDE OF UPPER HEADSTOCKS.

APERTURE CARD
NO. E-7469

Amend.	Description	Date	Approved

File No. 19-38-20
Job No.
Aperture Card No.

Ratio Scales mm
1:1 0 10 20 30 40 50 60
1:2 0 20 40 60 80 100 120
1:2·5 0 50 100 150
1·5 0 100 200 300

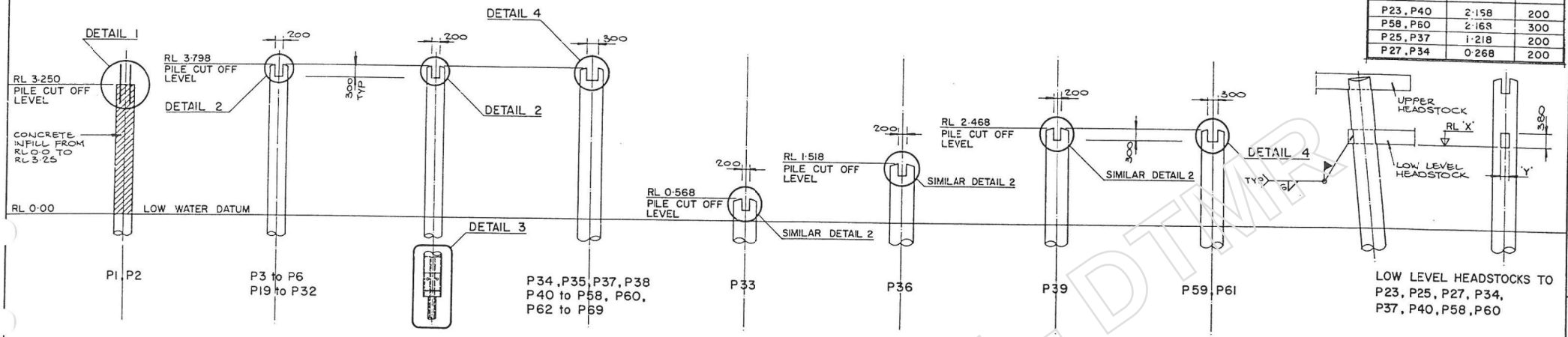
DEPARTMENT OF HARBOURS & MARINE

Design	Prep. NR	Ckd.	NR
Drafting	Prep. P.J. Moore	Ckd. B.L.T.	Senior Eng. Harbour Works
Supervising Draftsman	NR	NR	Assistant Director Works
Principal Draftsman		Principal Eng.	Date 13-10-86

PALM COVE
PUBLIC JETTY
STRUCTURAL AND FENDER PILE LAYOUTS

Drawing Number
CN-5-1-4

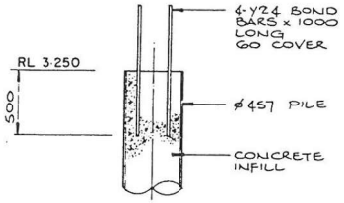
PILE No	RL 'X'	DIM 'Y'
P23, P40	2·158	200
P58, P60	2·168	300
P25, P37	1·218	200
P27, P34	0·268	200



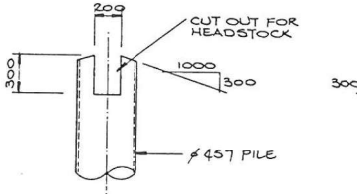
PILE DETAILS
SCALE 1:50

P7 to P18
DRILLED ROCK ANCHOR REQUIRED
ONLY WHERE DIRECTED REFER SPEC.

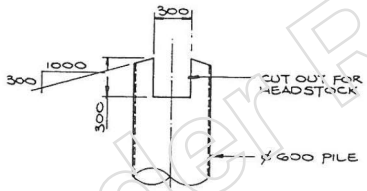
PILE SIZES:
P1 to P32 — 457 OD x 12 THICK
P33 to P69 — 600 OD x 12 THICK



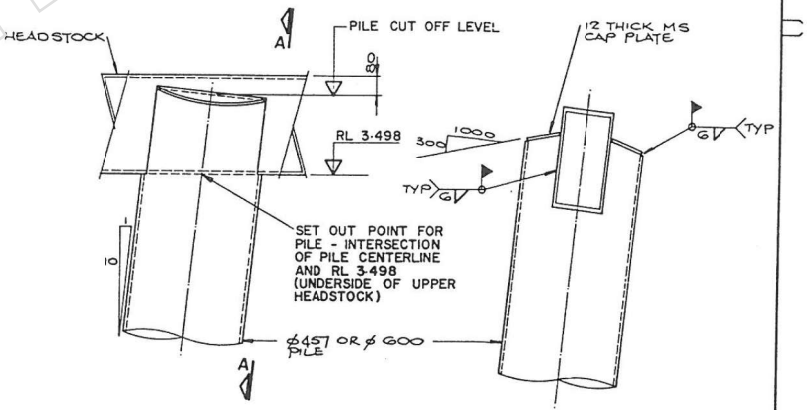
DETAIL 1
SCALE 1:20



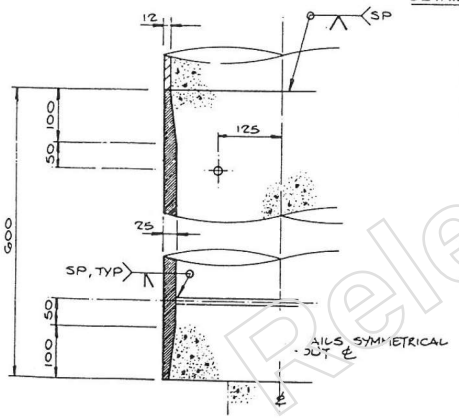
DETAIL 2
SCALE 1:20



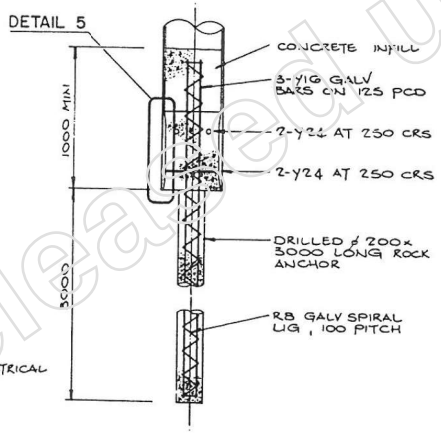
DETAIL 4
SCALE 1:20



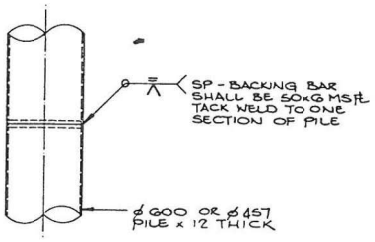
PILE / HEADSTOCK JOINT DETAILS
VERTICAL PILE DETAILS SIMILAR
SCALE 1:10



DETAIL 5
SCALE 1:5



DETAIL 3
SCALE 1:20



PILE SPLICE
SCALE 1:20

APERTURE CARD
NO. E-7470

NOTES:
1. FOR LAYOUT OF PILES AND NOTES REFER DRG Nº CN-5-1-4

Amend	Description	Date	Approved	Aperture Card No.

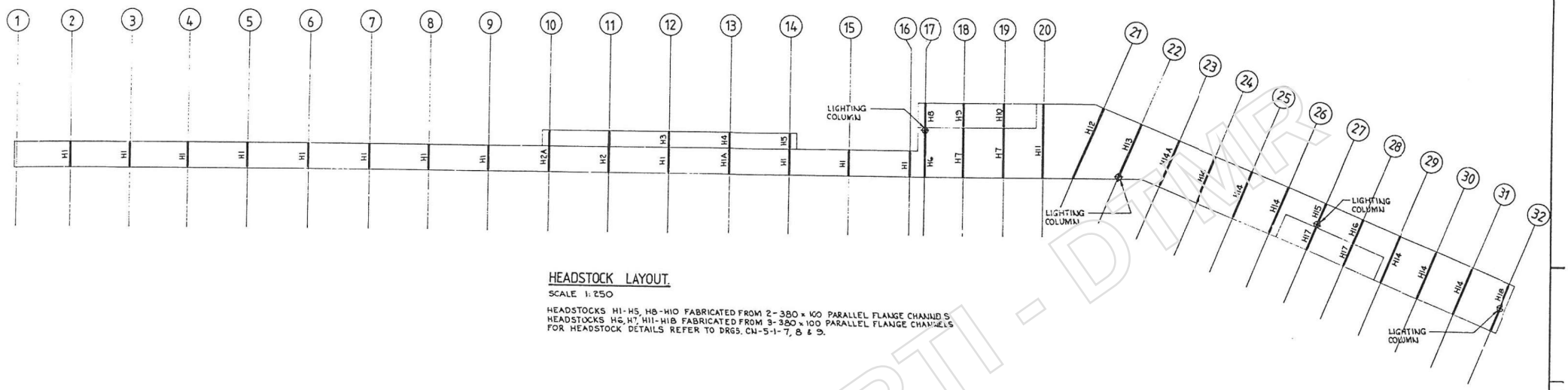
File No. 19-38-20
Job No.
Ratio Scales 1:1, 1:2, 1:2·5, 1:5

DEPARTMENT OF HARBOURS & MARINE

Design	Prep. NR		
Drafting	Prep. R.H.Moore	Chd. B.L.T.	Senior Eng. Harbour Works NR
Supervising Draftsman			Assistant Director Works
Principal Draftsman NR			Principal Eng. NR
			Date 13-10-86

PALM COVE
PUBLIC JETTY
STRUCTURAL PILE DETAILS

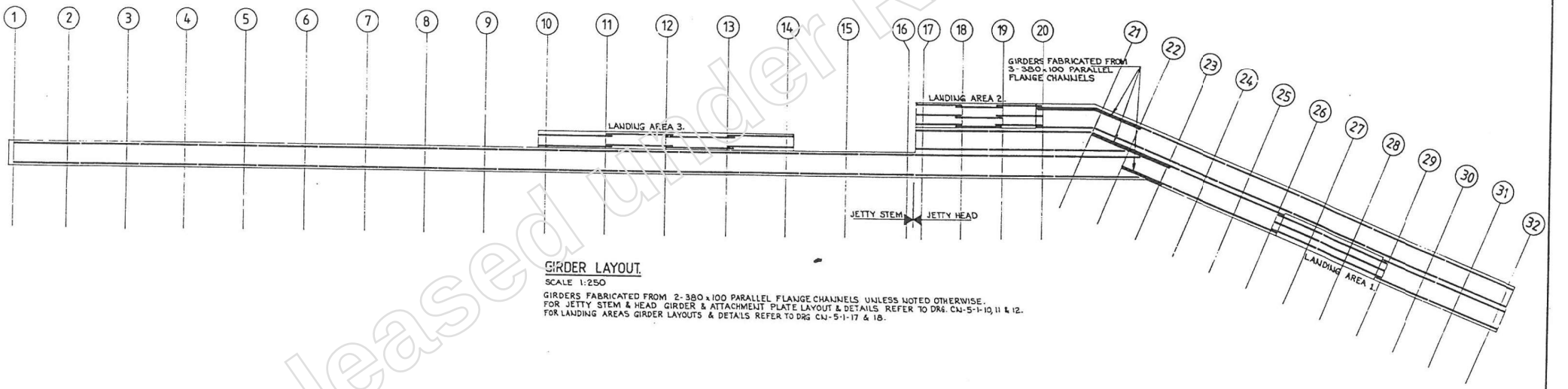
Drawing Number
CN-5-1-5



HEADSTOCK LAYOUT.

SCALE 1:250

HEADSTOCKS H1-H5, H8-H10 FABRICATED FROM 2-380 x 100 PARALLEL FLANGE CHANNELS
HEADSTOCKS H6, H7, H11-H18 FABRICATED FROM 3-380 x 100 PARALLEL FLANGE CHANNELS
FOR HEADSTOCK DETAILS REFER TO DRGS. CN-5-1-7, 8 & 9.



GIRDER LAYOUT.

SCALE 1:250

GIRDERS FABRICATED FROM 2-380 x 100 PARALLEL FLANGE CHANNELS UNLESS NOTED OTHERWISE.
FOR JETTY STEM & HEAD GIRDER & ATTACHMENT PLATE LAYOUT & DETAILS REFER TO DRG. CN-5-1-10, 11 & 12.
FOR LANDING AREAS GIRDER LAYOUTS & DETAILS REFER TO DRG CN-5-1-17 & 18.

NOTE: FOR GENERAL ARRANGEMENT & NOTES REFER DRG. CN-5-1-2

APERTURE CARD
NO. E-7471

Amend.	Description	Date	Approved

File No. 19 - 38 - 20
Job No.
Aperture Card No.

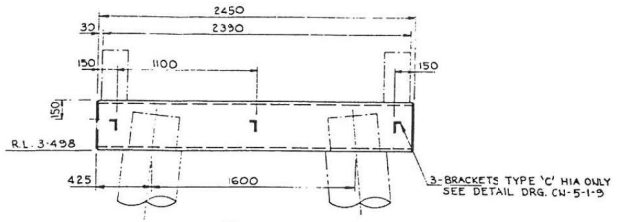
Ratio Scales
1:1 0 10 20 30 40 50 60 mm
1:2 0 20 40 60 80 100 120
1:2.5 0 50 100 150
1:5 0 100 200 300

DEPARTMENT OF HARBOURS & MARINE

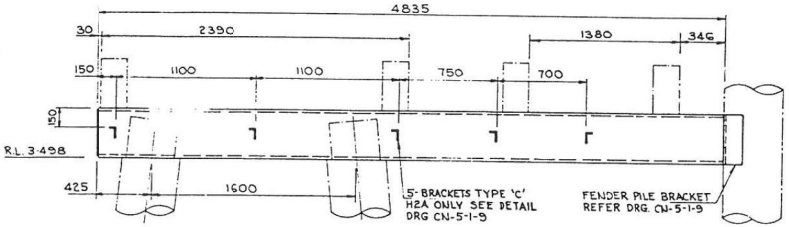
Design	Prep. NR	Chd.	NR
Drafting	Prep. R.G.S.	Chd. E.L.T.	Assistant Director Works
Supervising Draftsman	NR	Principal Eng.	
Principal Draftsman		Date	13-10-86

PALM COVE
PUBLIC JETTY
HEADSTOCK AND GIRDER LAYOUT

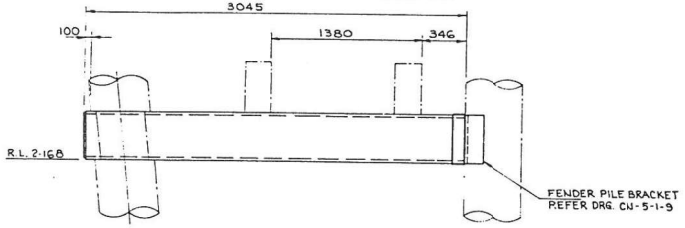
Drawing Number
CN - 5 - 1 - 6



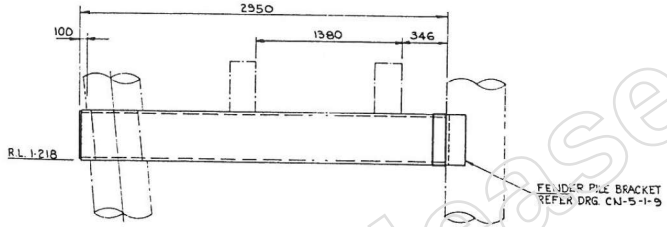
H1.
H1A SIMILAR AS NOTED.
SCALE 1:20



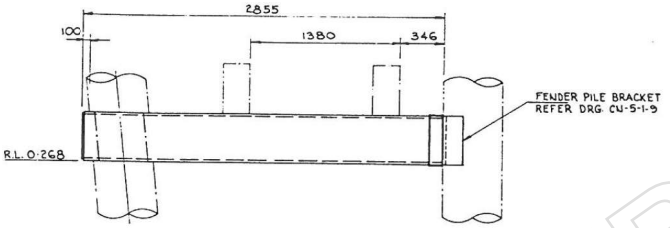
H2.
H2A SIMILAR AS NOTED.
SCALE 1:20



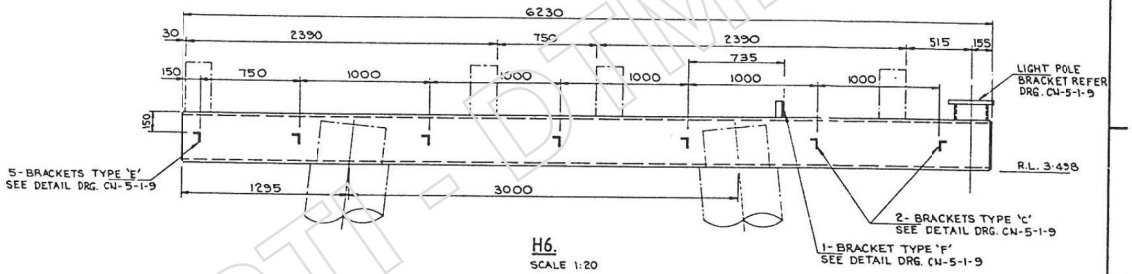
H3.
SCALE 1:20



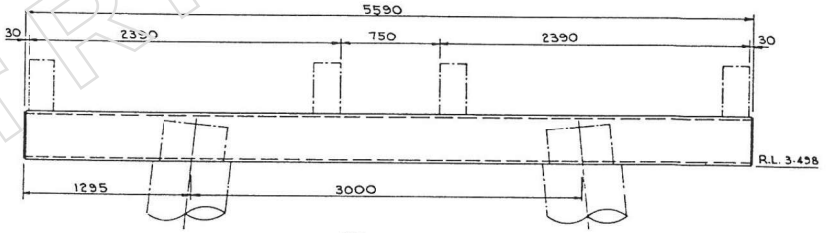
H4.
SCALE 1:20



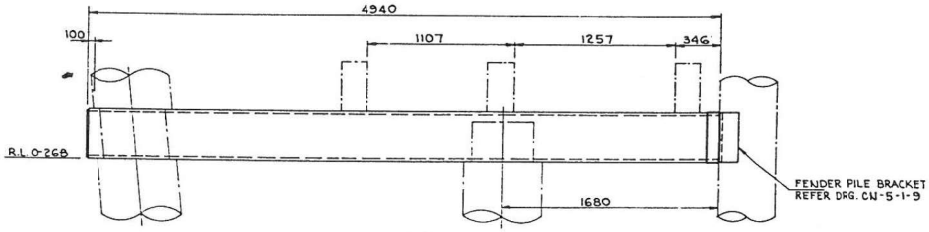
H5.
SCALE 1:20



H6.
SCALE 1:20



H7.
SCALE 1:20



H8.
SCALE 1:20

NOTE: FOR GENERAL ARRANGEMENT
& NOTES REFER DRG. CN-5-1-2

APERTURE CARD
NO. E-7472A

Amend.	Description	Date	Approved
A	CRES. COLLAR ADDED TO H3, H4, H5, & H8	5.11.86	J.H.K.

File No. 19 - 38 - 20
Job No.
Aperture Card No.

Ratio Scales
1:1 0 10 20 30 40 50 60 mm
1:2 0 20 40 60 80 100 120
1:2·5 0 50 100 150
1:5 0 100 200 300

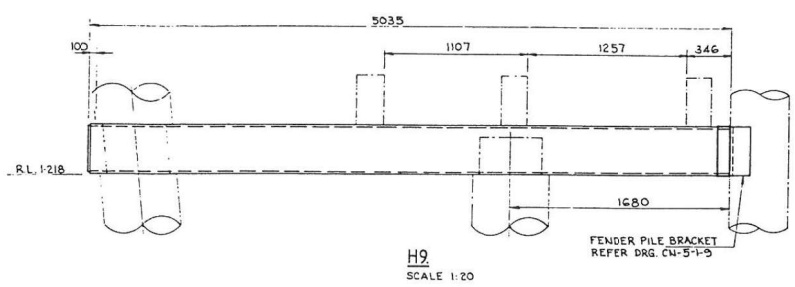
DEPARTMENT OF HARBOURS & MARINE

Design	Prep. NR	Chd.	NR
Drafting	Prep. R.G.S.	Chd. B.L.T.	Senior Eng. Harbours Works / Assistant Director Works
Supervising Draftsman	NR	NR	
Principal Draftsman		Principal Eng.	Date 13-10-86

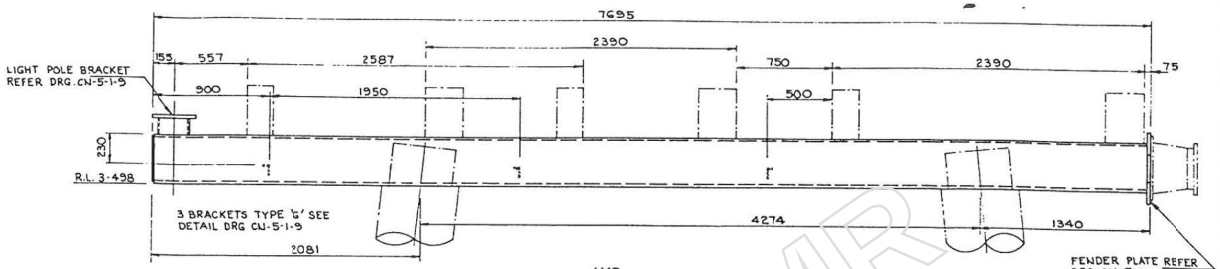
PALM COVE –
PUBLIC JETTY

HEADSTOCK DETAILS SHEET 1.

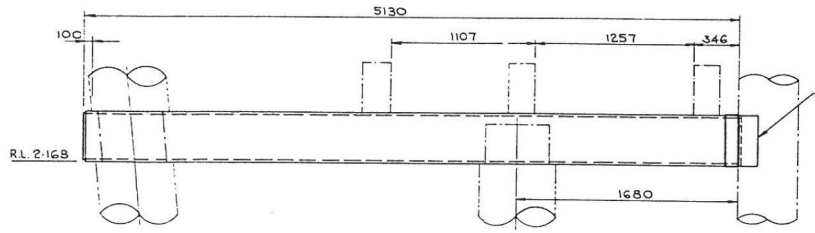
Drawing Number
CN - 5 - 1 - 7
A



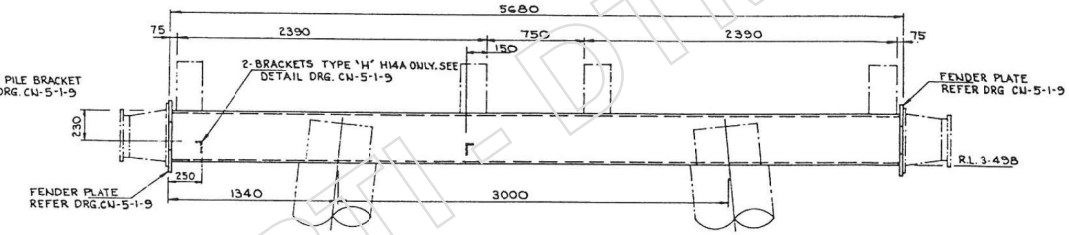
H9
SCALE 1:20



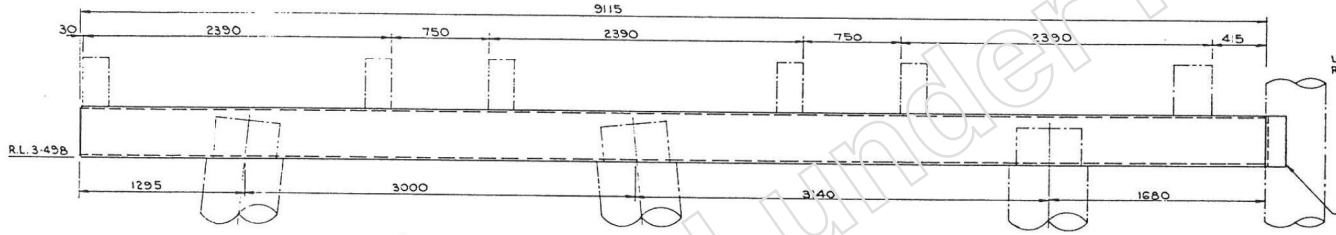
H13.
SCALE 1:20



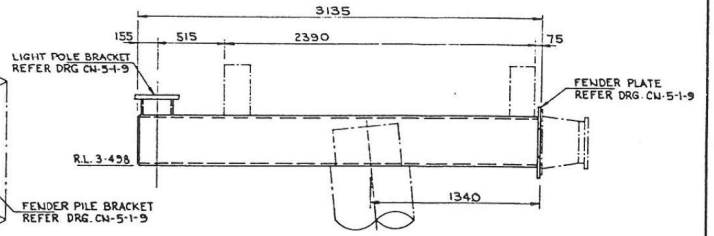
H10.
SCALE 1:20



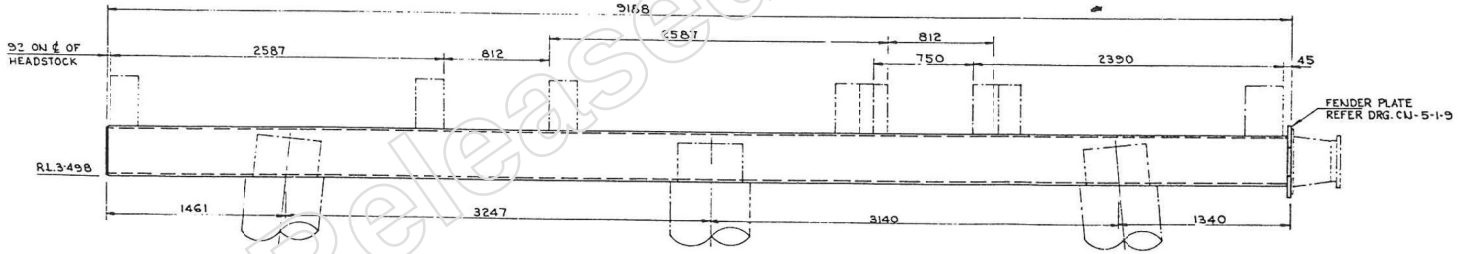
H14.
H14A SIMILAR AS NOTED
SCALE 1:20



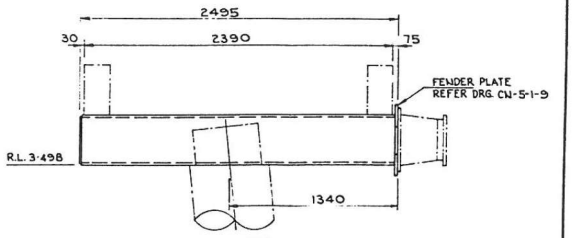
H11.
SCALE 1:20



H15.
SCALE 1:20



H12.
SCALE 1:20



H16.
SCALE 1:20

APERTURE CARD
NO. E-7473A

Amend.	Description	Date	Approved
A	CRES. COLLAR ADDED TO H9, & H10.	5.11.86.	J.R.C.

File No. 19 - 38 - 20
Job No.
Aperture Card No.

Ratio Scales
1:1 0 10 20 30 40 50 60 mm
1:2 0 20 40 60 80 100 120
1:2·5 0 50 100 150
1:5 0 100 200 300

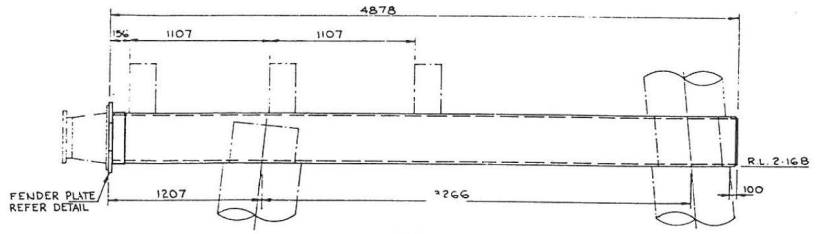
DEPARTMENT OF HARBOURS & MARINE

Design	Prep. NR	Ckd.	NR	
Drafting	Prep. R.G.S.	Ckd. B.L.T.	Senior Eng. Harbour Works	Assistant Director Works
Supervising Draftsmen	NR		NR	
Principal Draftsmen			Principal Eng.	Date 13-10-86

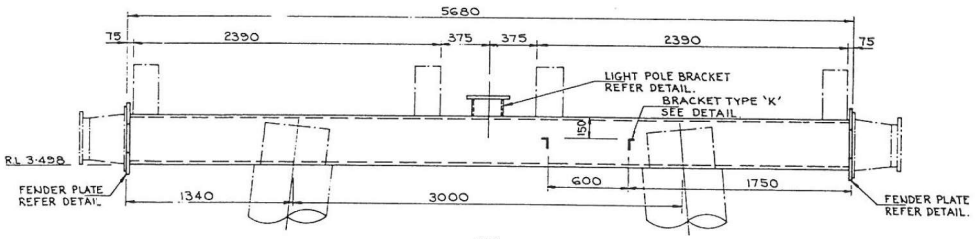
PALM COVE–
PUBLIC JETTY

HEADSTOCK DETAILS SHEET 2.

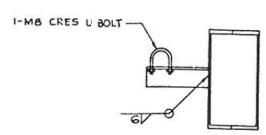
Drawing Number
CN - 5 - 1 - 8
A

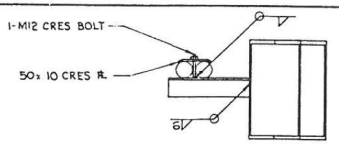


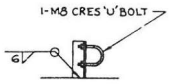
H17.
SCALE 1:20

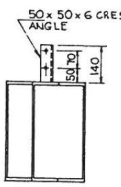


H18.
SCALE 1:20

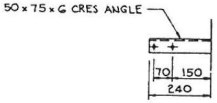




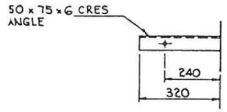




BRACKET TYPE 'F'
SCALE 1:10



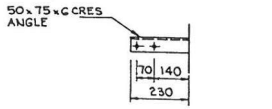
BRACKET TYPE 'C'
SCALE 1:10



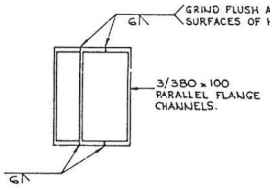
BRACKET TYPE 'E'
SCALE 1:10

BRACKET TYPE 'G'
SCALE 1:10

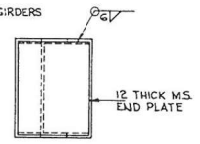
BRACKET TYPE 'H'
SCALE 1:10



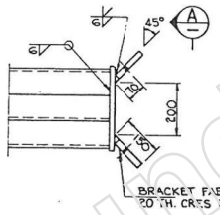
BRACKET TYPE 'K'
SCALE 1:10



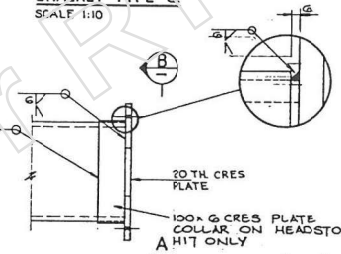
TYPICAL SECTION - H6, H7, H11 - H18.
SCALE 1:10



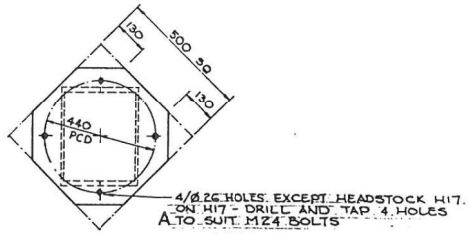
TYPICAL END PLATE - H6, H7, H11 - H18.
SCALE 1:10



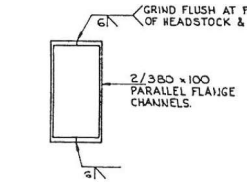
FENDER PILE BRACKET - H11 ONLY.
SCALE 1:10



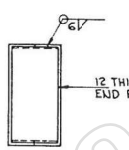
FENDER PLATE DETAIL.
SCALE 1:10



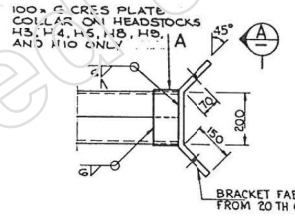
ELEVATION B.
SCALE 1:10



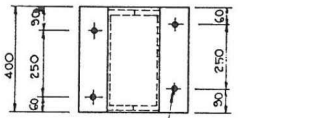
TYPICAL SECTION - H1-H5, H8-H10.
SCALE 1:10



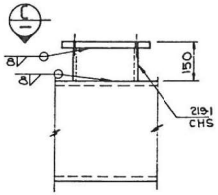
TYPICAL END PLATE - H1-H5, H8-H10.
SCALE 1:10



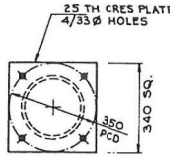
FENDER PILE BRACKET - TYPICAL U.N.O.
SCALE 1:10



ELEVATION A.
SCALE 1:10



TYPICAL LIGHT POLE BRACKET.
SCALE 1:10



VIEW C.
SCALE 1:10

APERTURE CARD
NO. E-7474/A

Amend.	Description	Date	Approved
A	CRES COLLAR ADDED TO H3-H5, H8-H10, & H17	5/11/86	

File No. 19 - 38 - 20
Job No.
Aperture Card No.

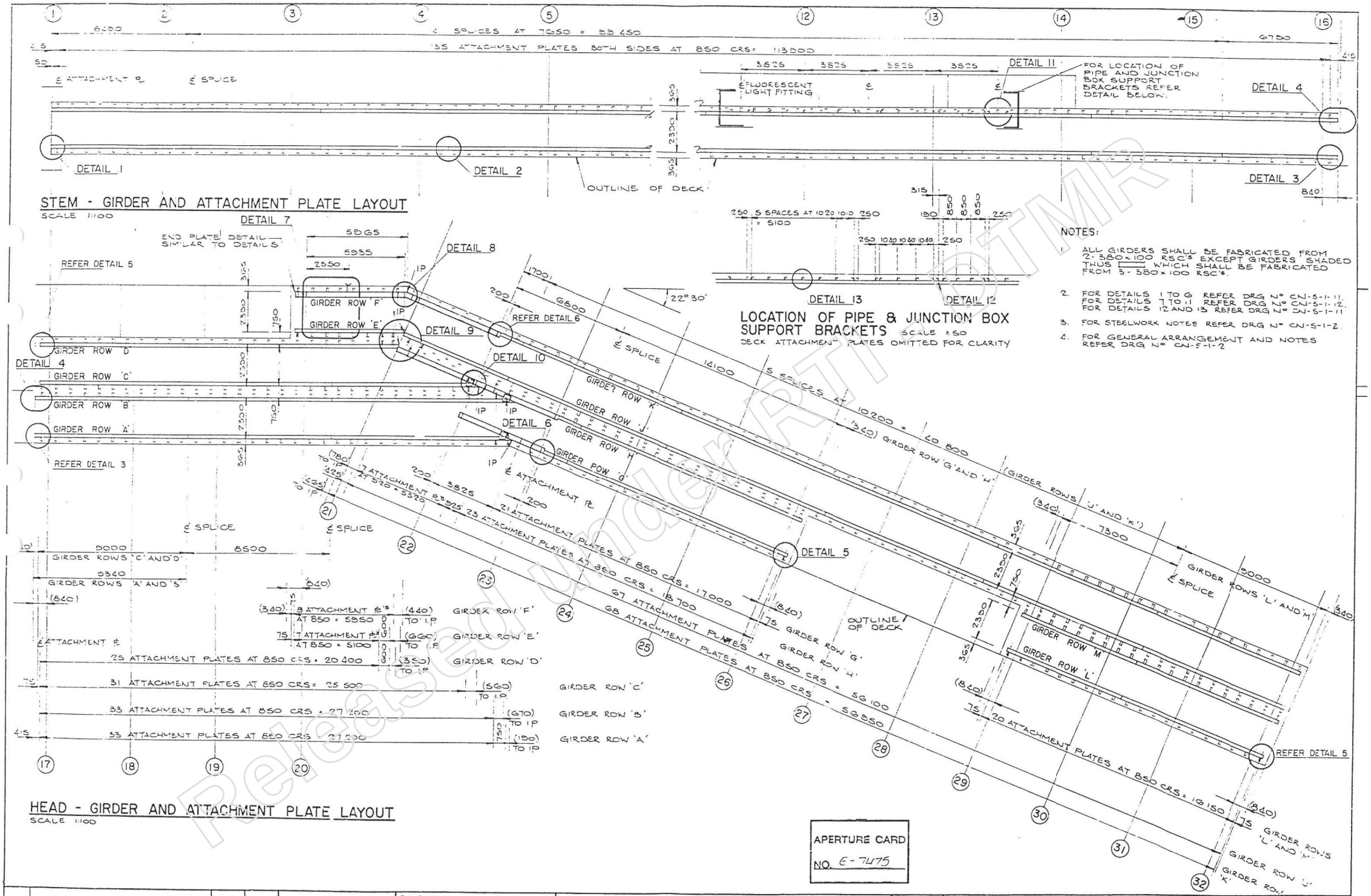
Ratio Scales
1:1 0 10 20 30 40 50 60 mm
1:2 0 20 40 60 80 100 120
1:2.5 0 50 100 150
1:5 0 100 200 300

DEPARTMENT OF HARBOURS & MARINE

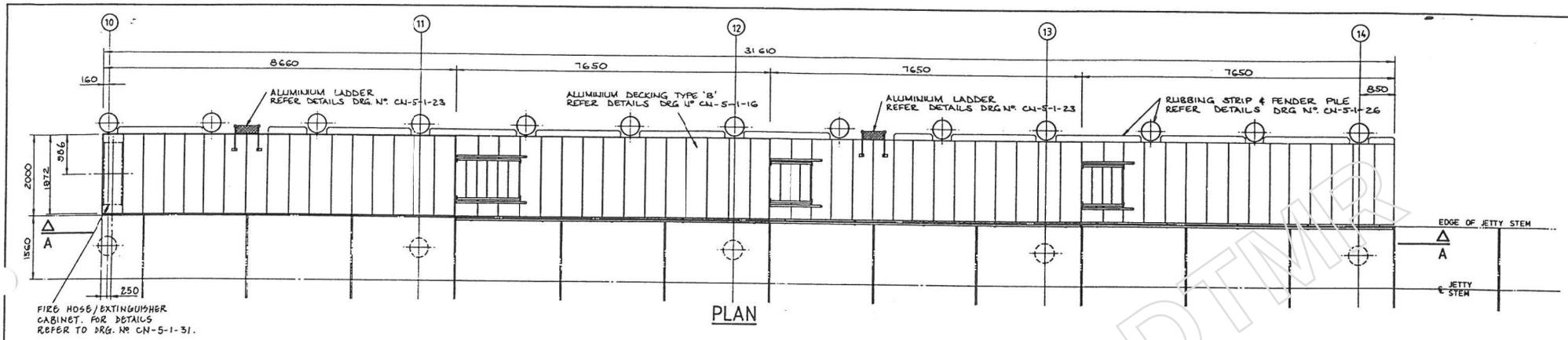
Design	Prep. NR	Chd.	NR
Drafting	Prep. R.G.S.	Chd. R.L.T.	Senior Eng. Harbour Works / Assistant Director Works
Supervising Draftsman			
Principal Draftsman	NR	Principal Eng. NR	Date 15-10-86

PALM COVE
PUBLIC JETTY
HEADSTOCK DETAILS SHEET 3.

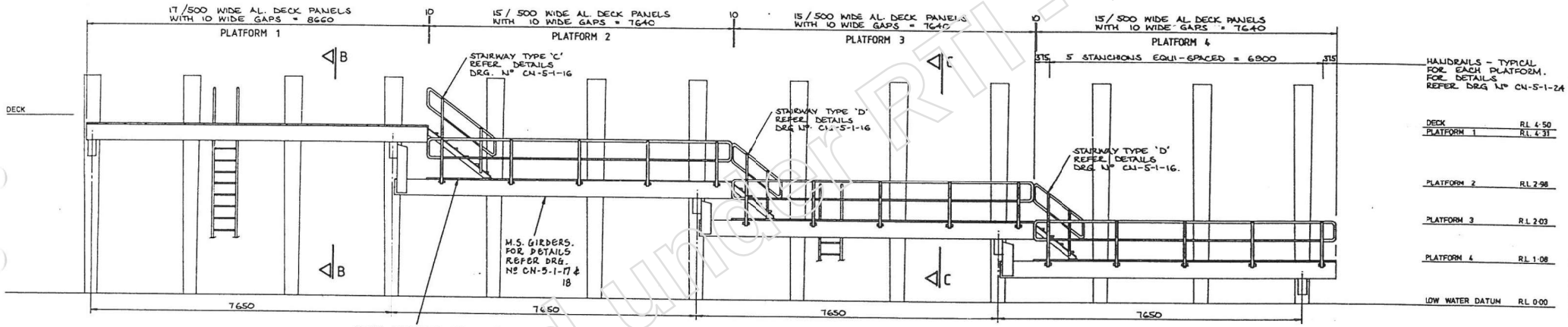
Drawing Number
CN - 5 - 1 - 9
A



Amend	Description	Date	Approved	File No. 19-38-20	Ratio Scales 1:1, 1:2, 1:2.5, 1:5	DEPARTMENT OF HARBOURS & MARINE	PALM COVE PUBLIC JETTY STEM AND HEAD GIRDER AND ATTACHMENT PLATE LAYOUT
				Job No		Design Prep. NR Ckd. NR; Drafting Prep. P.J.Moore Ckd. B.L.T.; Supervising Draftsman NR; Principal Draftsman	Senior Eng. Harbour Works; Assistant Director Works; Principal Eng. NR; Date 13-10-86
				Aperture Card No.			Drawing Number CN-5-1-10

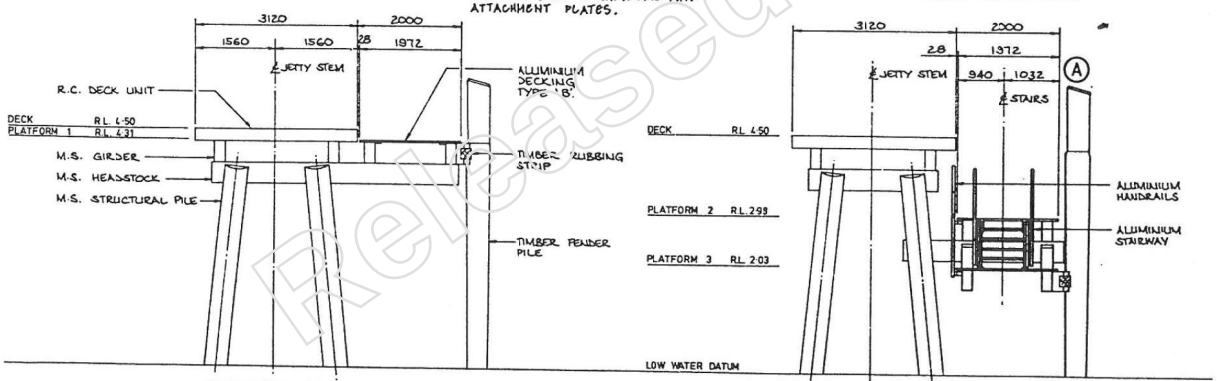


PLAN



12 THK. NEOPRENE SHALL BE USED BETWEEN ALUMINIUM DECK PANELS AND TOP FACE OF GIRDERS AND ATTACHMENT PLATES.

SECTIONAL ELEVATION A-A



SECTION B-B

SECTION C-C

SCALE 1:50

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FOR GENERAL ARRANGEMENT & NOTES REFER TO DRG. N°. CN-5-1-2.

APERTURE CARD
NO. E-7480A

Amend.	Description	Date	Approved
A	DIMENSIONS ALTERED	8.3.87	

File No. 19-38-20
Job No.
Aperture Card No.

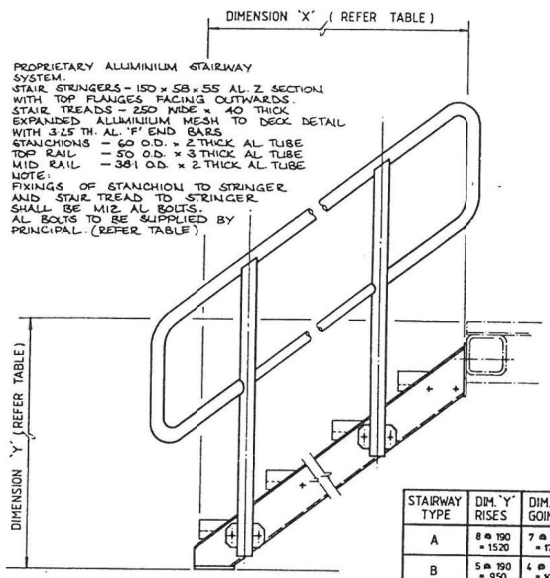
Ratio Scales
1:1 0 10 20 30 40 50 60 mm
1:2 0 20 40 60 80 100 120
1:2·5 0 50 100 150
1:5 0 100 200 300

DEPARTMENT OF HARBOURS & MARINE

Design	Prep. NR	Chd.	NR
Drafting	Prep. D.K.C.	Chd. R.L.T.	Senior Eng. Harbour Works / Assistant Director Works
Supervising Draftsman	NR	NR	
Principal Draftsman		Principal Eng.	Date 8-10-86

PALM COVE
PUBLIC JETTY
LANDING AREA N° 3
ARRANGEMENT AND SECTIONS

Drawing Number
CN-5-1-15
A

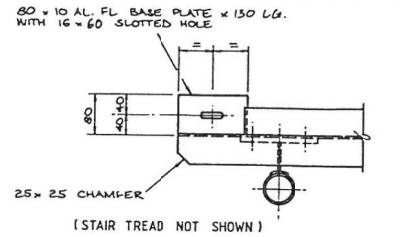


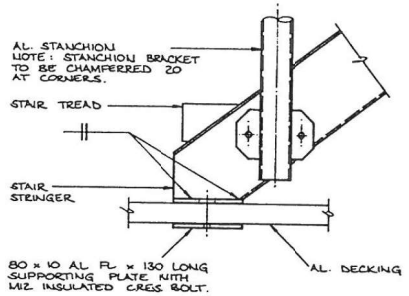
NOTE: FOR CONNECTION OF STAIRWAY TO PLATFORM OR R.C. DECK UNITS REFER DETAIL.

STAIRWAY TYPE	DIM. 'Y' RISES	DIM. 'X' GOINGS	WIDTH BETWEEN STRINGERS
A	8 @ 190 = 1520	7 @ 250 = 1750	1234
B	5 @ 190 = 950	4 @ 250 = 1000	1234
C	7 @ 190 = 1330	6 @ 250 = 1500	926
D	5 @ 190 = 950	4 @ 250 = 1000	926

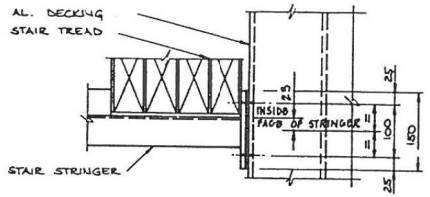
STAIRWAY DETAIL

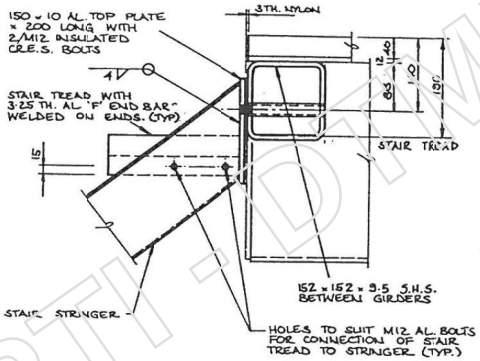
SCALE 1:10



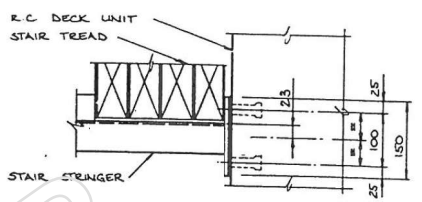


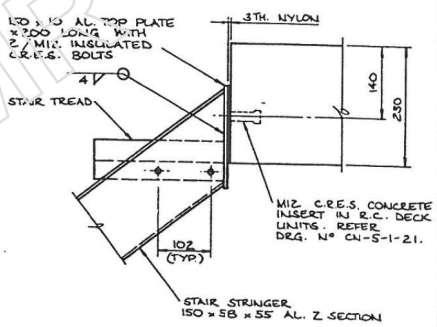
BASE CONNECTION





TOP CONNECTION TO PLATFORM FRAME





TOP CONNECTION TO R.C. DECK UNITS

STAIRWAY CONNECTION DETAILS

SCALE 1:5

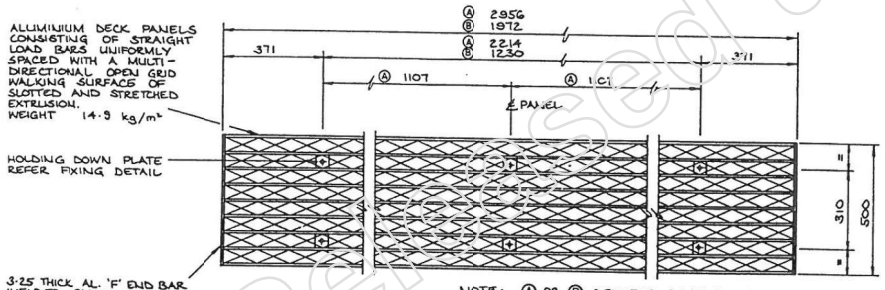
NOTES

ALUMINIUM

1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH A.S. 1664.
2. ALUMINIUM SHALL COMPLY WITH A.S. 1734, A.S. 1866 AND A.S. 1867 AND SHALL BE OF THE ALLOY TYPES 6061 OR 6063 TEMPER T5 OR T6 DEPENDING ON AVAILABILITY.
3. WELDING SHALL BE CARRIED OUT USING ARGON GAS SHIELDING AND IN ACCORDANCE WITH A.S. 1665.
4. ALL WELDS SHALL BE FULLY SEALED WITH EITHER A 5 mm FILLET OR AN INCOMPLETE PENETRATION BUTT WELD. UNLESS NOTED OTHERWISE.
5. ALL WORK SHALL BE NEATLY FINISHED AND ALL EDGES GROUND SMOOTH.

GENERAL

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FOR REMAINING NOTES REFER DRG N° CN-S-1-2
3. ALL ALUMINIUM BOLTS, NUTS AND WASHERS SHALL BE SUPPLIED BY THE PRINCIPAL.

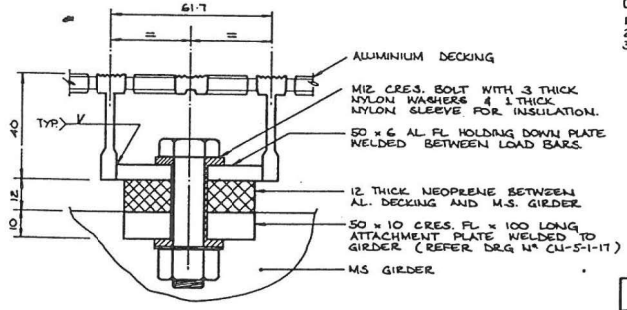


NOTE: Ⓐ OR Ⓑ DENOTES DIMENSIONS FOR EITHER TYPE A OR TYPE B DECK PANELS. DIMENSIONS WITHOUT THE SYMBOL ARE COMMON FOR BOTH.

ALUMINIUM DECK PANELS - TYPE A & TYPE B

ALUMINIUM DECK DETAIL

NOT TO SCALE



ALUMINIUM DECK FIXING DETAIL

SCALE 1:1

APERTURE CARD
NO. E-7481

ALUMINIUM BOLTS - SUPPLIED BY PRINCIPAL		
LOCATION	SIZE	N° OFF
CONNECTION OF STAIR TREADS AND STANCHIONS TO STRINGERS	M12 x 40 LONG WITH NUT AND WASHER	172
FIRE CABINET BOLTS	" " "	54

Amend.	Description	Date	Approved

File No. 19 - 38 - 20
Job No.
Aperture Card No.

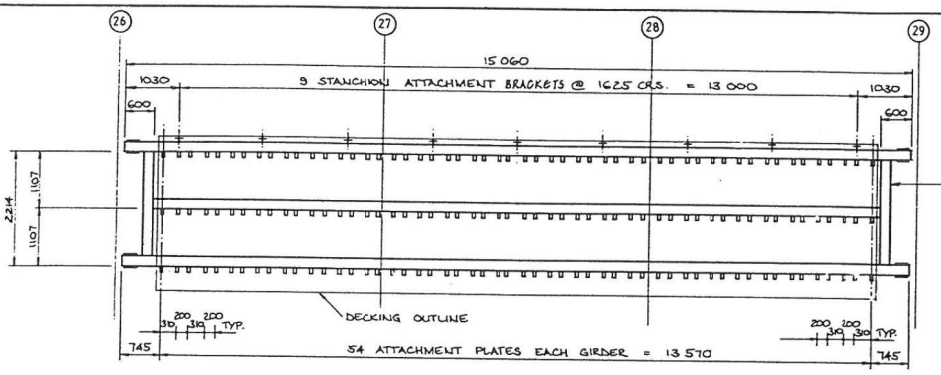
Ratio Scales
1:1 0 10 20 30 40 50 60 mm
1:2 0 20 40 60 80 100 120
1:2.5 0 50 100 150
1:5 0 100 200 300

DEPARTMENT OF HARBOURS & MARINE

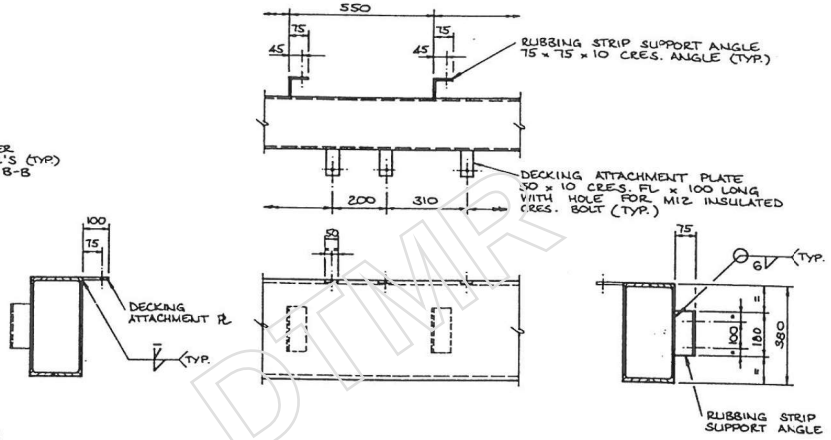
Design	Prep. NR	Chd. NR	Senior Eng. Harbour Works	Assistant Director Works
Drafting	Prep. D.K.C.	Chd. B.L.X		
Supervising Draftsman	NR	Principal Eng. NR		Date 13-11-86
Principal Draftsman				

PALM COVE
PUBLIC JETTY
LANDING AREAS
STAIRWAY AND DECKING DETAILS

Drawing Number
CN-S-1-16

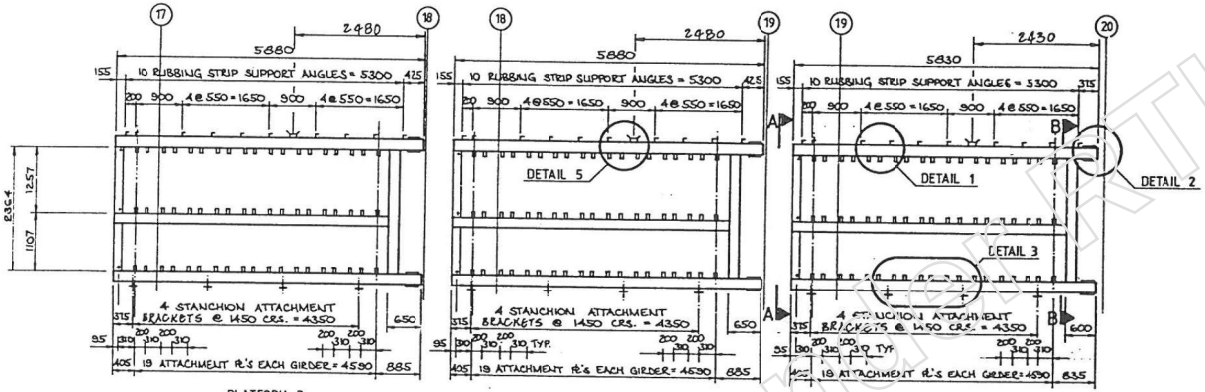


LANDING AREA 1

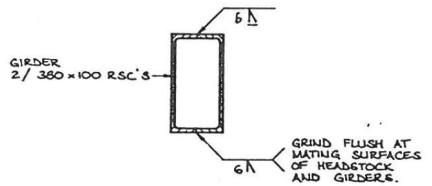


DETAIL 1

SCALE 1:10



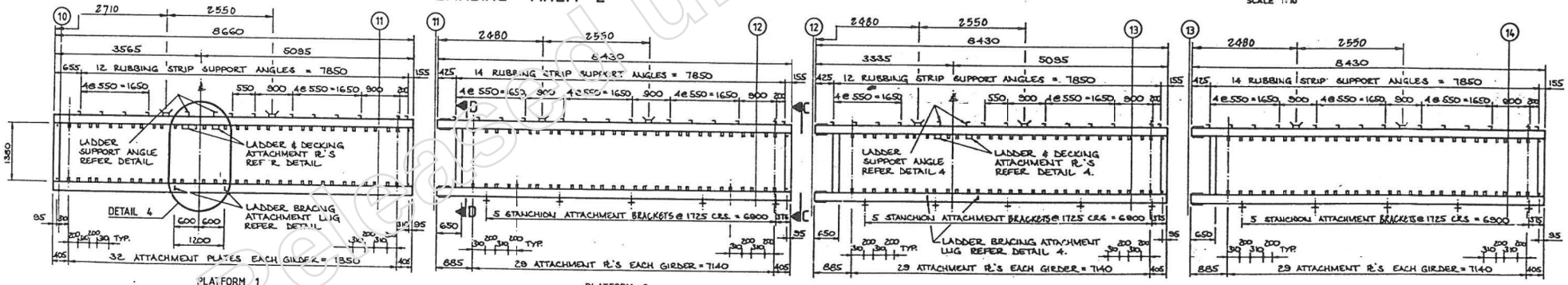
LANDING AREA 2



GIRDER FABRICATION DETAIL

SCALE 1:10

APERTURE CARD No. E-74182



LANDING AREA 3

LANDING AREAS - GIRDER LAYOUT

SCALE 1:50

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FOR DETAILS 2,3,4,&5 AND SECTIONS REFER DRG. N° CN-5-1-18.
3. FOR GENERAL ARRANGEMENT & NOTES REFER DRG. N° CN-5-1-2.

Amend.	Description	Date	Approved

File No. 19 - 38 - 20
Job No.
Aperture Card No.

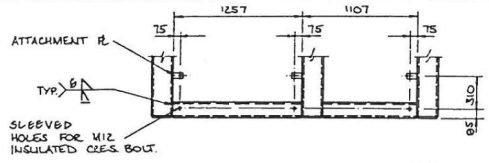
Ratio Scales
1:1 0 10 20 30 40 50 60 mm
1:2 0 20 40 60 80 100 120
1:2·5 0 50 100 150
1:5 0 100 200 300

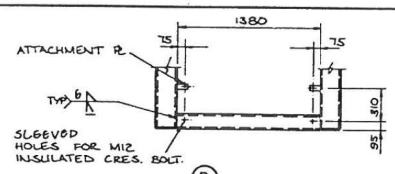
DEPARTMENT OF HARBOURS & MARINE

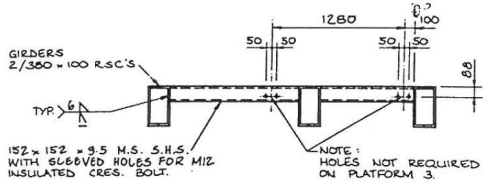
Design	Prep. NR	Chk.	NR
Drafting	Prep. J.K.C.	Chk. B.L.T.	Senior Engr. Asst Asst Director Works
Supervising Draftsman	NR	NR	
Principal Draftsman		Principal Engr.	Date 13-10-86

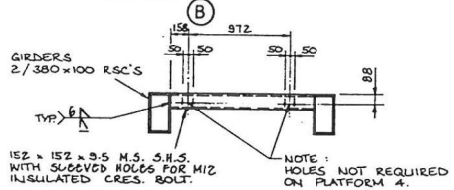
PALM COVE
PUBLIC JETTY
LANDING AREAS
GIRDER LAYOUT

Drawing Number
CN-5-1-17

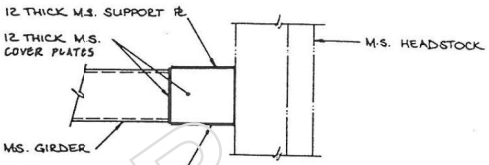








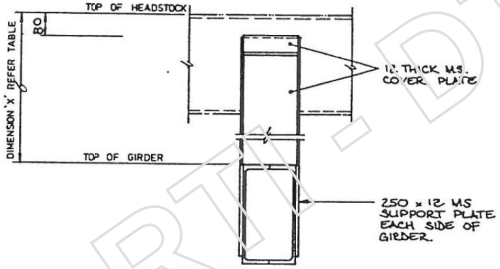
LANDING AREA	PLATFORM	DIMENSION 'X'
1	–	950
2	1	950
2	2	570
2	3	570
3	2	950
3	3	570
3	4	570

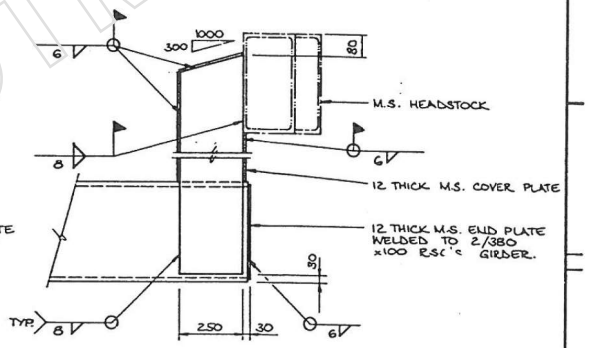


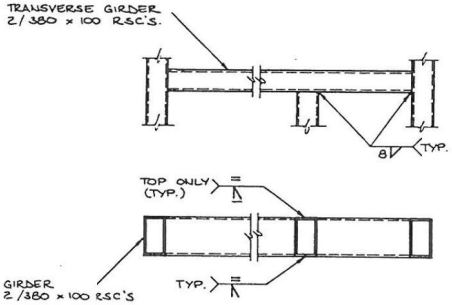
VIEW A-A
SCALE 1:25

NOTE: HOLES THROUGH S.H.S. MEMBERS TO BE SLEEVED WITH Ø26.7 x 3.9 WALL THICKNESS C.R.B.S. PIPE. SLEEVES TO BE SEAL WELDED INTO S.H.S.

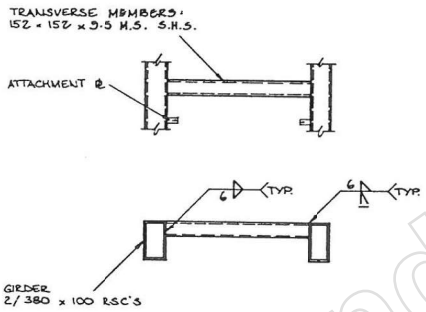
VIEW C-C
SCALE 1:25







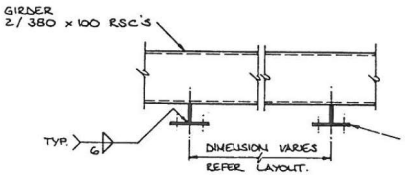
SECTION B-B
SCALE 1:25

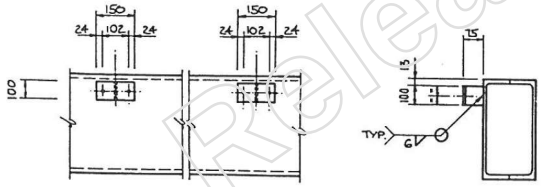


SECTION D-D
SCALE 1:25

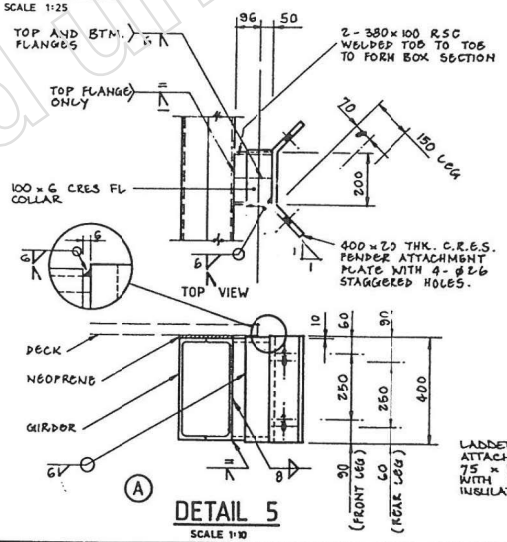
NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FOR GENERAL ARRANGEMENT & NOTES REFER DRG. Nº CN-5-1-2.
3. FOR LOCATIONS OF SECTIONS & DETAILS REFER TO DRG. Nº. CN-5-1-17.

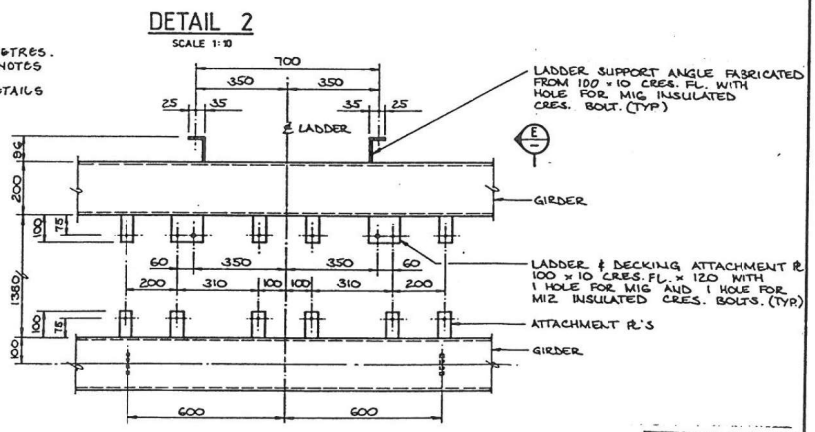




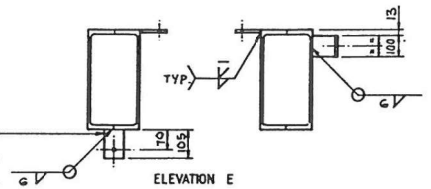
DETAIL 3
SCALE 1:10



DETAIL 5
SCALE 1:10



DETAIL 2
SCALE 1:10



ELEVATION E

DETAIL 4
SCALE 1:10

APERTURE CARD
NO. E-74838

Amend.	Description	Date	Approved
B	DIMENSIONS ALTERED	2.8.87	
A	CRES. COLLAR ADDED TO DETAIL 5.	5.11.86	

File No. 19 - 38 - 20
Job No.
Aperture Card No.

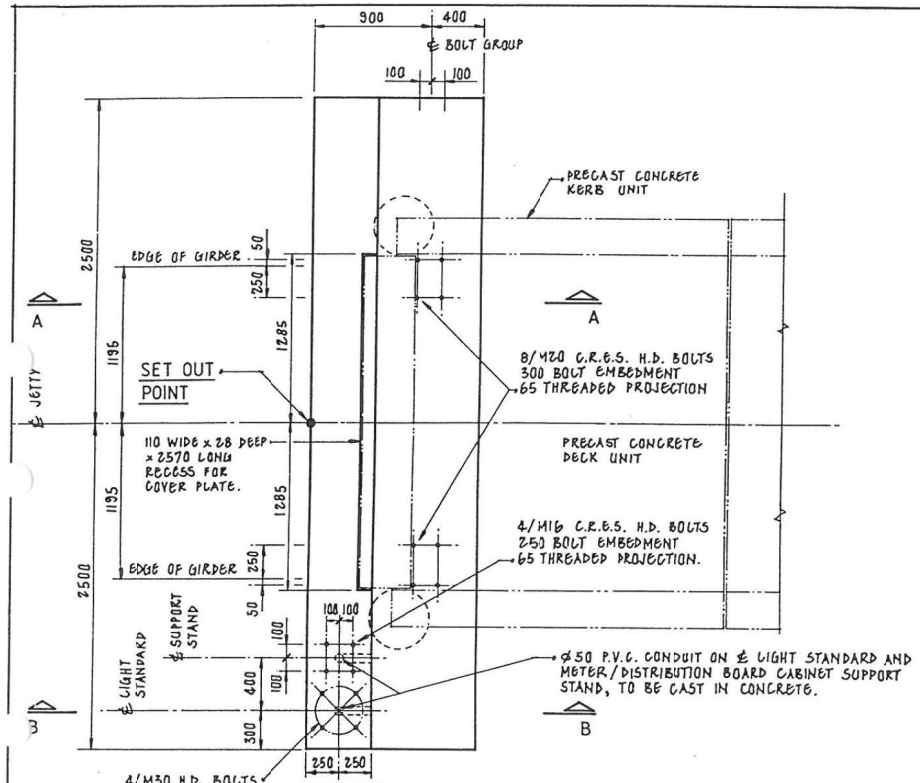
Ratio Scales
1:1
1:2
1:2.5
1:5

DEPARTMENT OF HARBOURS & MARINE

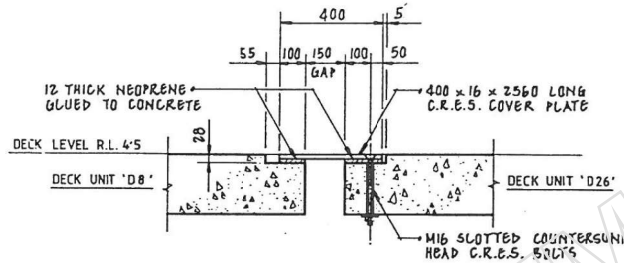
Design	Prep. NR	Chd.	NR
Drafting	Prep. D.K.C.	Chd. B.L.T.	Senior Ch. Harbour Works
Supervising Draftsman	NR	NR	Assistant Director Works
Principal Draftsman		Principal	Date 13-10-86

PALM COVE
PUBLIC JETTY
LANDING AREAS
GIRDER DETAILS

Drawing Number
CN-5-1-18
A B

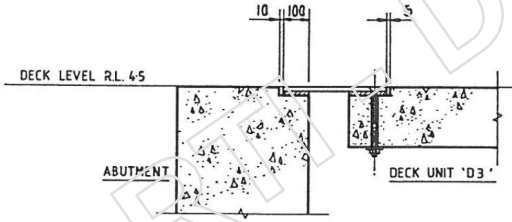


TOP VIEW



JOINT AT DECK UNITS

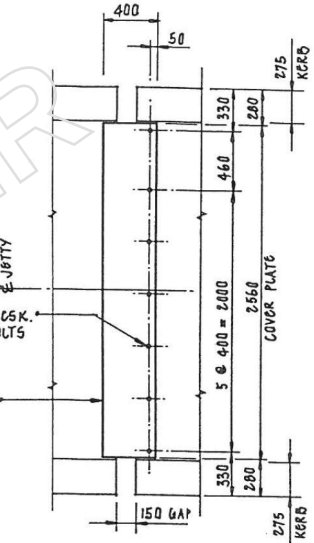
SCALE 1:10



JOINT AT ABUTMENT

SCALE 1:10

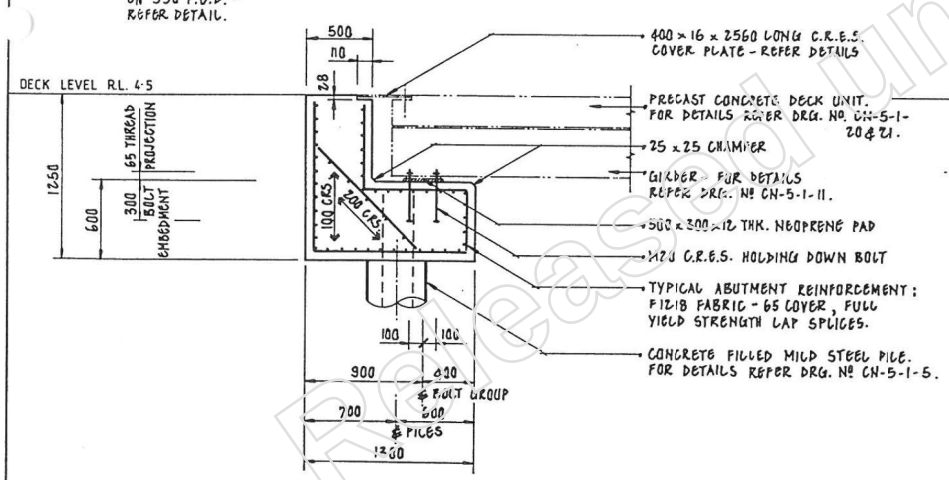
REMAINING DETAILS AS FOR DECK UNIT JOINT.



COVER PLATE DETAIL

SCALE 1:20

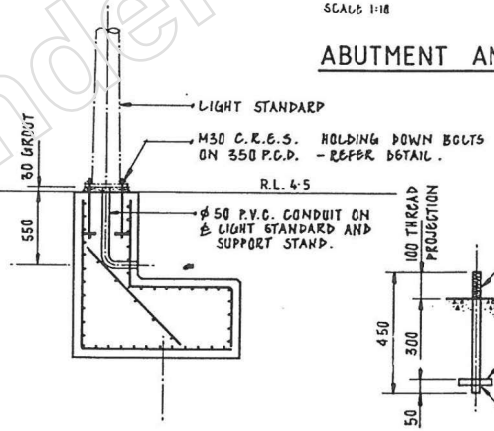
ABUTMENT AND DECK JOINT COVER PLATE DETAIL



SECTION A-A

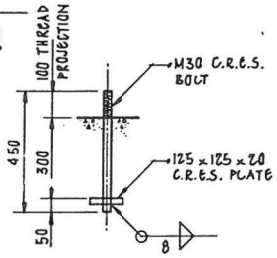
ABUTMENT DETAILS

SCALE 1:20



SECTION B-B

REMAINING DETAILS AS FOR SECTION A-A.



LIGHT STANDARD H.D. BOLT DETAIL

SCALE 1:10

APERTURE CARD NO. E-7484

NOTE:

1. FOR CONCRETE AND REINFORCEMENT NOTES REFER TO DRG. № CN-5-1-22.
2. FOR REMAINING NOTES REFER TO DRG. № CN-5-1-2.

Amend.	Description	Date	Approved	Aperture Card No.

File No. 19 - 38 - 20

Job No.

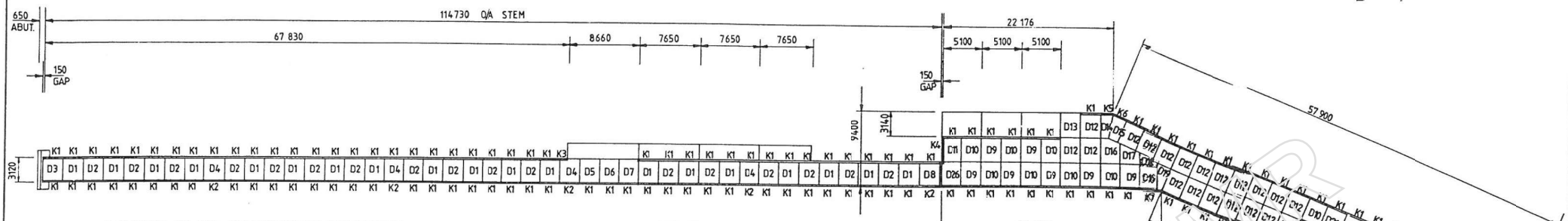
Ratio Scales: 1:1, 1:2, 1:2·5, 1:5

DEPARTMENT OF HARBOURS & MARINE

Design	Prep. NR	Chd. NR	
Drafting	Prep. D. LUERS	Chd. R.L.T.	Senior Engr. Harbour Works / Assistant Director Works
Supervising Draftsman	NR	NR	
Principal Draftsman		Principal Engr.	Date 13-10-86

PALM COVE
PUBLIC JETTY
ABUTMENT AND COVER PLATE DETAILS

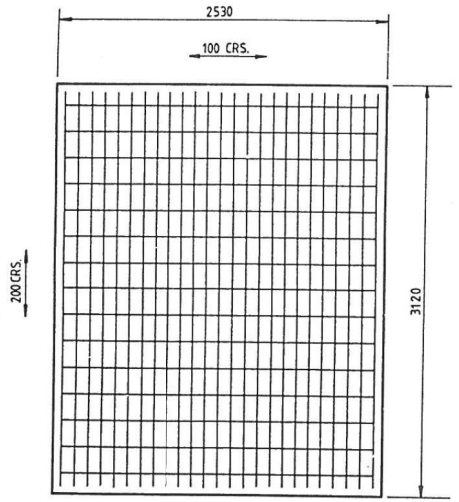
Drawing Number: CN - 5 - 1 - 19

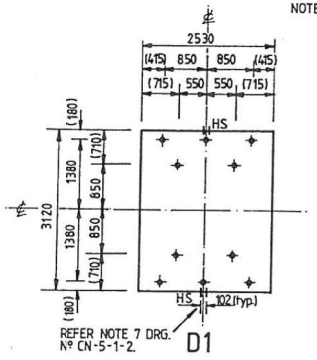


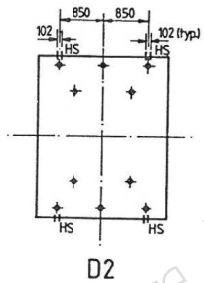
LAYOUT PLAN OF PRECAST CONCRETE DECK AND KERB UNITS

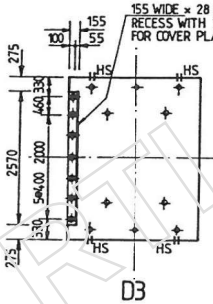
SCALE 1:250

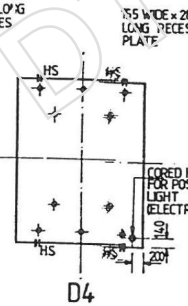
NOTE: POSITIONS OF CORED HOLES AND INSERTS ON D1 & D2 ARE TYPICAL FOR ALL UNITS UNLESS SHOWN OTHERWISE.

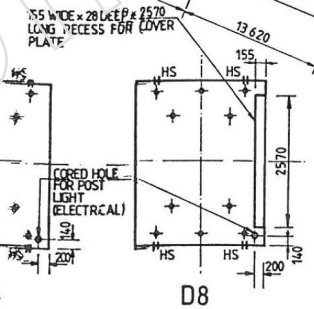


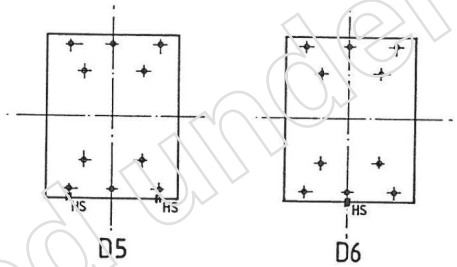


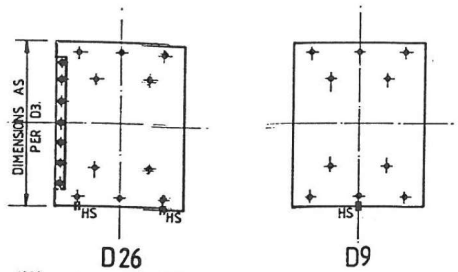


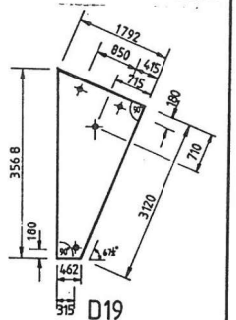


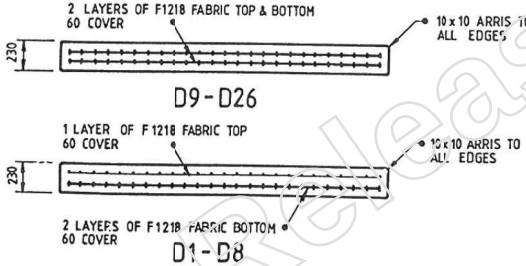


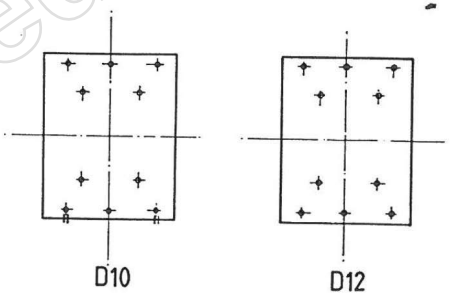


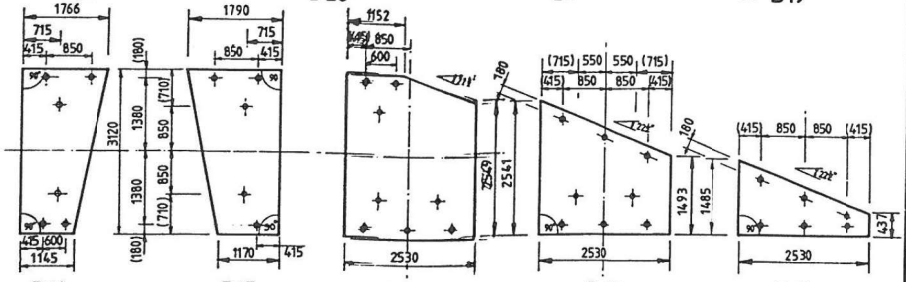












PRECAST CONCRETE DECK UNITS REINFORCEMENT DETAILS

SCALE 1:20

ARRANGEMENT OF DECK UNITS.

SCALE - 1:50

NOTE: FOR NOTES REFER DRG. Nº CN-5-1-21.

Amend.	Description	Date	Approved

File No. 19 - 38 - 20
Job No.
Aperture Card No.

Ratio Scale
1:1 0 10 20 30 40 50 60 mm
1:2 0 20 40 60 80 100 120
1:2.5 0 50 100 150
1:5 0 100 200 300

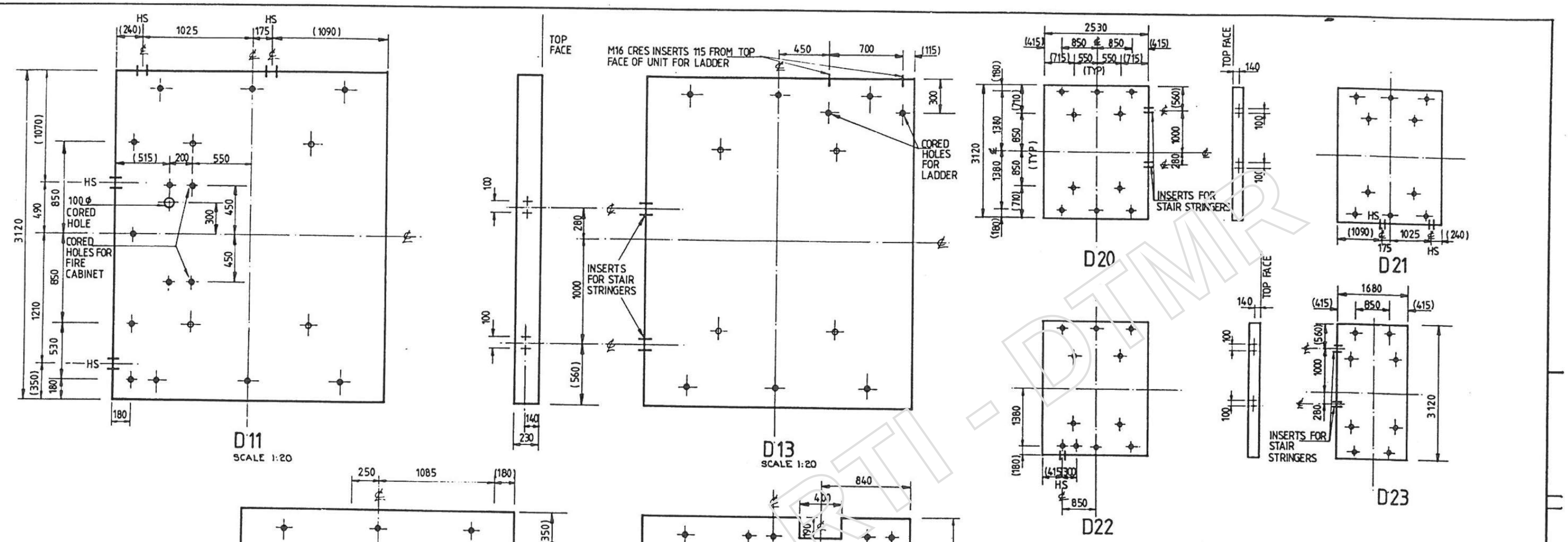
DEPARTMENT OF HARBOURS & MARINE

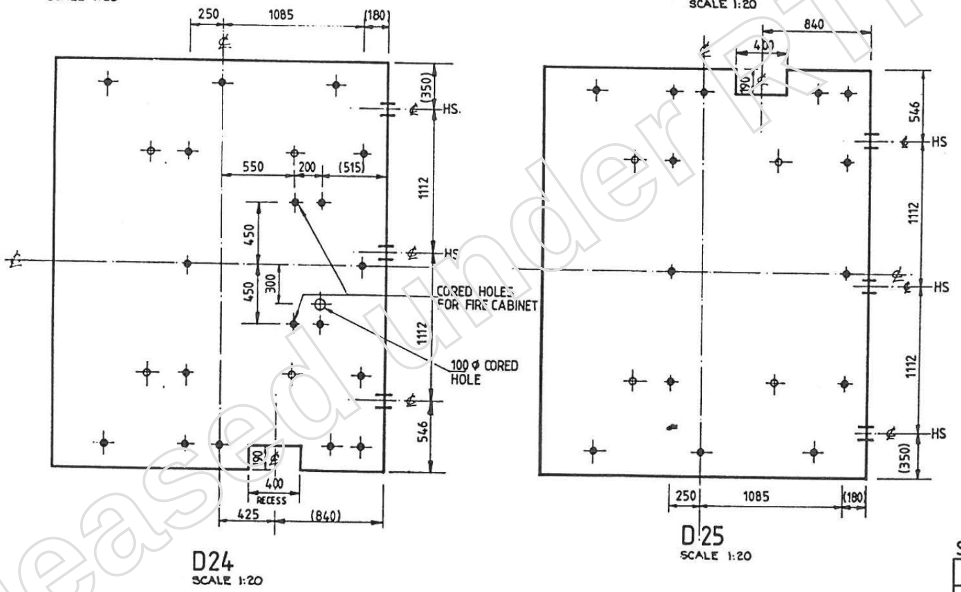
Design	Prep. NR	Chd.	NR
Drafting	Prep. GL	Chd. B.L.T.	Senior Eng. Harbour Works
Supervising Draftsman	NR		Assistant Director Works
Principal Draftsman		Principal Engr. NR	Date 13-10-86

PALM COVE
PUBLIC JETTY
PRECAST CONCRETE DECK & KERB UNITS
LAYOUT & DETAILS

Drawing Number
CN-5-1-20

APERTURE CARD
NO. E-7485





ARRANGEMENT OF DECK UNITS.

SCALE 1:50 UNLESS NOTED OTHERWISE

NOTE:-

1 - ALL CORED HOLES SHALL BE LINED WITH 26·6 OD. x 1·4 WALL UPVC PIPE CLASS 12 TO AS1477 UNLESS NOTED OTHERWISE.
2 - DENOTES CORED HOLES FOR CRES. (STAINLESS STEEL) BOLTS
3 - DENOTES CORED HOLES FOR LIFTING/DRAINAGE PURPOSES
4 - DENOTES CRES. (STAINLESS STEEL) CAST IN INSERTS IN SIDE FACES OF DECK UNITS. ALL INSERTS TO SUIT M12 CRES. BOLTS UNLESS NOTED OTHERWISE.
5 - DIMENSIONS SHOWN IN BRACKETS ARE AUXILIARY DIMENSIONS GIVEN FOR REFERENCE ONLY AND SHOULD NOT BE USED FOR CONSTRUCTION
6 - FOR REINFORCEMENT AND CONCRETE NOTES AND KERB UNIT DETAILS REFER TO DWG Nº CN 3-1-22.
7 - HS INDICATES POSITION OF CRES INSERTS FOR HANDRAIL STANCHIONS. THESE INSERTS ARE TO BE CAST CENTRALLY IN SIDE FACE OF DECK UNITS AT CENTRES SHOWN.

SCHEDULE OF PRECAST DECK UNITS

MARK	Nº OFF
D1	19
D2	17
D3, D5, D6, D7, D8, D11, D13 TO D26 INCL.	1 OFF EACH
D4	4
D9	9
D10	10
D12	29

APERTURE CARD
NO. E-7486

Amend	Description	Date	Approved	File No. 19 - 38 - 20
				Job No.
				Aperture Card No.

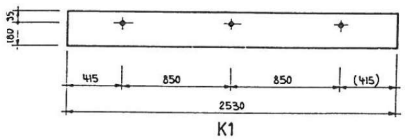
Ratio Scales 1:1, 1:2, 1:2.5, 1:5

DEPARTMENT OF HARBOURS & MARINE

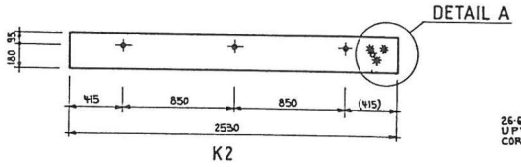
Design Prep. NR Chd.
Drafting Prep. G.L. Chd. B.L.T.
Supervising Draftsman
Principal Draftsman NR
Senior Eng. Harbour Works NR
Assistant Director Works
Principal Eng. NR
Date 13-10-86

PALM COVE
PUBLIC JETTY
PRECAST CONCRETE DECK UNIT DETAILS

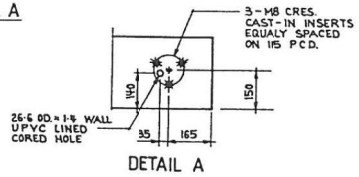
Drawing Number
CN-5-1-21



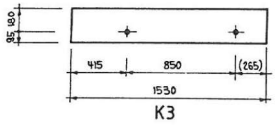
K1



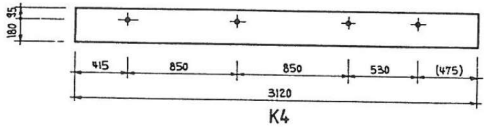
K2



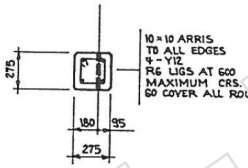
DETAIL A



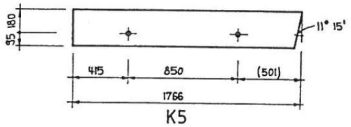
K3



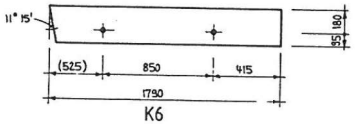
K4



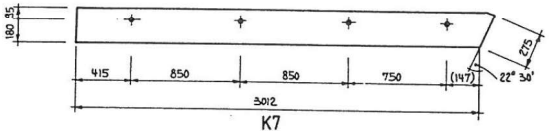
TYPICAL SECTION



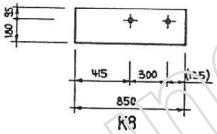
K5



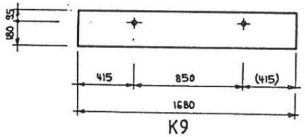
K6



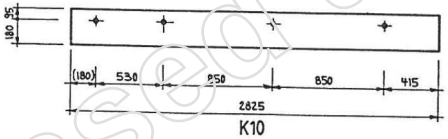
K7



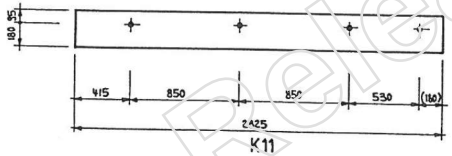
K8



K9



K10



K11

K11	2
K10	2
K3 TO K9 INCLUSIVE	1 OFF EACH
K2	5
K1	138
MARK	Nº OFF

SCHEDULE OF PRECAST KERB UNITS

NOTES:

GENERAL
1. ALL CORED HOLES SHOWN THUS ✣ TO BE LINED WITH 26.6 O.D. x 1.6 WALL UPVC PIPE CLASS 12 TO AS. 1477
2. ALL CRES. (STAINLESS STEEL) INSERTS SHALL BE GRADE 316.
3. DIMENSIONS SHOWN IN BRACKETS ARE AUXILIARY DIMENSIONS GIVEN FOR REFERENCE ONLY AND SHOULD NOT BE USED FOR CONSTRUCTION.

REINFORCEMENT
1. REINFORCING BARS DESIGNATED Y SHALL BE GRADE 410 Y BARS TO AS. 1302
2. REINFORCING BARS DESIGNATED R SHALL BE GRADE 230 R BARS TO AS. 1302
3. REINFORCING FABRIC DESIGNATED F SHALL BE WELDED WIRE FABRIC TO AS. 1304.
4. ALL REINFORCEMENT TO BE HOT DIP GALVANIZED.
5. REINFORCEMENT IN DECK UNITS TO BENT / CUT AROUND CORED HOLES WHERE NECESSARY. ENDS OF FABRIC TO BE TRIMMED TO MAINTAIN COVER.

CONCRETE
1. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH AS. 1480
2. PROVIDE 10 x 10 ARRISES TO ALL EDGES. UNLESS NOTED OTHERWISE
3. CLEAR COVER TO ALL REINFORCEMENT SHALL BE 60. UNLESS NOTED OTHERWISE
4. F'c TO BE 40 MPa.
5. TOP SURFACE OF DECK AND KERB UNITS SHALL BE FINISHED BY BROOMING ACROSS THE SURFACE OF THE CONCRETE PRIOR TO INITIAL SET.

APERTURE CARD
NO. E-7487

Amend.	Description	Date	Approved

File No. 19 – 38 – 20
Job No.
Aperture Card No.

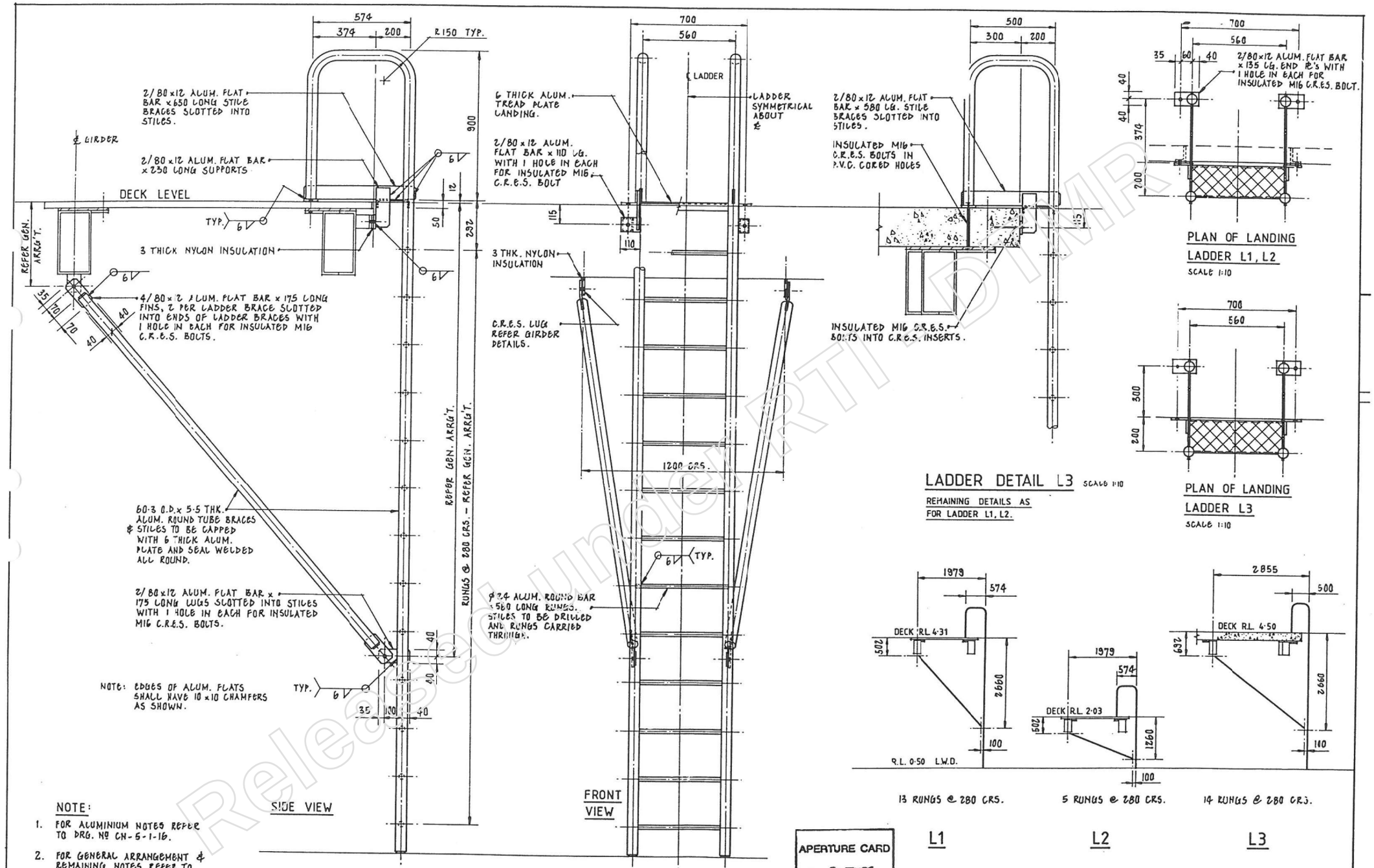
Ratio Scales
1:1 0 10 20 30 40 50 60 mm
1:2 0 20 40 60 80 100 120
1:2.5 0 50 100 150
1:5 0 100 200 300

DEPARTMENT OF HARBOURS & MARINE

Design	Prep. NR	Ckd.	NR
Drafting	Prep. P. J.	Ckd. B.L.T.	Bundaberg Harbour Works
Supervising Draftsman	NR	NR	Assistant Director Works
Principal Draftsman		Principal Eng.	Date 13-10-86

PALM COVE
PUBLIC JETTY
PRECAST CONCRETE KERB DETAILS

Drawing Number
CN-5-1-22



NOTE:

1. FOR ALUMINIUM NOTES REFER TO DRG. Nº CN-5-1-16.
2. FOR GENERAL ARRANGEMENT & REMAINING NOTES REFER TO DRG. Nº CN-5-1-2.

APERTURE CARD NO. E-7488

Amend.	Description	Date	Approved	Aperture Card No.

File No. 19 - 38 - 20
Job No.

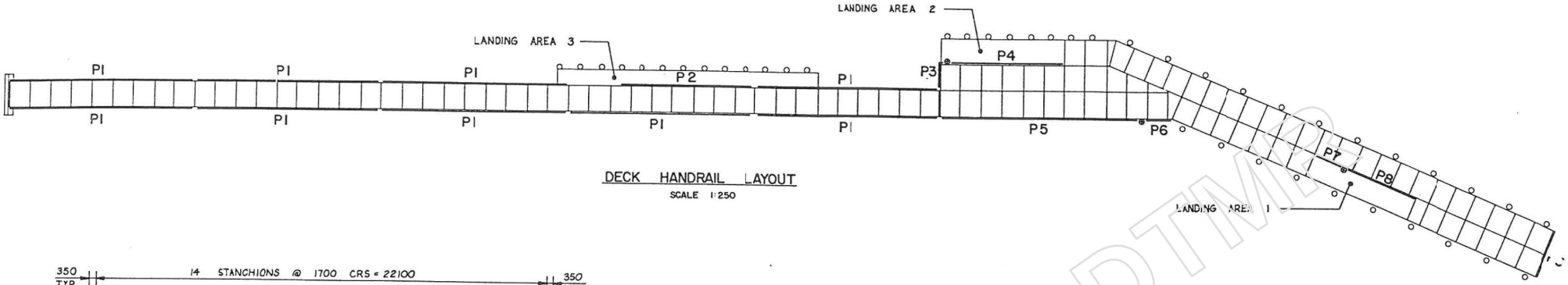
Ratio Scales mm
1:1 0 10 20 30 40 50 60
1:2 0 20 40 60 80 100 120
1:2·5 0 50 100 150
1:5 0 100 200 300

DEPARTMENT OF HARBOURS & MARINE

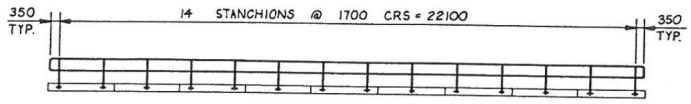
Design	Prep. NR	Chd.	NR
Drafting	Prep. P. LUNES	Chd.	Senior Eng. Harbours Works
Supervising Draftsman	NR	NR	Assistant Director Works
Principal Draftsman		Principal Engr.	Date 13-10-86

PALM COVE
PUBLIC JETTY
LADDER DETAILS

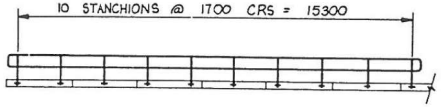
Drawing Number
CN - 5 - 1 - 23



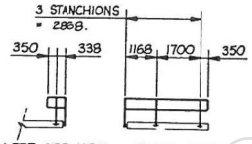
DECK HANDRAIL LAYOUT
SCALE 1:250



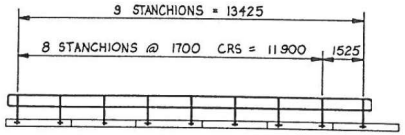
P1: 9 OFF



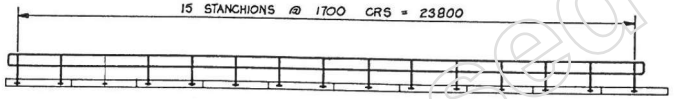
P2



P3



P4



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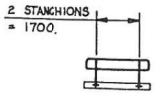

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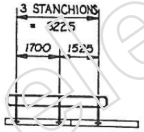

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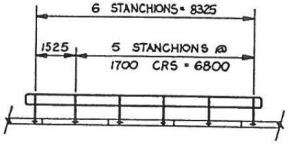
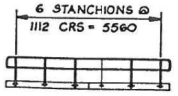


P8



P9

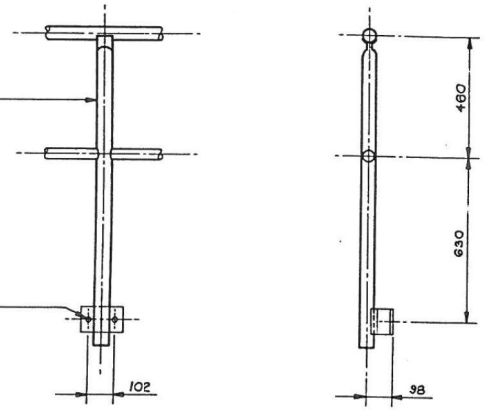
FRONT VIEWS OF HANDRAILS
SCALE: 1:100

PROPRIETARY ALUMINIUM HANDRAIL SYSTEM.
TOP RAIL - 50 O.D. x 3 THICK ALUMINIUM TUBING.
STANCHION - 60 O.D. x 2 THICK ALUMINIUM TUBING.
KNEE RAIL - 38.1 O.D. x 2 THICK ALUMINIUM TUBING.

2 HOLES FOR M12 CRES INSULATED BOLTS. NEUTRAL CURING SILICONE SEALANT SHALL BE USED BETWEEN CONTACT FACES OF STANCHION BRACKET AND CONCRETE DECK UNITS.

3 THICK NYLON INSULATION SHALL BE USED BETWEEN CONTACT FACES OF STANCHION BRACKET AND CRES ATTACHMENT BRACKETS ON LANDING AREA GIRDERS.

ON LANDING AREA STAIRWAYS M12 ALUMINIUM BOLTS (SUPPLIED BY PRINCIPAL) SHALL BE SUBSTITUTED FOR INSULATED CRES. BOLTS.



TYPICAL HANDRAIL DETAILS
SCALE: 1:10

NOTES:
1 FOR LAYOUT OF HANDRAILS ON LANDING AREAS 1, 2, & 3 REFER TO DRG Nos CN-5-1-13, 14 & 15.
2 FOR ALUMINIUM NOTES REFER TO DRG. No CN-5-1-16.

APERTURE CARD
NO. E-7489

Amend.	Description	Date	Approved

File No. 19-38-20
Job No.
Aperture Card No.

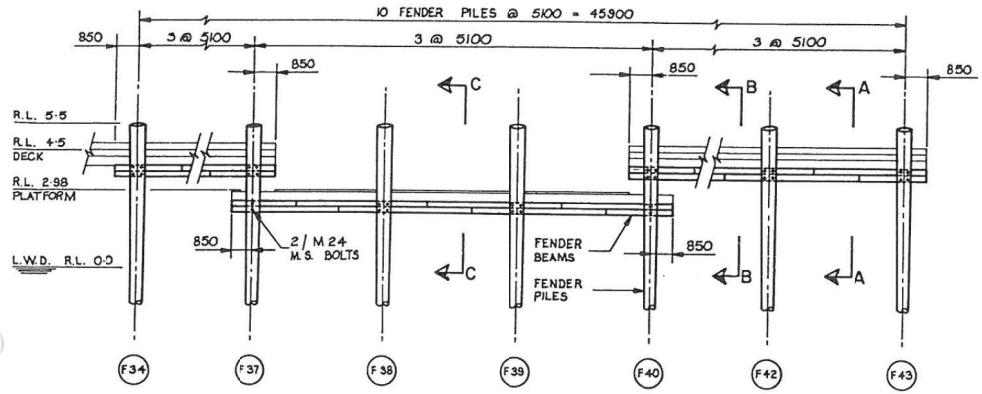
Ratio Scales
1:1 0 10 20 30 40 50 60 mm
1:2 0 20 40 60 80 100 120
1:2.5 0 50 100 150
1:5 0 100 200 300

DEPARTMENT OF HARBOURS & MARINE

Design	Prep. NR	Chd.	NR
Drafting	Prep. BJS	Chd. B.L.T.	Senior Engr. Harbour Works
Supervising Draftsman			Assistant Director Works
Principal Draftsman	NR	NR	
		Principal Engr.	Date 13-10-86

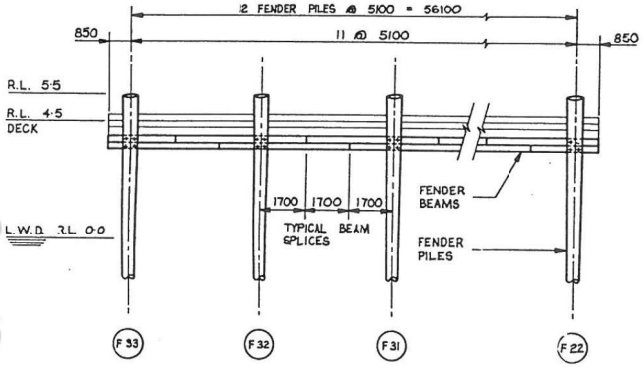
PALM - COVE
PUBLIC JETTY
HANDRAIL LAYOUT AND DETAILS

Drawing Number
CN-5-1-24



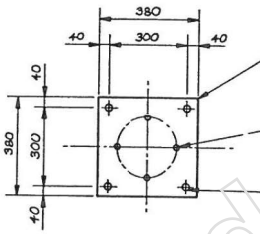
FENDERING LAYOUT - (F34) TO (F43)

SCALE: 1:100



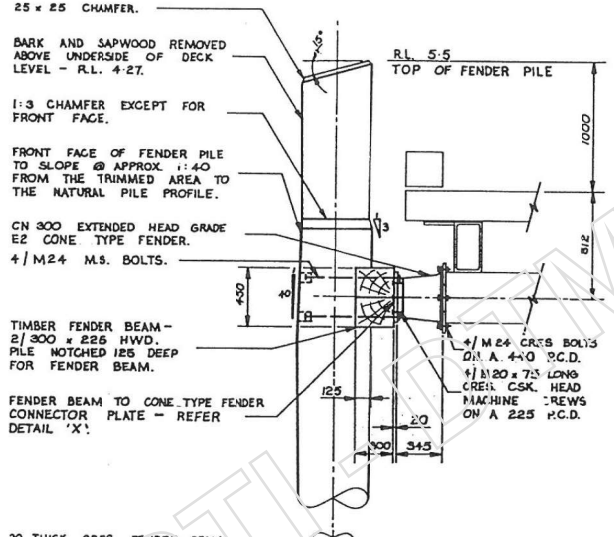
FENDERING LAYOUT - (F22) TO (F33)

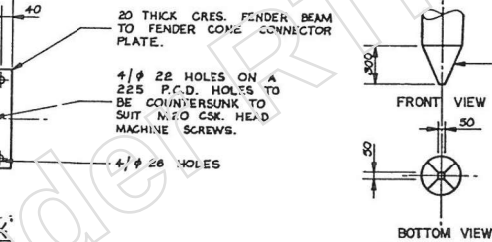
SCALE: 1:100



DETAIL 'X'

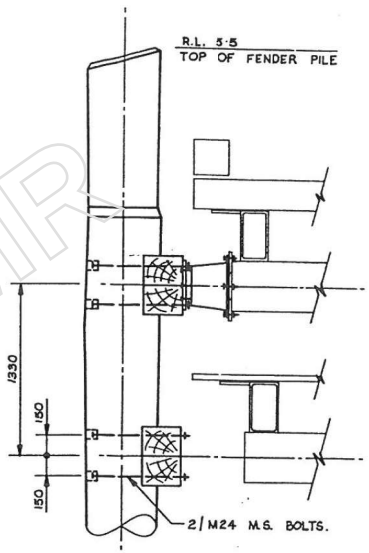
SCALE: 1:10





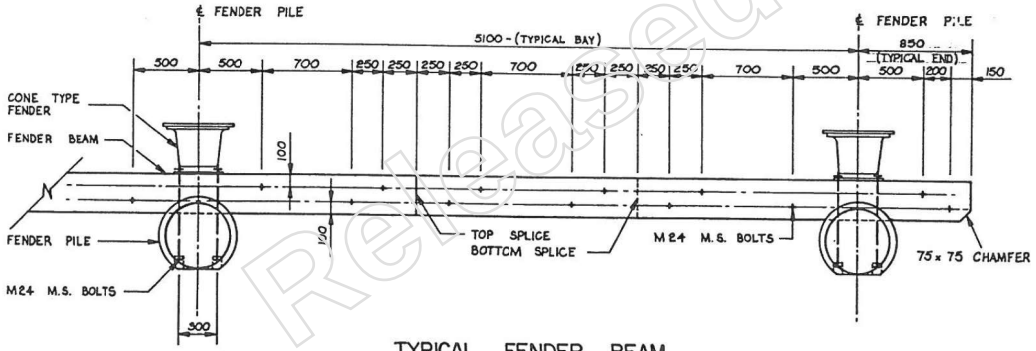
SECTION A-A

SCALE: 1:20



SECTION B-B

SCALE: 1:20

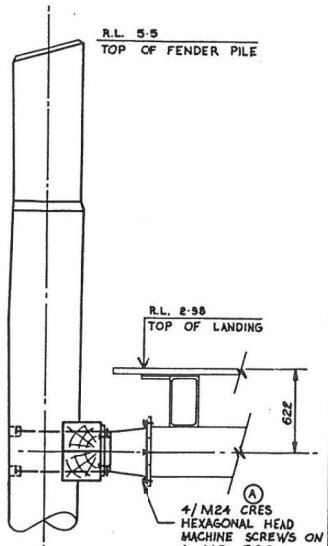


TYPICAL FENDER BEAM SPLICE AND BOLT ARRANGEMENT

SCALE: 1:20

NOTES:

1. FOR GENERAL ARRANGEMENT AND NOTES REFER DRG Nº CN-5-1-2.
2. FENDER PILES TO BE TURPENTINE TIMBER PILES, DRIVEN WITH BARK INTACT.
3. FENDER PILES F 22 TO F 43 TO BE 14·000 LONG WITH A MINIMUM HEAD φ 600 AND A MINIMUM TOE φ 300.
4. AFTER TRIMMING TO SHAPE, TOPS OF FENDER PILES AND ENDS OF RUBBING STRIPS TO BE FITTED WITH GALVANIZED MULTI-TOOTHED ANTI-SPLITTING PLATES OVER THE ENTIRE EXPOSED END GRAIN SURFACE.
5. ALL BOLTS, WHERE THEY BEAR ONTO TIMBER MEMBERS, TO BE FITTED WITH EXTRA LARGE SERIES, ROUND FLAT WASHERS TO AS 1237, UNDER HEADS AND/OR NUTS.
6. BOLTS FITTED TO THE FRONT FACE OF FENDER PILES AND RUBBING STRIPS TO BE COUNTERBORED TO FINISH 50 CLEAR BELOW SURFACE OF TIMBER.
7. ALL MILD STEEL BOLTS, NUTS AND WASHERS TO BE HOT DIP GALVANIZED.
8. TIMBER FENDER BEAMS AND RUBBING STRIPS SHALL BE HARDWOOD OF DURABILITY CLASS 1 AND STRENGTH GROUP S3 COMPLYING WITH AS. 1720.
9. TIMBER FENDER BEAMS AND RUBBING STRIPS SHALL BE TREATED WITH CREOSOTE OIL PRIOR TO ASSEMBLY.
10. FOR FENDER PILE LAYOUT REFER ALSO TO DRG Nº CN-5-1-4.



SECTION C-C

SCALE: 1:20

APERTURE CARD

E-7490A

Amend.	Description	Date	Approved
A	M24 CRES BOLTS REPLACED WITH MACHINE SCREWS.	4/11/86	JAS

File No. 19-38-20

Job No.

Aperture Card No.

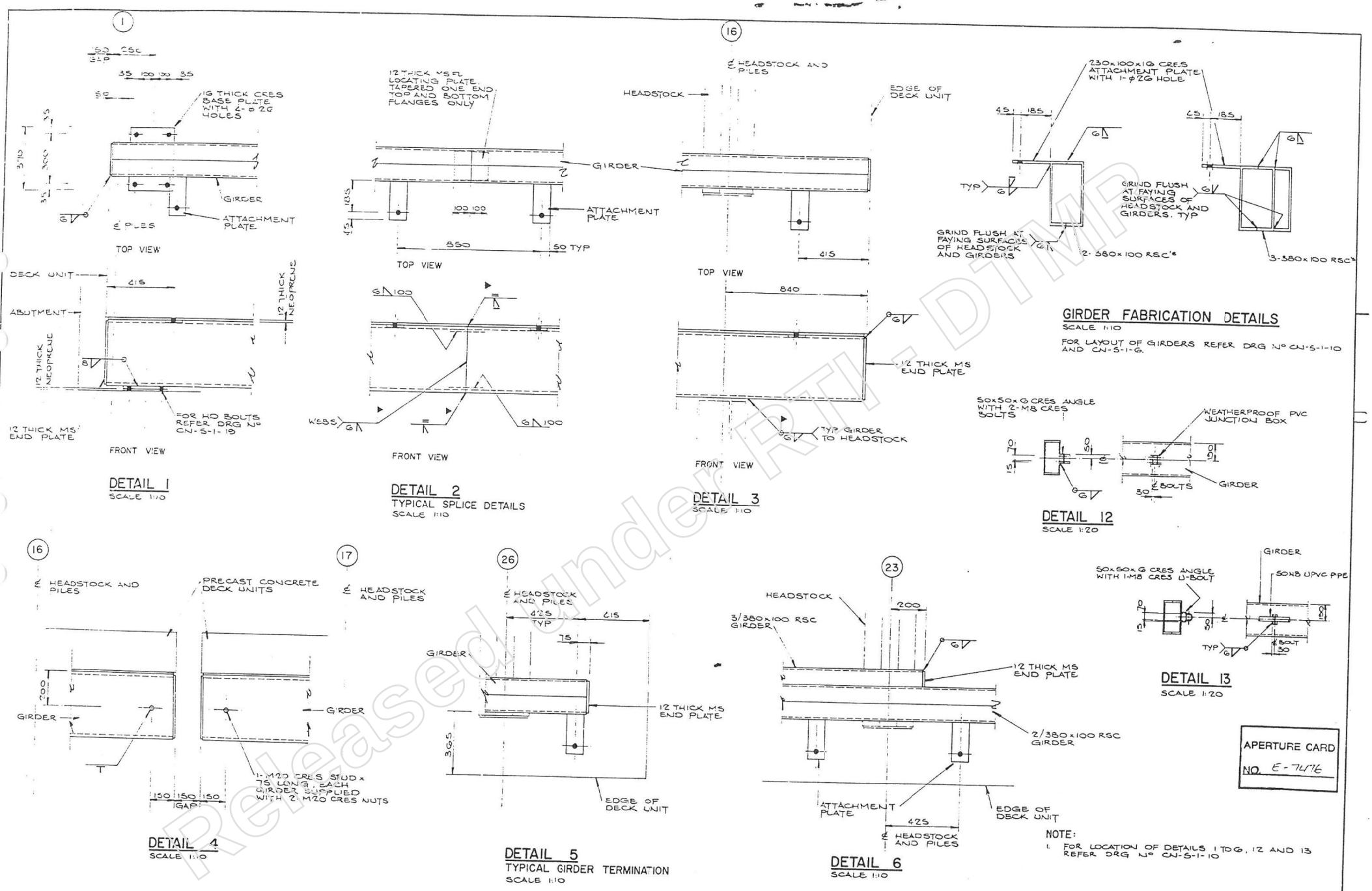
Ratio Scales mm
1:1 0 10 20 30 40 50 60
1:2 0 20 40 60 80 100 120
1:2·5 0 50 100 150
1:5 0 100 200 300

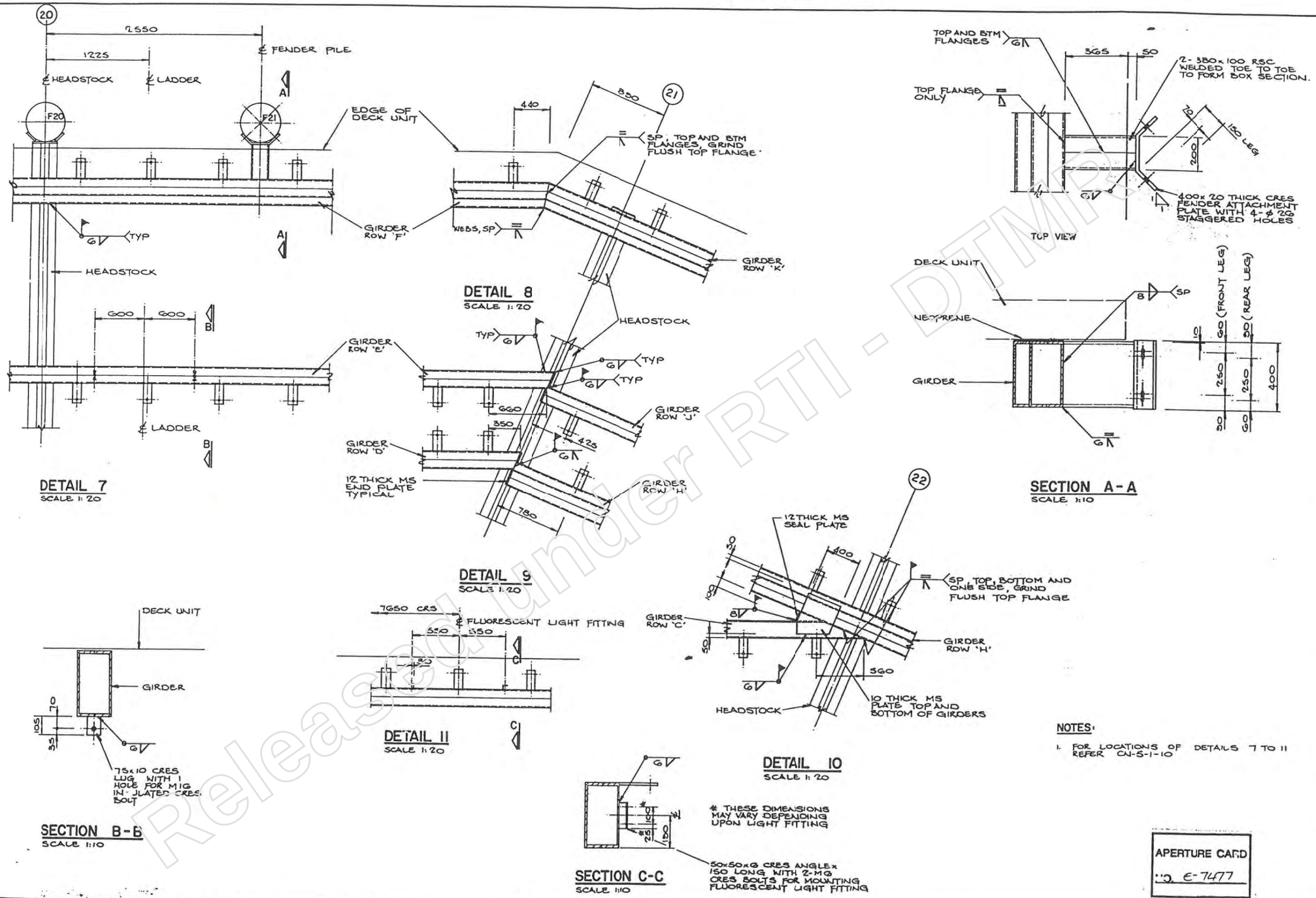
DEPARTMENT — HARBOURS & MARINE

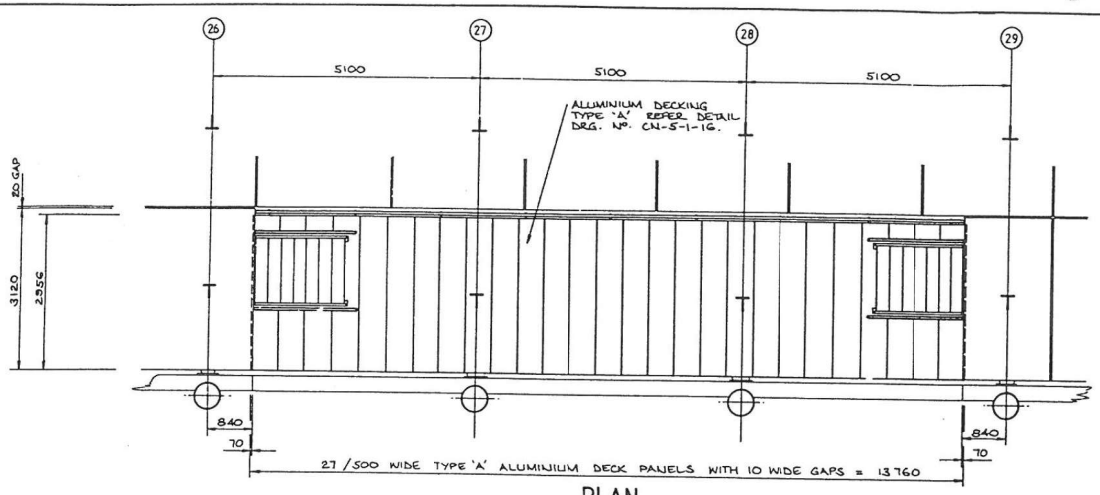
Design	Prep. NR	Chd.	
Drafting	Prep. MJS	Chd. B.L.T.	Senior Engr. Harbours (Advis.) NR
Supervising Draftsman	NR		Assistant Director Works
Principal Draftsman		Principal Engr.	Date 13-10-86

PALM COVE
PUBLIC JETTY
JETTY HEAD
FENDERING ARRANGEMENT AND DETAILS

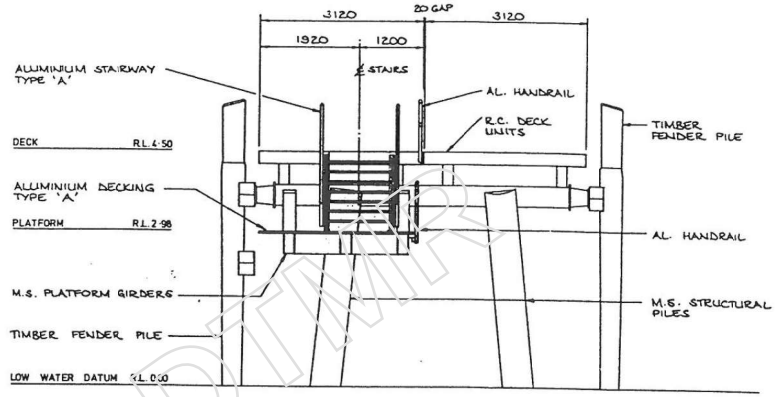
Drawing Number CN-5-1-25 A


16 CRS STIP
35 100 100 35
16 THICK CRES BASE PLATE WITH 2-ø26 HOLES
GIRDER
ATTACHMENT PLATE
℄ PILES
TOP VIEW
DECK UNIT
ABUTMENT
215
12 THICK NEOPRENE
FOR HD BOLTS REFER DRG No CN-5-1-19
12 THICK MS END PLATE
FRONT VIEW
DETAIL 1
SCALE 1:10
12 THICK MS FL LOCATING PLATE TAPERED ONE END TOP AND BOTTOM FLANGES ONLY
100 100
850
50 TYP
WEBS
DETAIL 2
TYPICAL SPLICE DETAILS
SCALE 1:10
℄ HEADSTOCK AND PILES
HEADSTOCK
EDGE OF DECK UNIT
415
840
12 THICK MS END PLATE
TYP GIRDER TO HEADSTOCK
DETAIL 3
SCALE 1:10
230x100x16 CRES ATTACHMENT PLATE WITH 1-ø26 HOLE
45
185
TYP
GRIND FLUSH AT FAYING SURFACES OF HEADSTOCK AND GIRDERS
2-380x100 RSC's
3-380x100 RSC's
GIRDER FABRICATION DETAILS
SCALE 1:10
FOR LAYOUT OF GIRDERS REFER DRG No CN-5-1-10 AND CN-5-1-6.
50x50x6 CRES ANGLE WITH 2-M8 CRES BOLTS
WEATHERPROOF PVC JUNCTION BOX
℄ BOLTS
GIRDER
DETAIL 12
SCALE 1:20
PRECAST CONCRETE DECK UNITS
℄ HEADSTOCK AND PILES
200
GIRDER
1-M20 CRES STUD x 75 LONG, EACH GIRDER SUPPLIED WITH 2 M20 CRES NUTS
150 150 150
GAP
DETAIL 4
SCALE 1:10
425 TYP
215
75
395
EDGE OF DECK UNIT
DETAIL 5
TYPICAL GIRDER TERMINATION
SCALE 1:10
3/380x100 RSC GIRDER
200
2/380x100 RSC GIRDER
ATTACHMENT PLATE
425
DETAIL 6
SCALE 1:10
50x50x6 CRES ANGLE WITH 1-M8 CRES U-BOLT
50NB UPVC PIPE
BOLT
30
DETAIL 13
SCALE 1:20
APERTURE CARD
NO. E-74776
NOTE:
1. FOR LOCATION OF DETAILS 1 TO 6, 12 AND 13 REFER DRG No CN-5-1-10
Released under RTI - DTMP
File No. 19-38-20
Job No.
Aperture Card No.
Ratio Scales
1:1
1:2
1:2.5
1:5
DEPARTMENT OF HARBOURS & MARINE
Design Prep. NR Chd.
Drafting Prep. PJH Chd. B.L.T.
Supervising Draftsman NR
Principal Draftsman
Senior Eng. Harbour Works NR
Principal Eng. NR
Assistant Director Works
Date 13-10-86
PALM COVE
PUBLIC JETTY
STEM AND HEAD
GIRDER DETAILS - SHEET 1
Drawing Number
CN-5-1-11
Amend
Description
Date
Approved

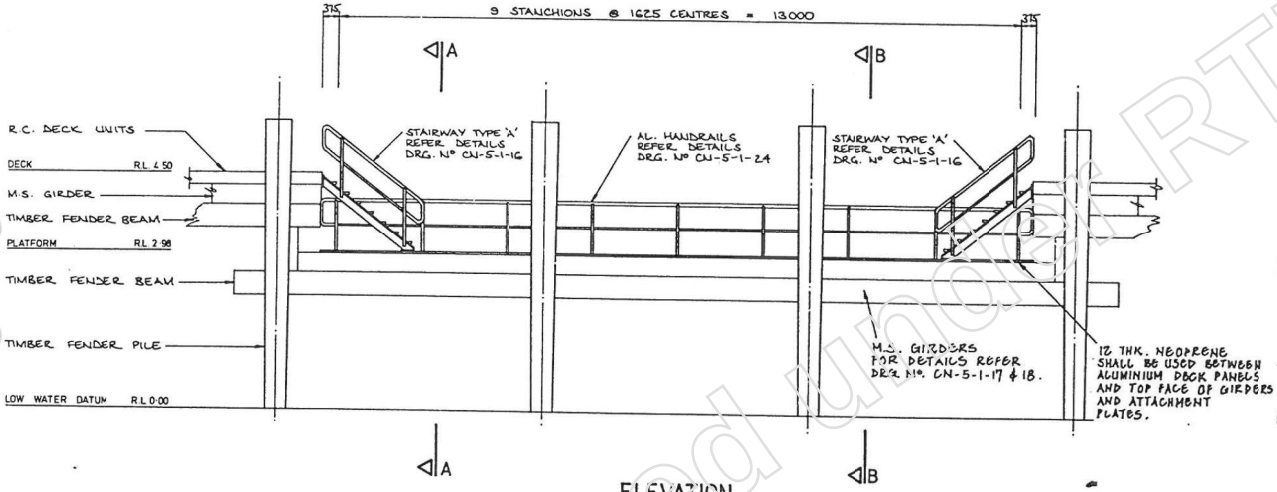




PLAN

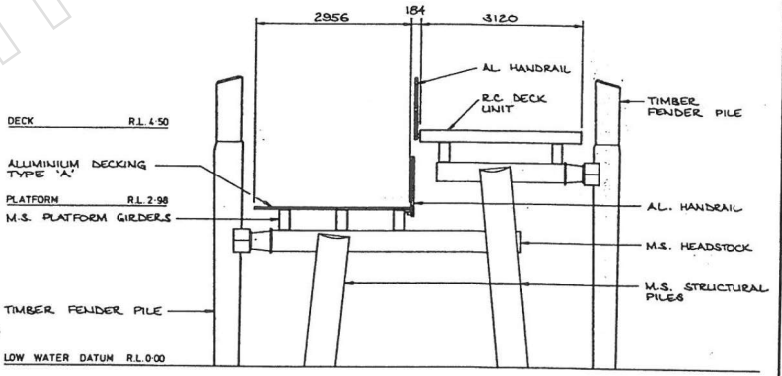


SECTION A-A



ELEVATION

SCALE 1:50



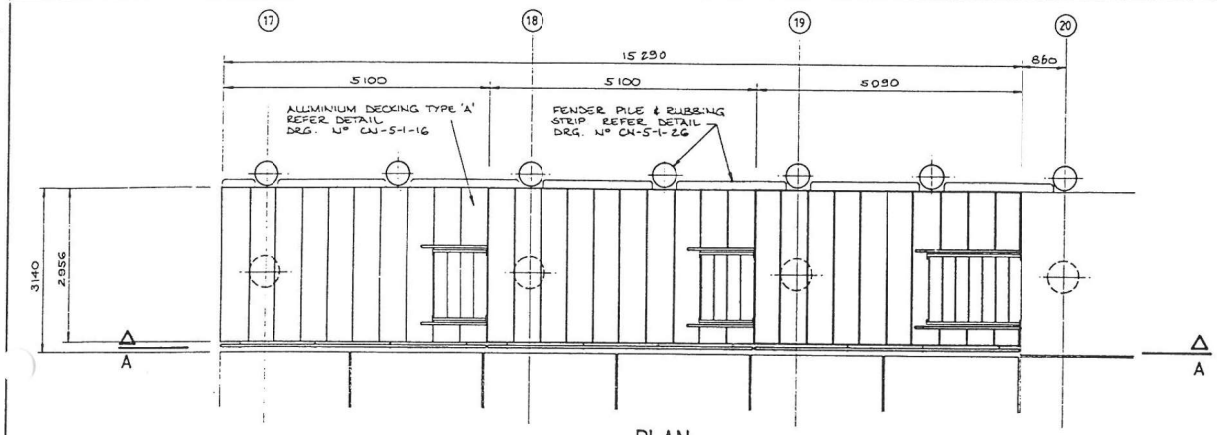
SECTION B-B

NOTES

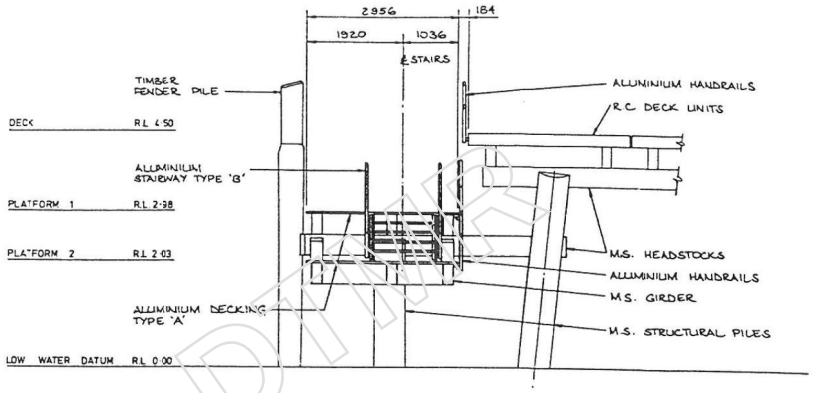
FOR GENERAL ARRANGEMENT & NOTES REFER DRG. Nº CN-5-1-2.

APERTURE CARD
I.D. E-7478

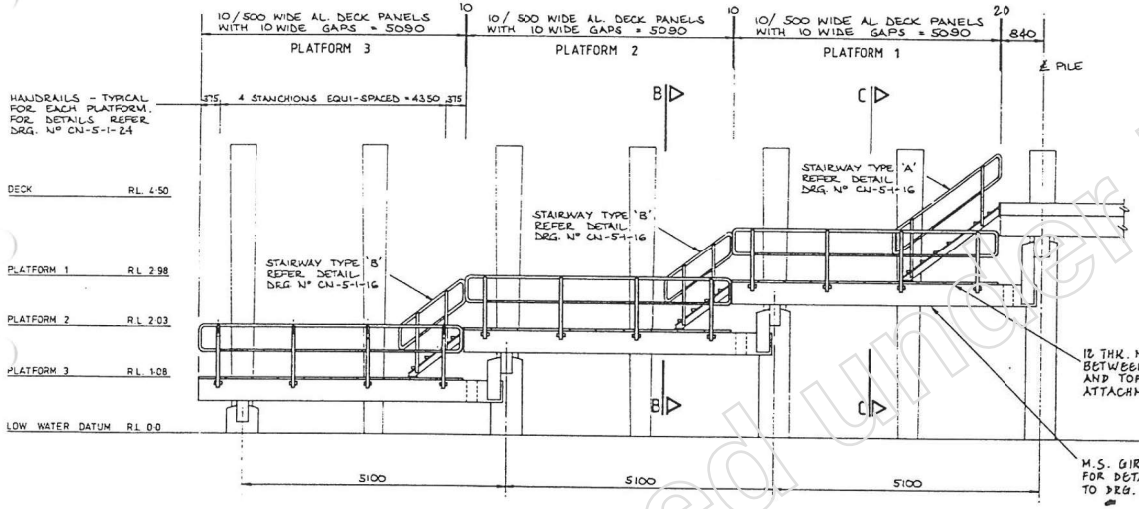
Amend.	Date	Approved	File No. 19 - 38 - 20	Ratio Scales 1:1 1:2 1:2·5 1:5	DEPARTMENT OF HARBOURS & MARINE	PALM COVE PUBLIC JETTY LANDING AREA Nº 1 ARRANGEMENT AND SECTIONS	Drawing Number CN-5-1-13
			Job No.		Design Prep. NR Chd. Senior Eng. Harbour Works NR Assistant Director Works		
			Aperture Card No.		Drafting Prep. D.K.C. Chd. B.C.T.		
					Supervising Draftsman NR Principal Eng. NR		
					Principal Draftsman Date 18-10-88		



PLAN

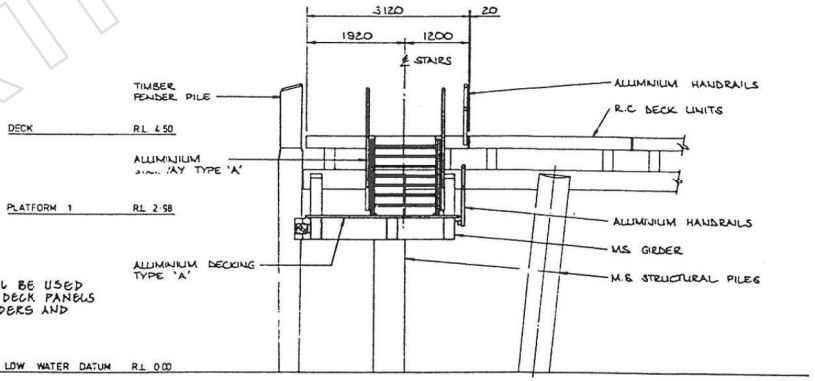


SECTION B-B



SECTIONAL ELEVATION A-A

SCALE 1:50



SECTION C-C

NOTES

FOR GENERAL ARRANGEMENT & NOTES REFER DRG. N° CN-5-1-2.

APERTURE CARD NO. E-7479

Amend.	Description	Date	Approved

File No. 19-38-20
Job No.
Aperture Card No.

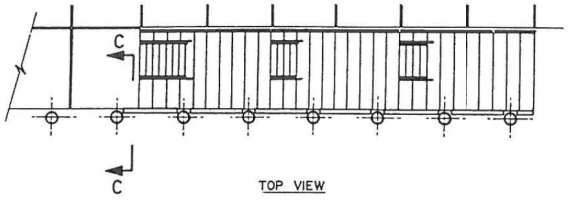
Ratio Scales
1:1 0 10 20 30 40 50 60 mm
1:2 0 20 40 60 80 100 120
1:2·5 0 50 100 150
1:5 0 100 200 300

DEPARTMENT OF HARBOURS & MARINE

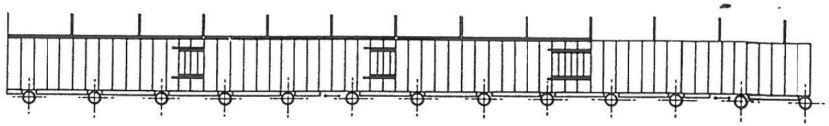
Design	Prep. NR	Chd.	NR	Assistant Director Works
Drafting	Prep. D.K.C.	Chd. B.L.T.	Principal Engineering, Harbour Works	
Supervising Draftsman	NR		NR	
Principal Draftsman			Principal E/S.	Date 13-10-86

PALM COVE
PUBLIC JETTY
LANDING AREA N° 2
ARRANGEMENT AND SECTIONS

Drawing Number
CN-5-1-14

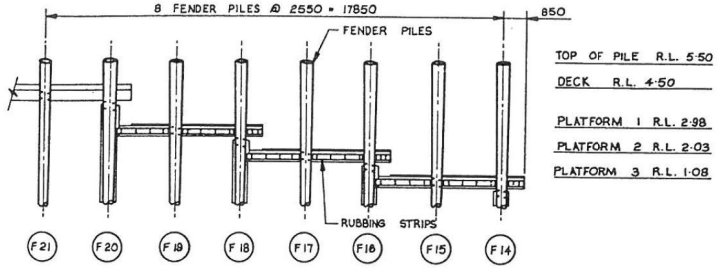


TOP VIEW



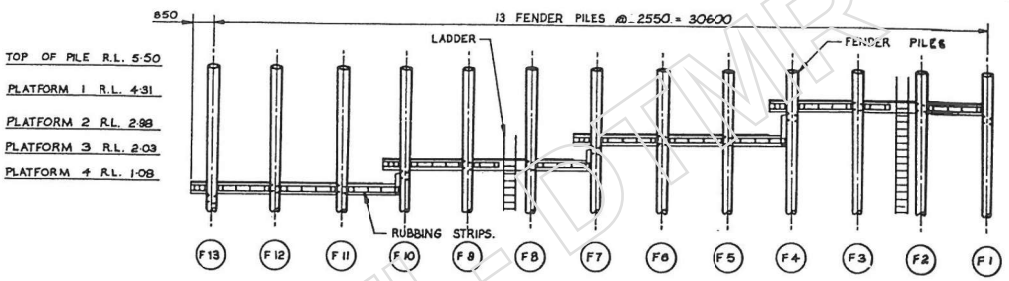
TOP VIEW

APERTURE CARD
NO. E-7491



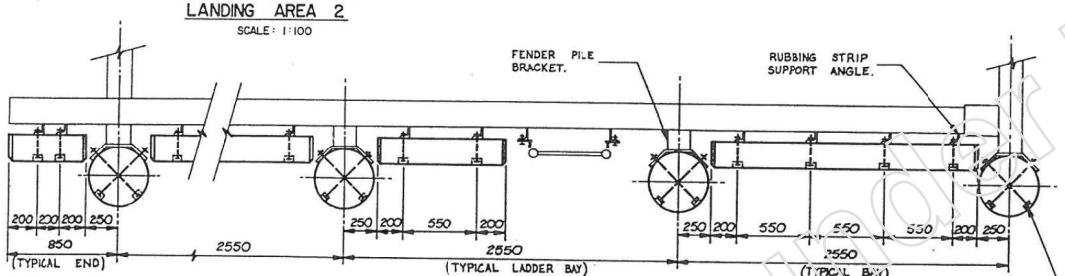
FRONT VIEW

FENDERING LAYOUT
LANDING AREA 2
SCALE: 1:100

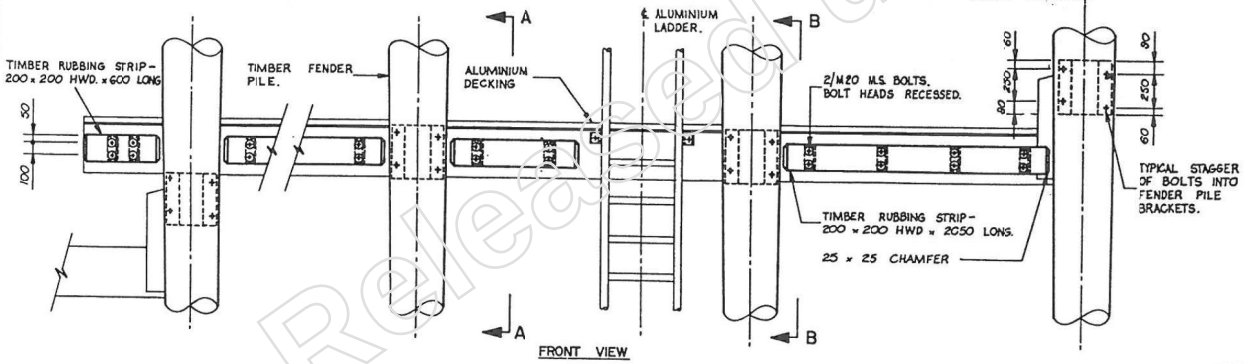


FRONT VIEW

FENDERING LAYOUT
LANDING AREA 3
SCALE: 1:100



TOP VIEW

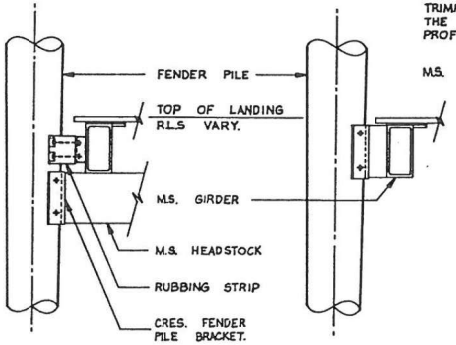


FRONT VIEW

TYPICAL FENDER PILE AND
RUBBING STRIP DETAIL
SCALE: 1:20

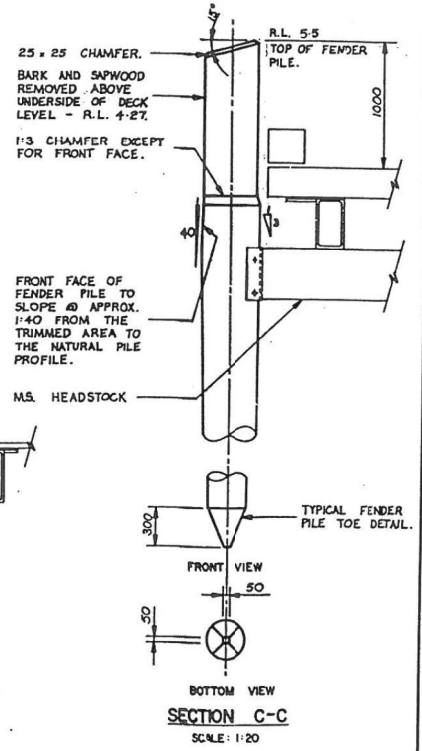
NOTES:

1 FOR GENERAL NOTES REFER DRG Nº CN-5-1-2.
2 FENDER PILES F1 TO F13 SHALL BE 13000 LONG WITH A MINIMUM HEAD ϕ 500 AND A MINIMUM TOE ϕ 250.
3 FENDER PILES F14 TO F21 SHALL BE 14000 LONG WITH A MINIMUM HEAD ϕ 500 AND A MINIMUM TOE ϕ 250.
4 FOR REMAINING FENDERING NOTES REFER DRG Nº CN-5-1-25
5 FOR FENDER PILE LAYOUT REFER DRG Nº CN-5-1-4.



SECTION A-A
SCALE: 1:20

SECTION B-B
SCALE: 1:20



SECTION C-C
SCALE: 1:20

Amend.	Description	Date	Approved

File No. 19-38-20
Job No.
Aperture Card No.

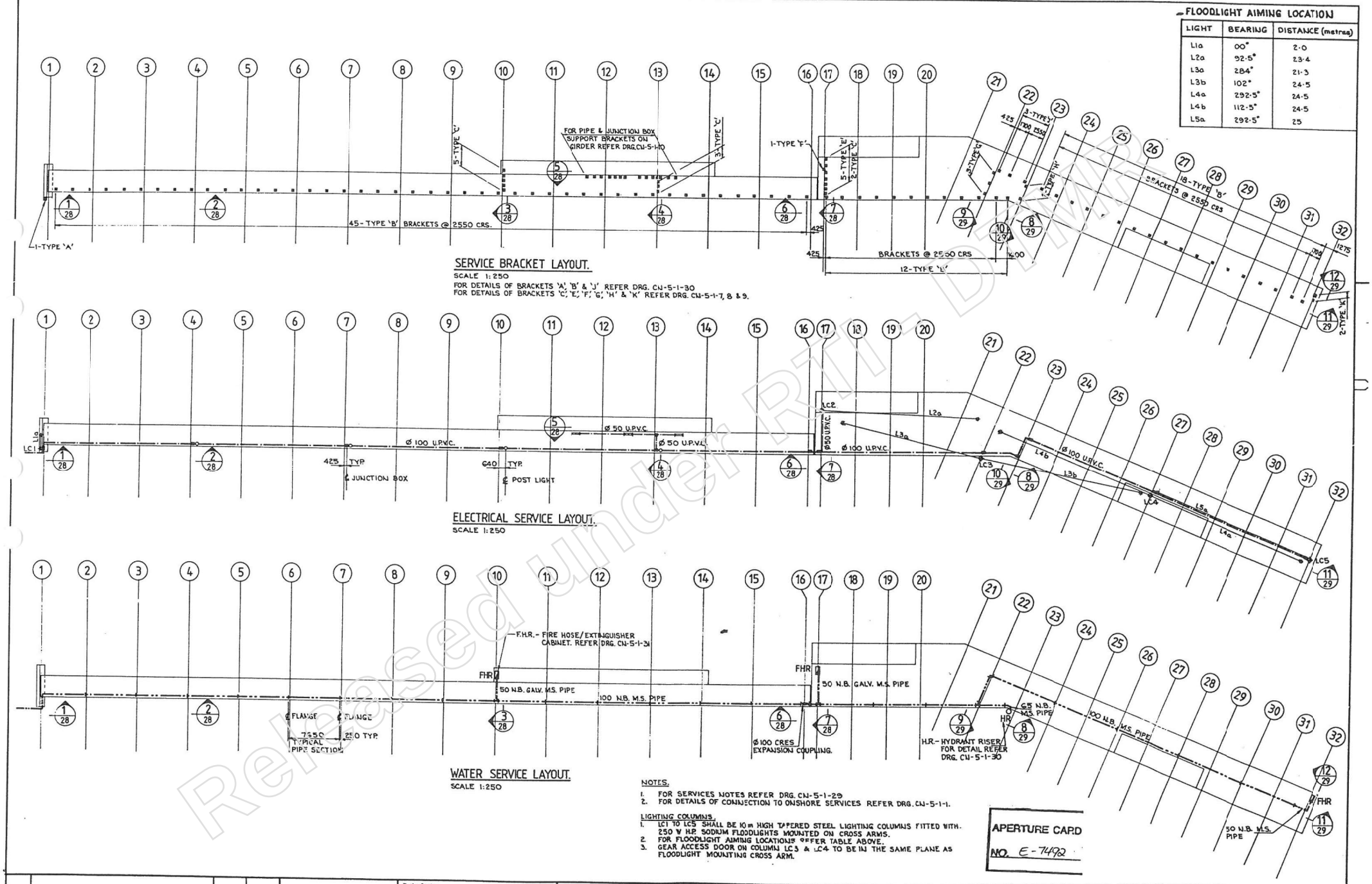
Ratio Scales
1:1 0 10 20 30 40 50 60 mm
1:2 0 20 40 60 80 100 120
1:2·5 0 50 100 150
1:5 0 100 200 300

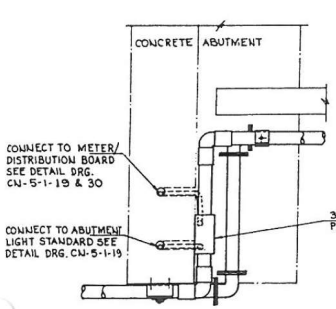
DEPARTMENT OF HARBOURS & MARINE

Design	Prep. NR	Chd.	NR
Drafting	Prep.	Chd. E.L.J.	Senior Engr. Harbour Works / Assistant Director Works
Supervising Draftsman	NR	NR	
Principal Draftsman		Principal Engr.	Date 13-10-86

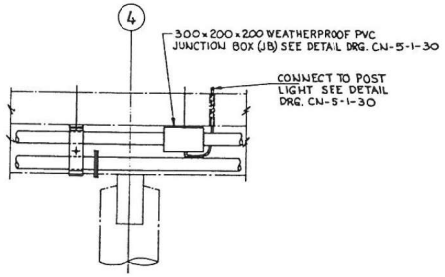
PALM COVE
PUBLIC JETTY
LANDING AREAS 2 AND 3
FENDERING ARRANGEMENT AND DETAILS

Drawing Number
CN-5-1-26

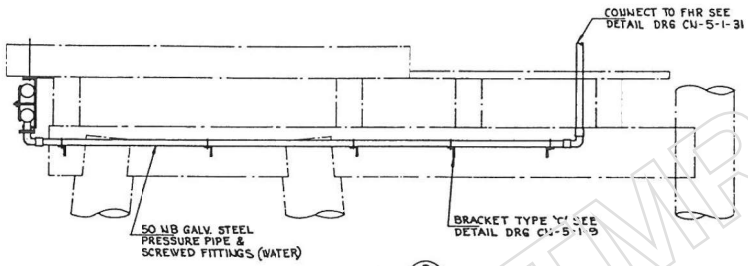




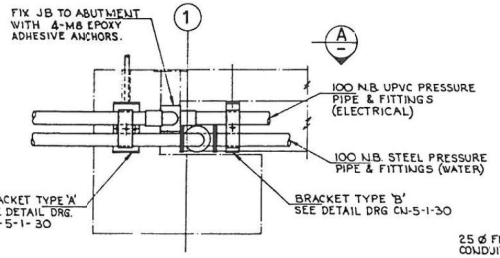
VIEW (A) SCALE 1:20



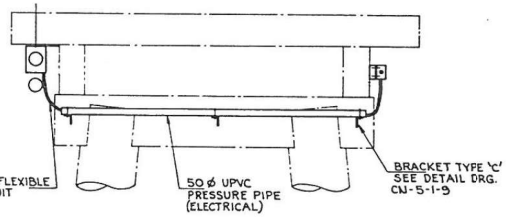
ELEVATION (2/27) SCALE 1:20



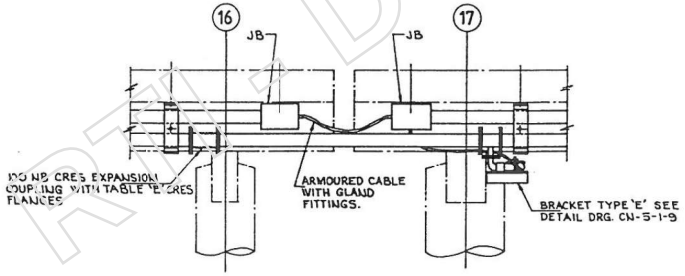
ELEVATION (3/27) SCALE 1:20



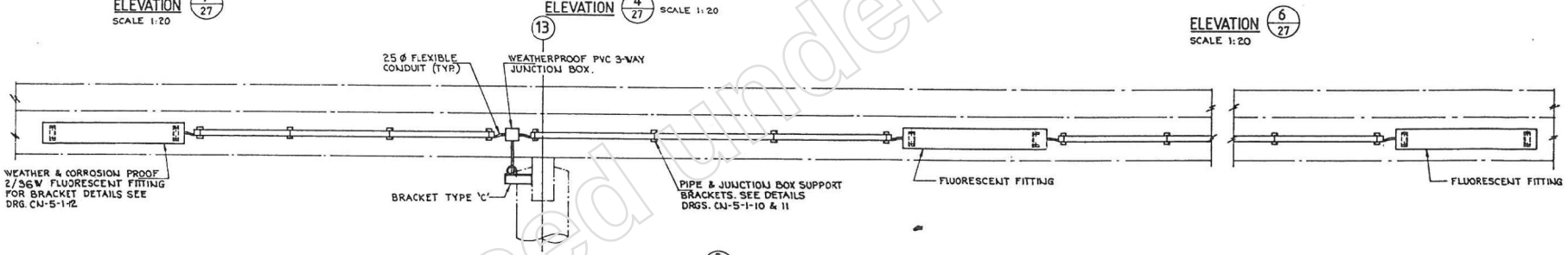
ELEVATION (1/27) SCALE 1:20



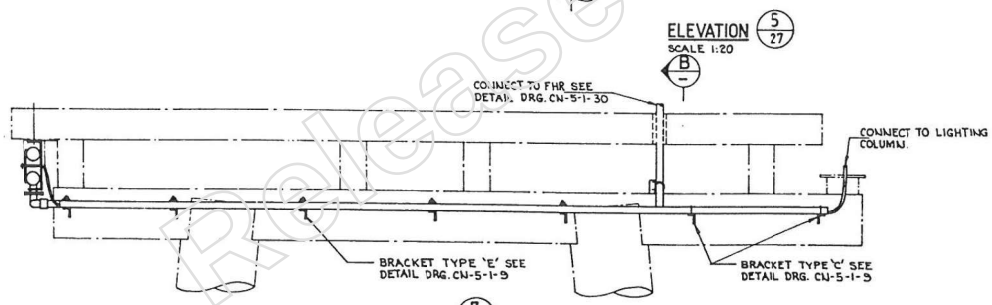
ELEVATION (4/27) SCALE 1:20



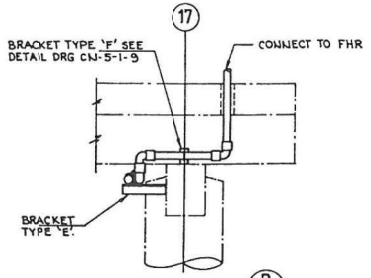
ELEVATION (6/27) SCALE 1:20



ELEVATION (5/27) SCALE 1:20



ELEVATION (7/27) SCALE 1:20



SECTION (B) SCALE 1:20

APERTURE CARD NO. E-7493

Amend.	Description	Date	Approved	Aperture Card No.
				File No. 19 - 38 - 20
				Job No.

Ratio Scales mm
1:1 0 10 20 30 40 50 60
1:2 0 20 40 60 80 100 120
1:2.5 0 50 100 150
1:5 0 100 200 300

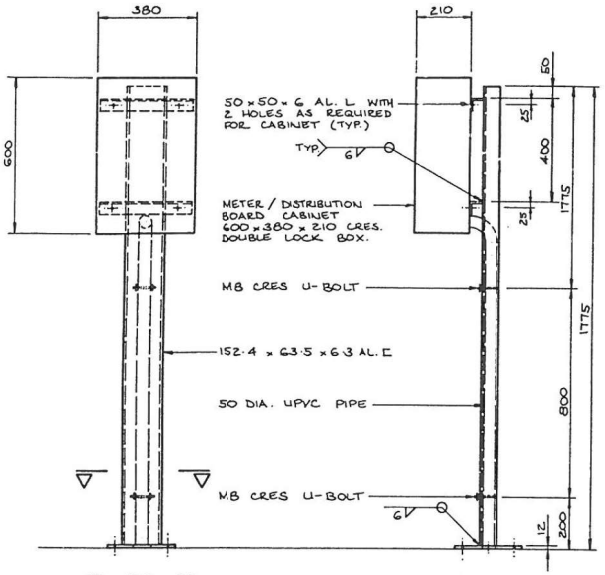
DEPARTMENT OF HARBOURS & MARINE

Design	Prep. NR	Chd. NR	Assistant Director Works
Drafting	Prep. R.G.S.	Chd. B.L.T.	Senior Eng. Harbour Works
Supervising Draftsman	NR	NR	Date 13-10-86
Principal Draftsman		Principal Eng.	

PALM COVE PUBLIC JETTY

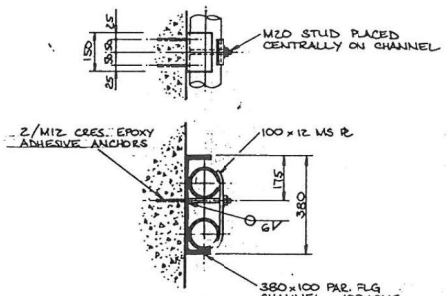
SERVICES DETAILS SHEET 1.

Drawing Number CN - 5 - 1 - 28



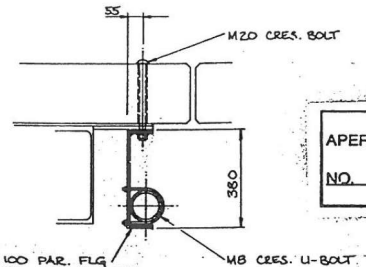
SUPPORT STAND DETAIL FOR METER/DISTRIBUTION BOARD CABINET

SCALE 1:10



BRACKET TYPE 'A'

SCALE 1:10

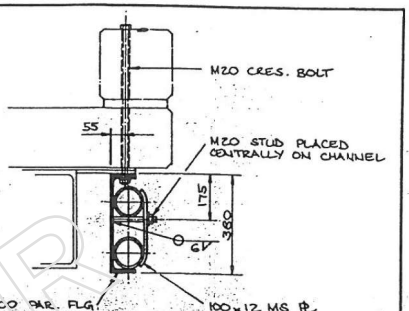


BRACKET TYPE 'J'

SCALE 1:10

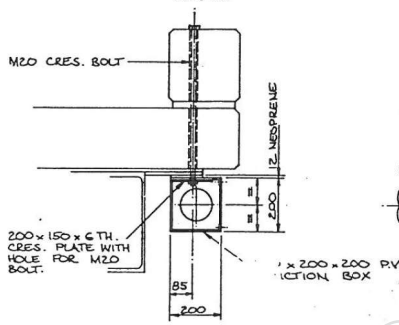
APERTURE CARD

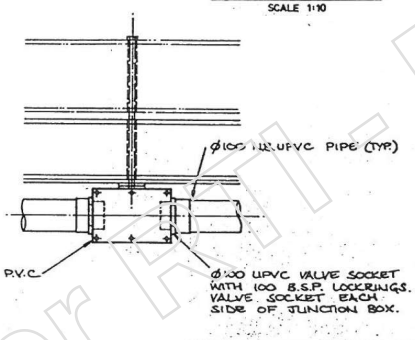
NO. E-7495



BRACKET TYPE 'B'

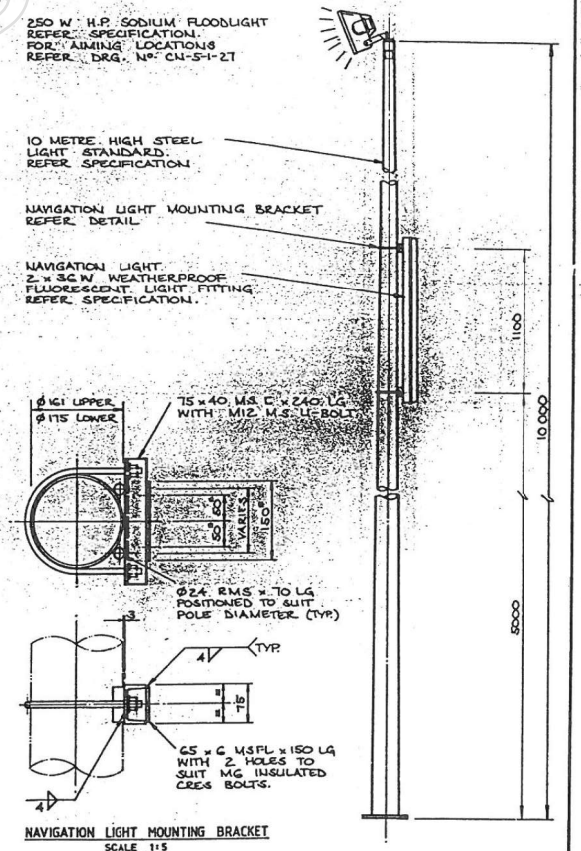
SCALE 1:10





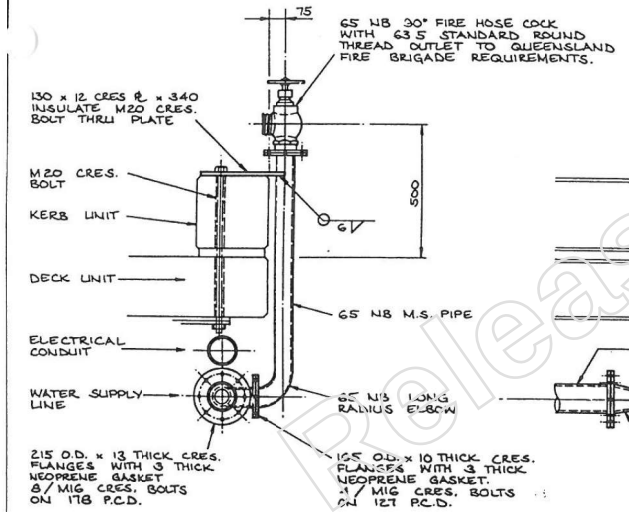
JUNCTION BOX DETAIL (JB)

SCALE 1:10



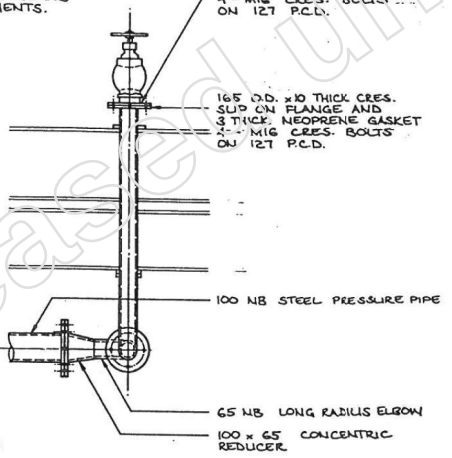
NOTES

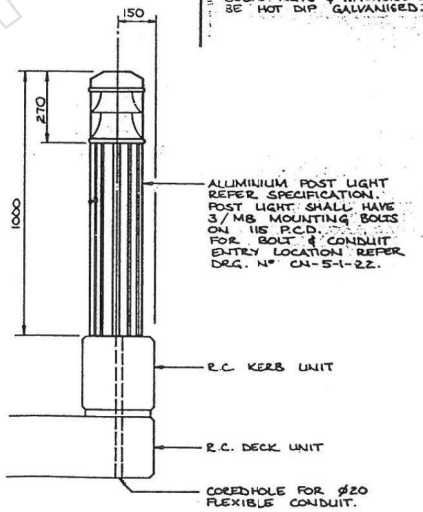
1. ALL DIMENSION ARE IN MILLIMETRES.
2. ALL M.S. BRACKETS INCLUDING BOLTS NUTS & WASHERS SHALL BE HOT DIP GALVANISED.



HYDRANT RISER DETAIL (HR)

SCALE 1:10





POST LIGHT DETAIL

SCALE 1:10

NAVIGATION LIGHT MOUNTING BRACKET

SCALE 1:5

NOTE: DIMENSIONS DENOTED BY THUS * MAY BE VARIED TO SUIT LIGHT FITTINGS.

NAVIGATION LIGHT DETAIL

SCALE 1:20 U.N.O.

Amend.	Description	Date	Approved

File No. 19-38-20

Job No.

Aperture Card No.

Ratio Scales: 1:1, 1:2, 1:2·5, 1:5

DEPARTMENT OF HARBOURS & MARINE

Design Prep. NR Chd. NR

Drafting Prep. D.K.C. Chd. B.L.T. Senior Eng. Harbours Works Assistant Director Works

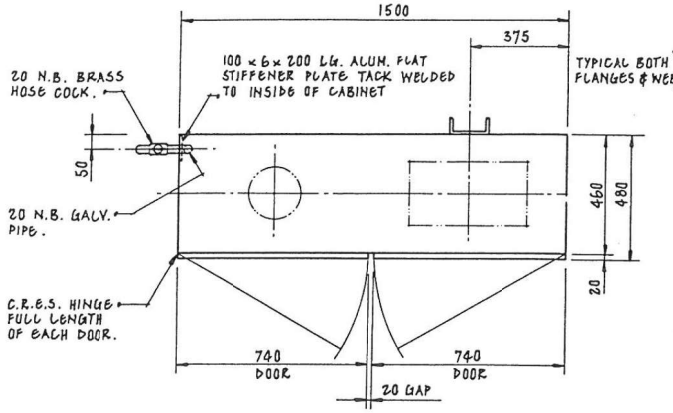
Supervising Draftsman NR Principal Engr. NR

Principal Draftsman Date 13-10-86

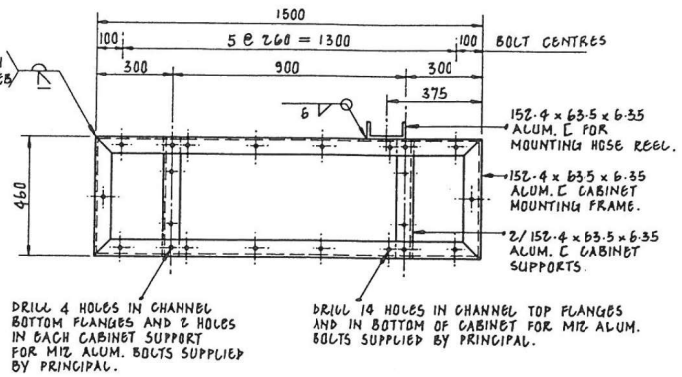
PALM COVE PUBLIC JETTY

MISCELLANEOUS SERVICES DETAILS

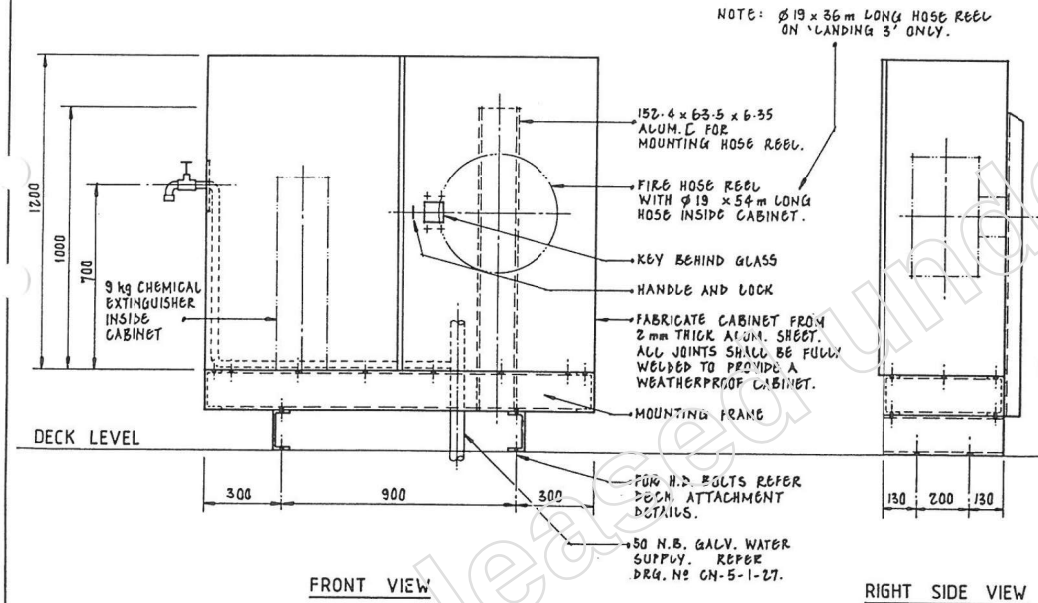
Drawing Number CN-5-1-30



TOP VIEW – CABINET

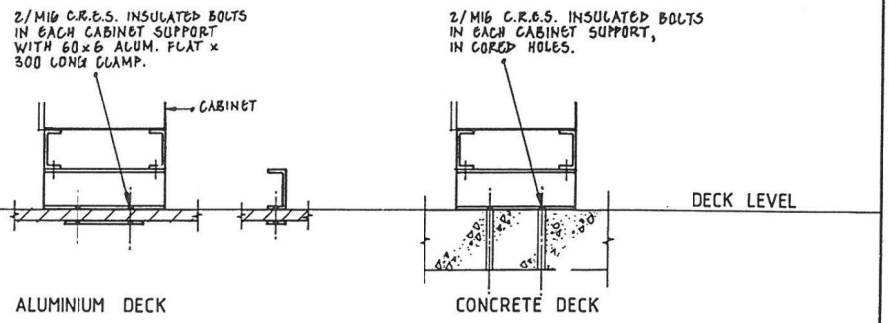


TOP VIEW – MOUNTING FRAME



FRONT VIEW

RIGHT SIDE VIEW



DECK ATTACHMENT DETAILS

APERTURE CARD
NO. E-7496

FIRE HOSE / EXTINGUISHER CABINET DETAILS 3 off REQ'D.

SCALE 1:10

NOTE

1. FOR GENERAL ARRANGEMENT AND NOTES REFER DRG. Nº CN-5-1-2.
2. FOR ALUMINIUM BOLTS SUPPLIED BY PRINCIPAL AND ALUMINIUM NOTES REFER TO TABLE ON DRG. Nº CN-5-1-16.

Amend.	Description	Date	Approved	Aperture Card No.

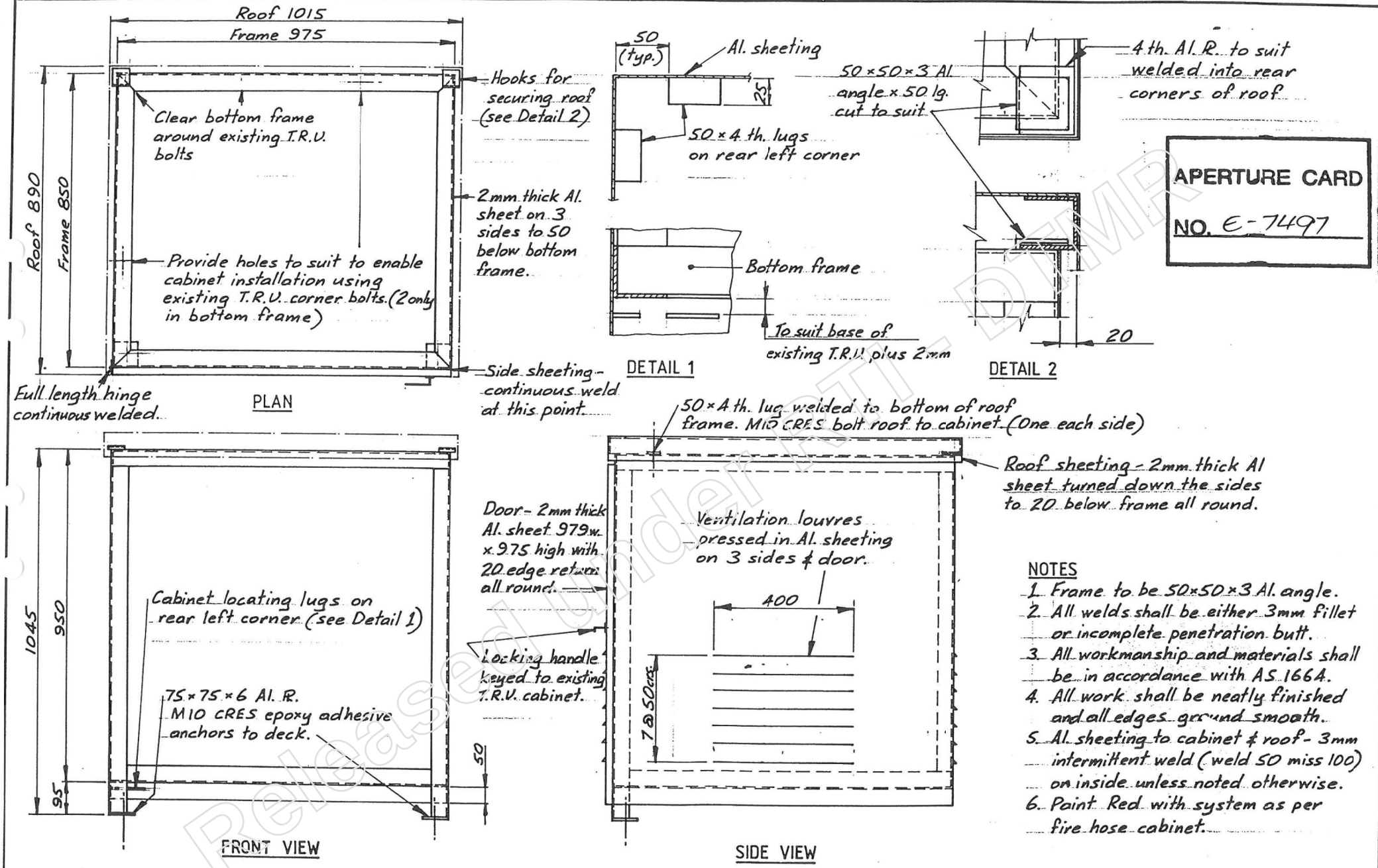
File No. 19 - 38 - 20
Job No.
Ratio Scales 1:1 1:2 1:2·5 1:5

DEPARTMENT OF HARBOURS & MARINE

Design	Prep. NR	Chd.	NR	
Drafting	Prep. B. CURRS	Chd. B.L.T.	Central Eng. Harbour Works	Assistant Director Works
Supervising Draftsman				
Principal Draftsman	NR	Principal Engr. NR	Date 13-10-86	

PALM COVE
PUBLIC JETTY
FIRE HOSE/EXTINGUISHER CABINET DETAILS

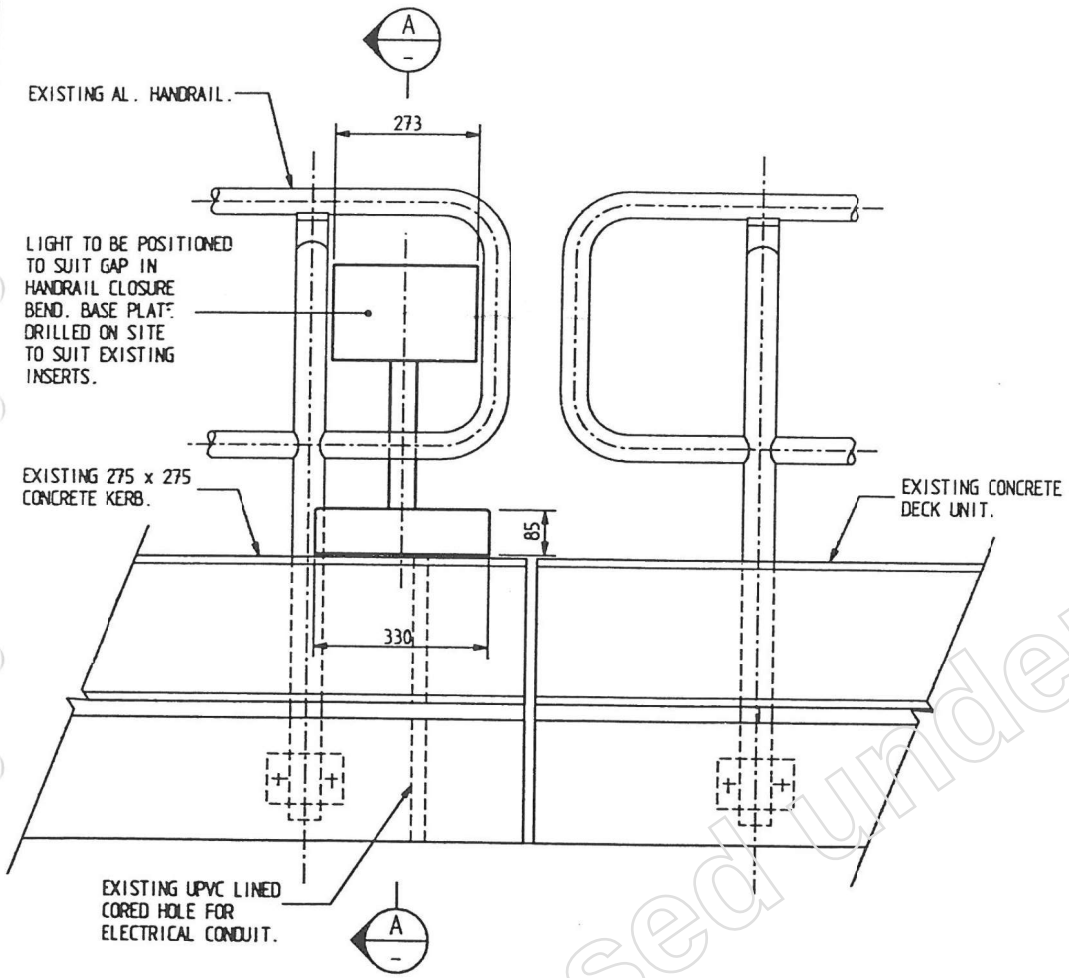
Drawing Number
CN - 5 - 1 - 31



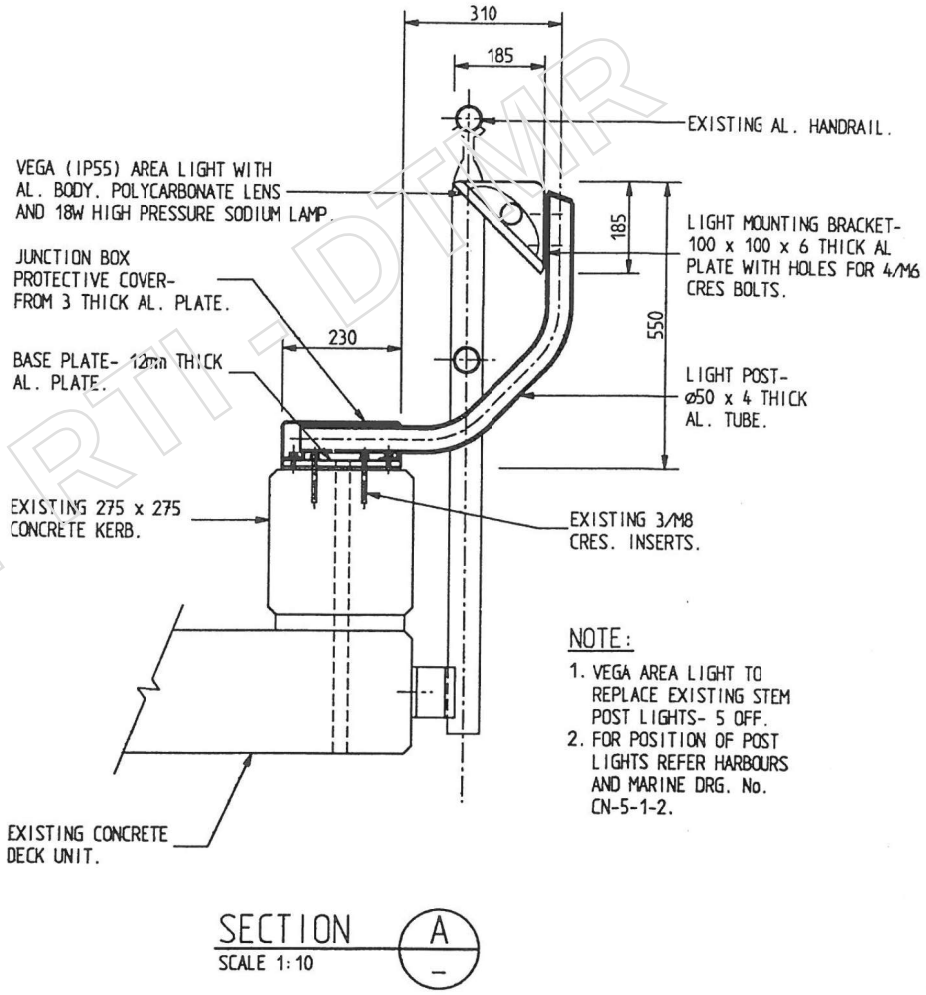
DEPARTMENT OF HARBOURS & MARINE				
Design	Prep	Ckd		
Drafting	Prep K.M.	Ckd	Senior Eng	Assistant Director Works
Supervising Draftsman				
Principal Draftsman	NR		Date	

CAIRNS - PUBLIC JETTY AT PALM COVE
CATHODIC PROTECTION TRANSFORMER RECTIFIER UNIT - CABINET

Drawing Number
CN-5-1-32



FRONT VIEW
SCALE 1:10



NOTE:

1. VEGA AREA LIGHT TO REPLACE EXISTING STEM POST LIGHTS- 5 OFF.
2. FOR POSITION OF POST LIGHTS REFER HARBOURS AND MARINE DRG. No. CN-5-1-2.

SECTION A
SCALE 1:10

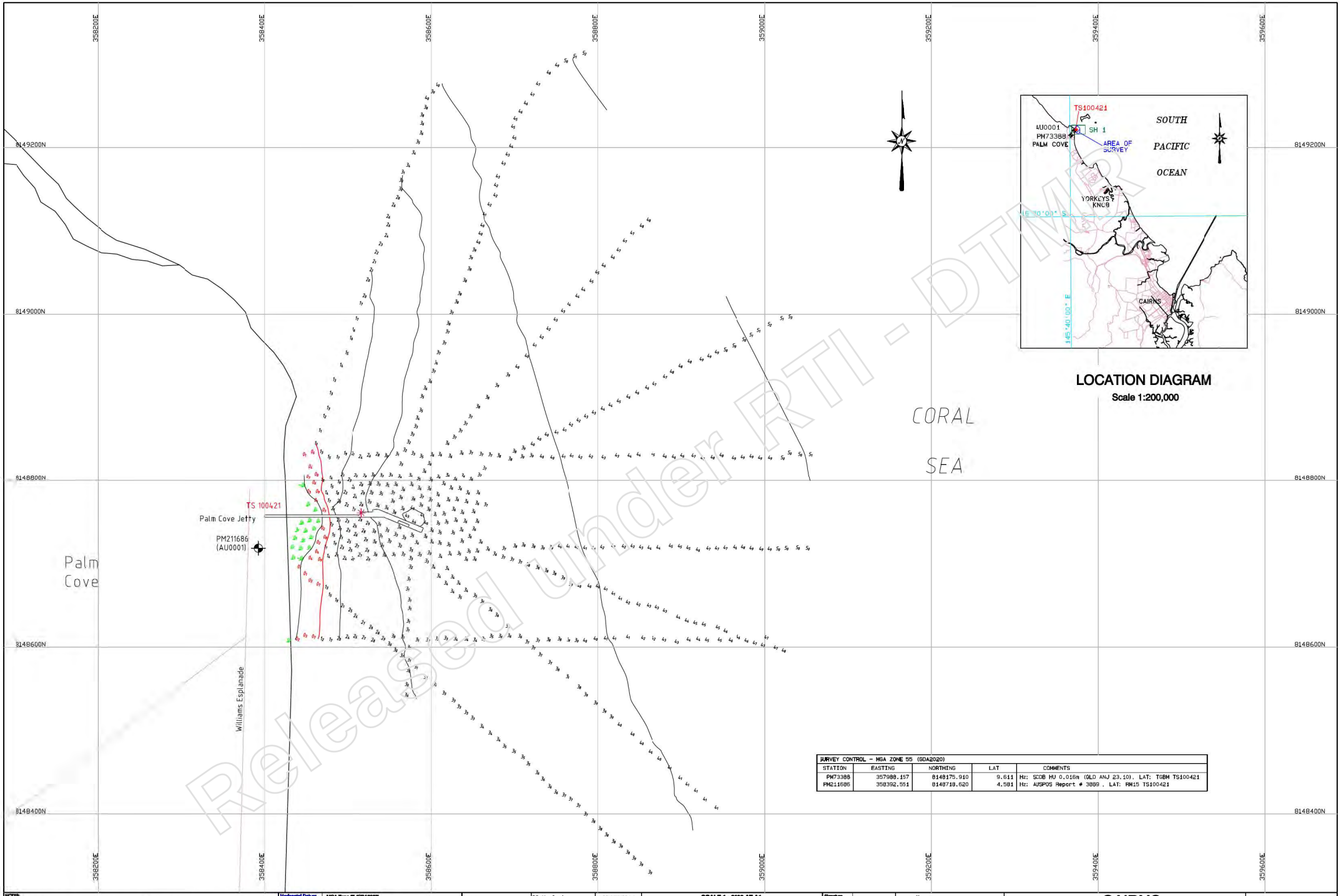
DEPARTMENT OF HARBOURS & MARINE

Design	Prep.	Ckd.		
Drafting	Prep. M.J.S.	Ckd.	Senior Eng.	Director Eng. Services
Supervising Draftsman				
Principal Draftsman				Date

PALM COVE
PUBLIC JETTY
JETTY STEM LIGHTING

E9382
Aperture Number
Drawing Number
CN-5-1-33

Appendix B – Hydrographic Survey



LOCATION DIAGRAM

Scale 1:200,000

SURVEY CONTROL – MGA ZONE 55 (GDA2020)				
STATION	EASTING	NORTHING	LAT	COMMENTS
PM73388	357988.157	8148175.910	9.611	Hz: SCDB HU 0.016m (QLD ANJ 23.10). LAT: TGBM TS100421
PM211686	358392.551	8148719.620	4.581	Hz: AUSPOS Report # 3889 . LAT: RM15 TS100421

NOTES:

1) This survey meets the mandatory class requirements as outlined in the MSQ document 'Standards for Hydrographic Surveys within Queensland Waters V1.3'.
2) Contours are computer generated to Hydrographic Standard (inclusive)
3) Soundings coloured to 1.0m LAT for clearance purposes
4) Coastline digitised from aerial photography is approximate only
5) Horizontal Datum for the survey as based on RTK-GNSS survey system
6) Vertical Datum for the survey as based on TGBM (PM 73388 on 26/01/2024
7) Water Level checks carried out from SMART TS 100421
8) Jetty positioned by RTK-GNSS on 8/01/2024
9) Refer to plan J370-003 for 1:500 scale.

Horizontal Datum	MGA Zone 55 (GDA2020)		
Base Station	Easting	Northing	
PM 211686 (AU0001)	358392.551	8148719.620	
Vertical Datum	LAT	based on TGBM (PM 73388)	RL 9.611m
Tide Notes	Soundings reduced to datum using RTK-GNSS systems and a single LAT-ellipsoid separation value based on PM55 of TS100421		
For tidal datum information contact MSQ Tidal Unit (tidesmsq.qld.gov.au)			
Depth Tolerance	0.2m	Horizontal Tolerance	1.5m
Weather	10-15 knots SE		

Vessel	QG Wenlock
Echo Sounder	CEESCOPE 100
Heavemeter	Novatel 628 RTK-GNSS
Horizontal Positioning	Novatel 628 RTK-GNSS
Data Collection/Processing	Hypack 2013 (64bit)HMOD1 10.61
Tidal Reference Station	TS 100421

SOUNDINGS (m): 2 below datum; 0 above datum

LEVELS (m): 0.91 above datum; 0.13 below datum

SCALE 1 : 2000 AT A1

0 20 100 200

CLASS C * see notes

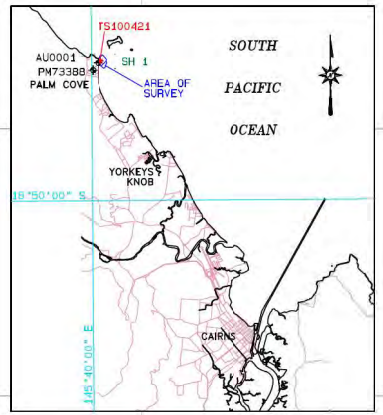
CLIENT: MSQ - Maritime Assets & Infrastructure

Signature	
Hydrographic Surveyor	
Surveyor	C BROCKLEHURST
Checked	D NING

Queensland Government
HYDROGRAPHIC SERVICES
Ph: (07) 3066 5909
Email: hydro@msq.qld.gov.au

CAIRNS
PALM COVE JETTY
HYDROGRAPHIC SURVEY
27 JANUARY 2024

Plot File. J370002P1.PDF
Job No. CN070001
Plan No. **J370-002**



LOCATION DIAGRAM

Scale 1:200,000

SURVEY CONTROL – MGA ZONE 55 (GDA2020)				
STATION	EASTING	NORTHING	LAT	COMMENTS
PM73388	357998.157	8148175.910	9.61ı	Hz: SCDB HJ 0.016m (QLD ANJ 23.10), LAT: TGBN TS100421
PM211686	358392.551	8148718.620	4.581	Hz: Auspos Report # 3889 , LAT: RM15 TS100421

NOTES:

1) This survey meets the mandatory class requirements as outlined in the MSQ document 'Standards for Hydrographic Surveys within Queensland Waters V1.3'.
2) Contours are computer generated to Hydrographic Standard (inclusive)
3) Soundings coloured to 1.0m LAT for clearance purposes
4) Coastline digitised from aerial photography is approximate only
5) Vertical control for the survey was based on RTK-GNSS systems and a single LAT-Ellipsoid separation value derived from PM 73388 on 22/01/2024
6) Water Level checks carried out from data of TS 100421
7) Jetty positioned by RTK-GNSS on 8/01/2024
8) Refer to plan J370-002 for a 2000 scale.

Horizontal Datum	MGA Zone 55 (GDA2020)				
Base Station	Name	Easting	Northing		
	PM 211686 (AU0001)	358392.551	8148718.620		
Vertical Datum	LAT based on TGBM (PM 73388) RL 9.611m				
Tide Notes	Soundings reduced to datum using RTK-GNSS systems and a single LAT-Ellipsoid separation value based on RM15 of TS100421				
For tidal datum information contact MSQ Tidal Unit (tidesmsq.qld.gov.au)					
Depth Tolerance	0.2m	Horizontal Tolerance	1.5m	Weather	10-15 knots SE

Vessel	QG Wenlock
Echo Sounder	CEESCOPE 100
Heavemeter	Novatel 628 RTK-GNSS
Horizontal Positioning	Novatel 628 RTK-GNSS
Data Collection/Processing	Hypack 2013 Terramodel 10.61
Tidal Reference Station	TS 100421

SOUNDINGS (m): 2₅ below datum; 0₇ above datum

LEVELS (m): 0.91 above datum; -1.13 below datum

SCALE 1 : 500 AT A1 (0 5 25 50)

CLASS C * see notes

CLIENT: MSQ - Maritime Assets & Infrastructure

Signature Hydrographic Surveyor	
Surveyor	C BROCKLEHURST
Checked	D NING

Queensland Government
HYDROGRAPHIC SERVICES
Ph: (07) 3066 6909
Email: hydro@msq.qld.gov.au

CAIRNS
PALM COVE JETTY
HYDROGRAPHIC SURVEY
27 JANUARY 2024

Plot File: J370003P1.PDF
Job No. CN070001
Plan No. **J370-003**