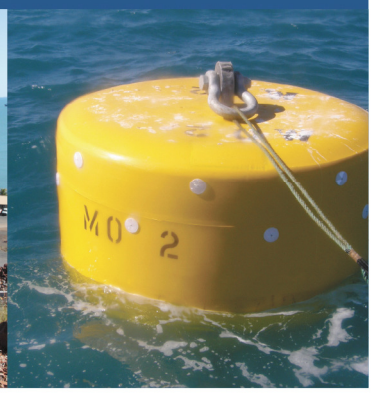
our port



Moorings Handbook

DAMPIER PORT AUTHORITY
H.M.S. ROEBUCK 1699

DEFINITIONS

Cyclone Mooring	In the Port of Dampier, a cyclone mooring must have minimum capability of holding a nominated vessel in 30-second gust, wind speed of 90 knots (at 10 metres above sea level) for a 50 year return period.
Mooring Designer	A person or organisation with appropriate professional qualifications to; a) prepare the technical specifications of a mooring system including configuration and materials; b) to review and make recommendations on inspection reports; and c) to ensure on-going suitability of mooring systems. A sample list of Mooring Designers is set out in Appendix B.
Mooring Inspector	A person or organisation duly qualified for their range of business and licensed in Western Australia: a) capable of conducting mooring inspections above or below water; and b) to produce measurements and records suitable for evaluation by a Mooring Designer. A sample list of Mooring Inspectors is set out in Appendix B.
Mooring Licence	In the Port of Dampier, a mooring licence is written approval to either set (install) or use a mooring.
Mooring Licence Terms and Conditions	The terms and conditions of the Mooring Licence a copy of which are set out in Appendix C.
Mooring Standards	The standards and other terms contained in this document.
Mooring User	The mooring owner or user of any mooring or proposed mooring.
Port	The Port of Dampier, Western Australia and its seabed and port waters together with all wharves, piers and land that are owned, vested in, occupied by, licensed to or controlled by the DPA.
Storm Mooring	In the Port of Dampier, a mooring other than a Cyclone Mooring, capable of withstanding winds and weather up to Beaufort force 8-9.

ABBREVIATIONS

DPA	Dampier Port Authority
E	East
HAT	Highest Astronomical Tide
LOA	Length Overall
MHWN	Mean High Water Neap
MHWS	Mean High Water Spring
SE	South East
SW	South West
WA	Western Australia

CONTENTS

1.1 Port of Dampier Mooring Standards

This document has been produced to:

(a) Meet the information needs of the owners, designers, installers and users of moorings in the Port of Dampier;

(b) Provide information with regard to mooring design, installation, maintenance and usage. **However, this document in no way absolves companies from their duty of care to their employees, contractors, products or operations or any other obligations they may owe in relation to their employees, contractors, products or operations**; and

(c) Set rules and procedures that bind all Mooring Users.

This document must be read in conjunction with the DPA's Mooring Licence Terms and Conditions (Appendix C) and the DPA Cyclone Procedure available on the DPA website www.dpa.wa.gov.au or on request from the DPA.

DAMPIER PORT AUTHORITY'S PRIORITY IS SAFETY AND PROTECTION OF THE ENVIRONMENT.

1.2 Dampier Port Authority

The DPA is a State Government agency that operates the Port under the Port Authorities Act 1999. The DPA has responsibilities:

- to facilitate trade within and through the Port and plan for future growth and development of the Port;
- for the safe, secure and efficient operation of the Port; and
- to protect the Port environment.

In this role, the DPA approves the installation and usage of moorings in the Port and regulates the usage and maintenance of the moorings through its broad mooring licensing regime and these Mooring Standards.

DPA Contact Details

Vessel Traffic Manager

MOF Road Burrup Peninsula, Dampier Western Australia 6713

(Postal Address PO Box 285, Dampier Western Australia 6713)

Phone: (08) 9159 6575

Fax: (08) 9159 6558

Email mailto:marineoperations@dpa.wa.gov.au

Web: www.dpa.wa.gov.au

1.3 Disclaimer

The information contained in these standards is believed to be correct at the time of issue. However, the DPA does not guarantee the accuracy of the information and accepts no liability for any damage, delay or loss resulting from any such inaccuracy. For more recent information, please consult a Mooring Designer or the DPA.

2.0 PREAMBLE

The Port of Dampier (see Figure 2-1) hosts a vast range of recreational and commercial vessels each year, many of which use moorings instead of anchoring within port limits. These moorings may be recreational or commercial Storm Moorings or heavier construction Cyclone Moorings. All moorings within the Port are managed by the DPA and the DPA's approval is required for the design and installation of a mooring and the use of moorings. The DPA monitors annual inspections, maintenance and repair of moorings within the Port. DPA's aim is to promote fair and equitable access to moorings, to ensure all moorings are maintained to a high standard.

Each mooring **must be capable of holding the assigned vessel** and correct guidance and advice from the Mooring Designer is necessary to safeguard the vessel owner's investment. A sample list of Mooring Designers and Mooring Inspectors can be found in Appendix B, however DPA makes no guarantee in relation to individual company performance or capability and vessel owners are advised to conduct their own due diligence when selecting any mooring contractor.

All Mooring Licences are of a temporary nature and no person has a property right in any mooring location without an express grant by the Commonwealth or WA State Governments.

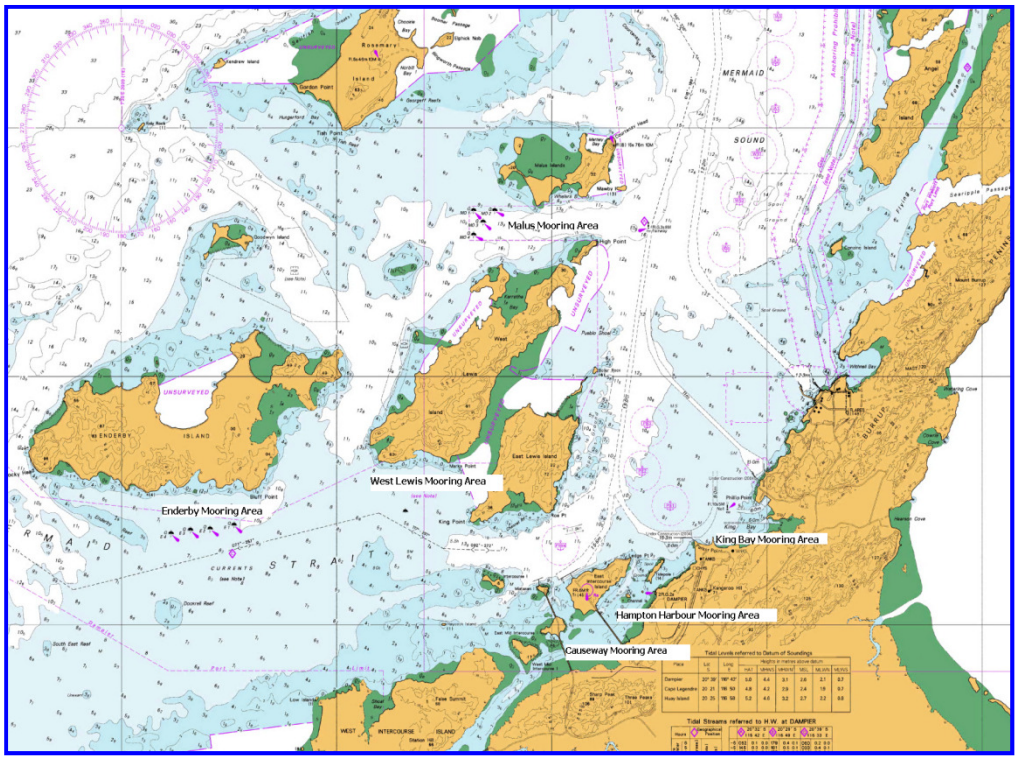


Figure 2-1 AUS 57, Dampier Archipelago

3.0 DAMPIER WEATHER CONDITIONS

The Port of Dampier is centred at 20 degrees 30' South and 116 degrees 45' East and lies within Australia's cyclone belt. Between three and five cyclones might typically approach the Pilbara Coast during the season (November to May) and winds over 100 knots can be experienced along with associated sea conditions. In 2005-06 Dampier directly experienced six cyclones, a record number.

Typically during November to May the winds blow in excess of 20 knots from the SW and winds over 60 knots might be experienced during seasonal tropical storms. The SW winds might blow strongly and continuously for 3-5 days.

During May to November the winds typically blow from E-SE, increasing in strength from the early morning and easing by late afternoon or early evening. Morning winds may exceed 30 knots. Sea conditions within the harbour after prolonged SW winds can produce seas to 1.5 metres through Mermaid Strait and whenever a cyclone is in vicinity of the coast a 'fetch' from the north can create seas to 2 metres through Mermaid Sound. During past cyclones, red alert phase seas to 9 metres have been encountered in Mermaid Sound. Storm tidal surge is always possible in conjunction with any cyclone.

Accordingly, Mooring Owners in the region should familiarise themselves with the risks associated with securing and mooring of vessels during adverse weather, including risks to the vessel and to personnel and responsibilities towards other vessels moored in the vicinity.

Tables 3-1 and 3-2 show Significant Wave Heights and Indicative Tidal Heights respectively.

Table 3-1 Significant Wave Heights

Location	Significant Wave Height (metres)
Southern Mermaid Sound	3.0 to 4.5
Hampton Harbour	1.5 to 3.0
Mermaid Strait (South of West Lewis Island)	2.0 to 4.0
NOTE: Maximum cyclone waves may be 1.6 – 2.0 times higher than significant wave height	

Table 3-2 Indicative Tidal Heights

Description	Level to Chart Datum CD (metres)	Level to Australian Height Datum AHD (metres)
HAT	5.22	2.51
MHWS	4.55	1.84
MHWN	3.22	0.51
NOTE: Storm Surge + Wind may add 3.5 metres to Sea Heights		

4.0 INDICATIVE MOORING LOADINGS

The DPA commissioned an engineering consultancy group to prepare a mooring report and design assessment (Report), (Appendix B) based on previous tropical cyclone analysis plus mooring assessments undertaken by several operators in the region. The complete Report is available on the DPA website www.dpa.wa.gov.au .

In the Report, Table 4-1 provides a range of indicative loadings for various vessel sizes and mooring locations. These indicative figures are shown for general guidance only and DPA

does not warrant the accuracy of any of the information contained in Table 4-1 or elsewhere in the Report.

The 300 tonne mooring force for the large vessels illustrates the high loadings that might occur due to a combination of low tide, shallow water depths, high winds and near breaking wave conditions.

Table 4-1 Indicative Vessel Loadings on Moorings

Vessel Size	Cyclone Mooring Location	Approximate Return Period (Years)	Total Mooring Force (Tonnes)
Small Vessel 10 metre LOA, 10 tonne displacement	Hampton Harbour	50	3-8
Medium Vessel 18 metre LOA, 25 tonne displacement	Hampton Harbour	50	10-15
Large Vessels 30-35 metre LOA, 500-800 tonne displacement	West Lewis Island	10-50	50-300
Small Ship 60-75 metre LOA, 2000 tonne displacement	West Lewis Island	25-100	40-70 (Wind Only) Total loadings not available (but would be expected to exceed 250-500 tonnes)

Other factors that might significantly influence actual mooring behaviour and loadings include:

- type of seabed anchorage (such as embedment anchor, drag anchor, spread mooring);
- mooring line configuration (such as chain and mass, clump weights, soft lines and type, buoys);
- vessel behaviour (such as windage, length, displacement, response amplitude, operators); and
- method of analysis (such as static, frequency or time-domain numerical modelling).

Mooring Owners should engage a Mooring Designer to perform inquiries and calculations for mooring parameters and loadings to suit their specific vessel characteristics, mooring location and risk assessment.

A sample list of Mooring Designers and Mooring Inspectors can be found in Appendix B, however the DPA makes no guarantee in regards to individual company performance or capability and vessel owners are advised to conduct their own due diligence when selecting any mooring contractor.

5.0 MOORING DESIGN AND COMPONENTS

5.1 General

All moorings must be designed, installed, used and maintained according to the design specifications of a Mooring Designer and DPA's mooring requirements.

The DPA's mooring requirements include:

- Cyclone moorings must be designed for a nominated vessel or class of vessel and certified by a Mooring Designer.
- Recreational Storm Moorings must comply with Table 5-1.
- Recreational craft moorings must be more than 300 millimetres in diameter and either bright red or orange in colour.
- Commercial moorings must be bright yellow in colour.
- Mooring owners must ensure that their allocated mooring number is on the mooring, positioned where it will always be clearly legible and if possible away from marine growth, bird droppings and tackle chaffing areas.
- Moorings must have visibility aids to avert collision between moving craft and moorings. As a minimum retro reflective material or "cats eyes" must be fitted to all moorings. Lighted moorings must have retro reflective material or "cats eyes" in case lights fail.
- Specifications for mooring tackle may not be varied without certification from a Mooring Designer, and written approval from the DPA, which DPA may withhold in its sole discretion.
- Hawsers are the responsibility of the Mooring Owner and need to be inspected and maintained. Refer to Port of Dampier Marine Notice 06-2009 available on the DPA website www.dpa.wa.gov.au .
- Moorings must not have a hawser secured to the mooring riser chain.

Failure to comply with these Mooring Standards or the Mooring Licence Terms and Conditions may, amongst other things, result in the suspension, termination or non-renewal of a Mooring Licence, the removal of a mooring, a fine being levied against the Mooring Owner or other legal action against the Mooring Owner.

5.2 Mooring Classifications

Moorings within the Dampier Archipelago typically fall into four classifications:

- Recreational craft storm moorings;
- Commercial craft storm moorings;
- Recreational craft cyclone moorings; and
- Commercial craft cyclone moorings.

5.3 Storm Moorings

5.3.1 Positions

Storm Mooring Positions:

- Hampton Harbour;
- King Bay; and
- West Mid Intercourse.

5.3.2 Storm Mooring Component Standards

See Table 5-1 for Minimum Storm Mooring Component Specifications.

Table 5-1 Minimum Storm Mooring Component Specifications

Vessel Length (m)	Mushroom Anchor/wheel (kg)	Concrete Block (weight in water) (kg)	Chain size (mm)	Hardware Size (mm)	Line Size (mm)
5 - 6	70	230	13	13	13
6 - 7.5	115	450	13	13	16
7.5 - 8.5	160	900	16	16	20
8.5 - 9.5	N/A	1400	19	20	22
9.5 - 12	N/A	1800	26	26	26
12 -15	N/A	2750	26	26	30
Over 15	Seek advice from Mooring Designer				

Figure 5-2 Railway Wheels

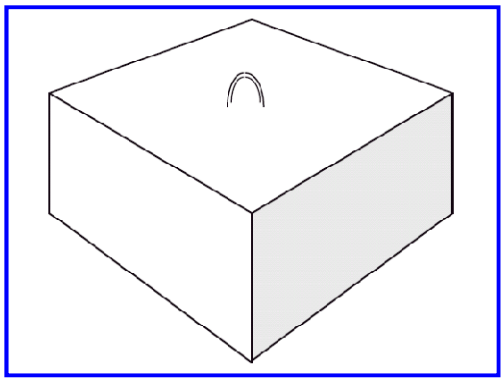


Figure 5-3 Concrete Block Anchor

5.3.3 Deadweight Anchors

Deadweight anchors such as wagon wheels and concrete blocks (clumps) become lodged in the seabed over time, providing a degree of suction resistance in any bottom material with cohesive properties. Thus, a deadweight anchor is not likely to break free from its set like a mushroom anchor. (An anchor is "set" when it becomes buried in the seabed over time.) Figure 5-2 and Figure 5-3 illustrate railway wheels and concrete block anchors respectively.

Railway wheels of 320 to 400 kilograms are used extensively in single or group lots for Hampton Harbour Storm Moorings.

The holding power of a concrete block anchor is approximately 1:2. In other words a properly-designed concrete anchor provides up to 50 per cent of its weight in air. For example, to provide a holding power of 900 kilograms in water, a concrete anchor would weigh 1640 kilograms in air (displacement factor of 0.55). A square-block concrete anchor is designed with the base dimensions greater than the anchor's height for a low centre of gravity to reduce transverse leverage.

5.4 Cyclone Moorings

5.4.1 Positions

Cyclone Mooring Positions:

- West Lewis Island Mooring Area
- Malus Island Mooring Area
- Hampton Harbour Mooring Area
- Enderby Island Mooring Area
- West Mid Intercourse Mooring Area

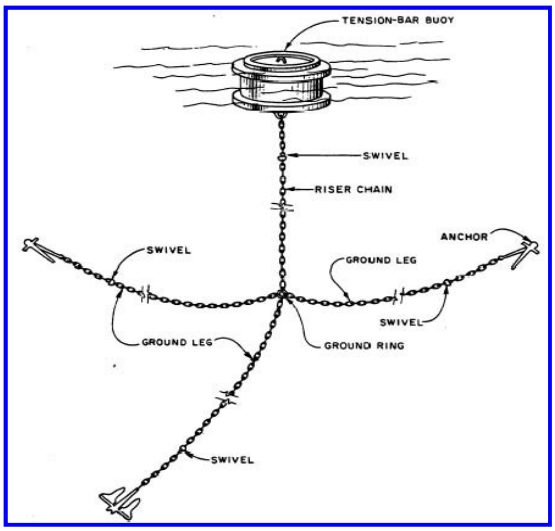


Figure 5-4 Admiralty Style Mooring – Typical Cyclone Mooring Layout

6.0 RESPONSIBILIIES OF A MOORING OWNER

6.1 Compliance with Mooring Standards and Mooring Licence Terms and Conditions

Mooring Owners must comply with the Mooring Standards and the Mooring Licence Terms and Conditions.

6.2 Sale or Transfer of Moorings

A Non recreational or commercial mooring or location may be sold, transferred, or rented, swapped, assigned, relocated or bartered except as permitted by the relevant Mooring Licence or these Mooring Standards and Mooring Licence Terms and Conditions. The holder of a recreational mooring may transfer his or her mooring to an immediate family member with the approval of the Harbour Master following the submission and approval of an Application for Use of Mooring.

Mooring Owners must seek written approval from DPA for vessels renting or swapping moorings by submitting the Change of Mooring Ownership or Personal Details form in Appendix B to the DPA's Vessel Traffic Manager. The information must include vessel name, GRT, LOA and who the owner is by fax, email or letter. The mooring may require re-certification by a Mooring Designer.

6.3 Yearly Renewal Application and Inspection Reports

Mooring Owners are required to complete and submit a Mooring Inspection Report and Annual Mooring Report with a Renewal Application for Use of Mooring prior to the beginning of each cyclone season, 1 November. Should a mooring not be inspected and reported by 1 November each year or if a mooring is not approved by the DPA, then the Mooring Licence may be cancelled by the DPA. If a mooring is not approved by the DPA, the Mooring User must relocate or remove the mooring at the discretion of the DPA and at the Mooring User's expense.

The Renewal Application for Use of Mooring is attached in Appendix A and is available on the DPA's website www.dpa.wa.gov.au or by request form the DPA)

6.4 Harbour Master to be notified of Vessel movement

Mooring Owners or vessel operators must notify Dampier Port Communications or the Harbour Master on VHF II or telephone 9159 6556 when a vessel is secured to or removed from a mooring.

7.0 NEW MOORING INSTALLATION PROCEDURE

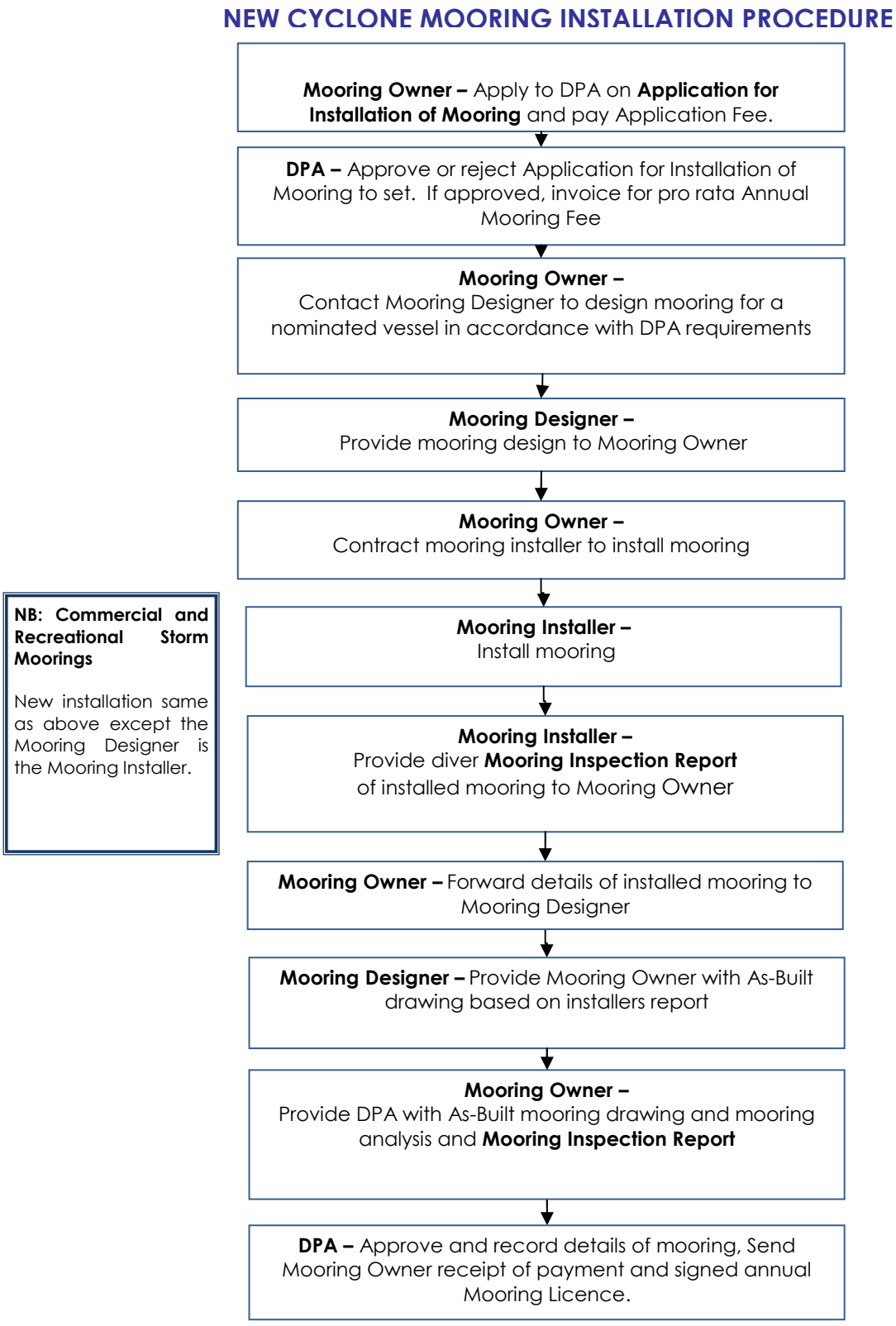
7.1 Applications

- All boat owners or operators (including recreational boat owners) (**Applicants**) applying to install a new mooring and moor a vessel within the Port must complete and submit to the DPA an **Application for Installation of New Mooring**, which is attached in Appendix A and is available on the DPA's website www.dpa.wa.gov.au or by request from the DPA.
- Applicants must detail the GPS position of the preferred location for approval by the Harbour Master.
- No mooring shall be placed in the Port unless permitted by the Harbour Master and in compliance with these Mooring Standards and the Mooring Licence Terms and Conditions. A mooring system set without prior authorisation of the Harbour Master may be removed immediately by the Harbour Master at the Mooring User's sole expense.
- Before placing a mooring in the water, the mooring tackle design and construction must be in accordance with Mooring Designer specifications and a copy of this specification furnished to, and approved by, the Harbour Master prior to installation.

7.2 Mooring Installation

- Upon installation, the mooring must be inspected by a Mooring Inspector for structural integrity, disposition on the seabed and compliance with these Mooring Standards and Mooring Licence Terms and Conditions – this report must include a written report containing photographs from diver inspection of the below water tackle and specified configuration.
- The Mooring Owner must forward to the Harbour Master a complete copy of the Mooring Inspector's report and as-built drawings including final confirmation that the mooring is set in the designated location, including GPS readout along with a photograph of the top mark and markings.

Figure 0-1 New Cyclone Mooring Installation Procedure Flow Chart



8.0 ANNUAL MOORING APPROVAL PROCEDURE

8.1 Annual Mooring report

A Mooring Owner must arrange for an **Annual Mooring Report** and **Mooring Inspection Report** (**Mooring Reports**) to be carried out by a Mooring Inspector before they apply for a renewal of the Mooring Licence.

Once the dive inspection has been done and the recertification received from the Mooring Designer, the Mooring Reports are to be completed and forwarded to the DPA by the Mooring Owner with a signed Renewal Application for Use of Mooring and the Annual Licence Fee prior to the start of the cyclone season on the 1st November each year.

The Mooring Reports will be reviewed by the DPA and if approved by the DPA, the owner will be notified and a new Mooring Licence issued for the use of the mooring by the nominated vessel.

Should a mooring not be inspected and the Mooring Reports not provided to the DPA by 1st November each year or if a mooring is not approved by the DPA, then the Mooring Licence may be cancelled by the DPA. If requested by the DPA, the Mooring User must remove the unapproved mooring. If the unapproved mooring is not promptly removed, it may be disposed of or relocated by the DPA at Mooring User's expense.

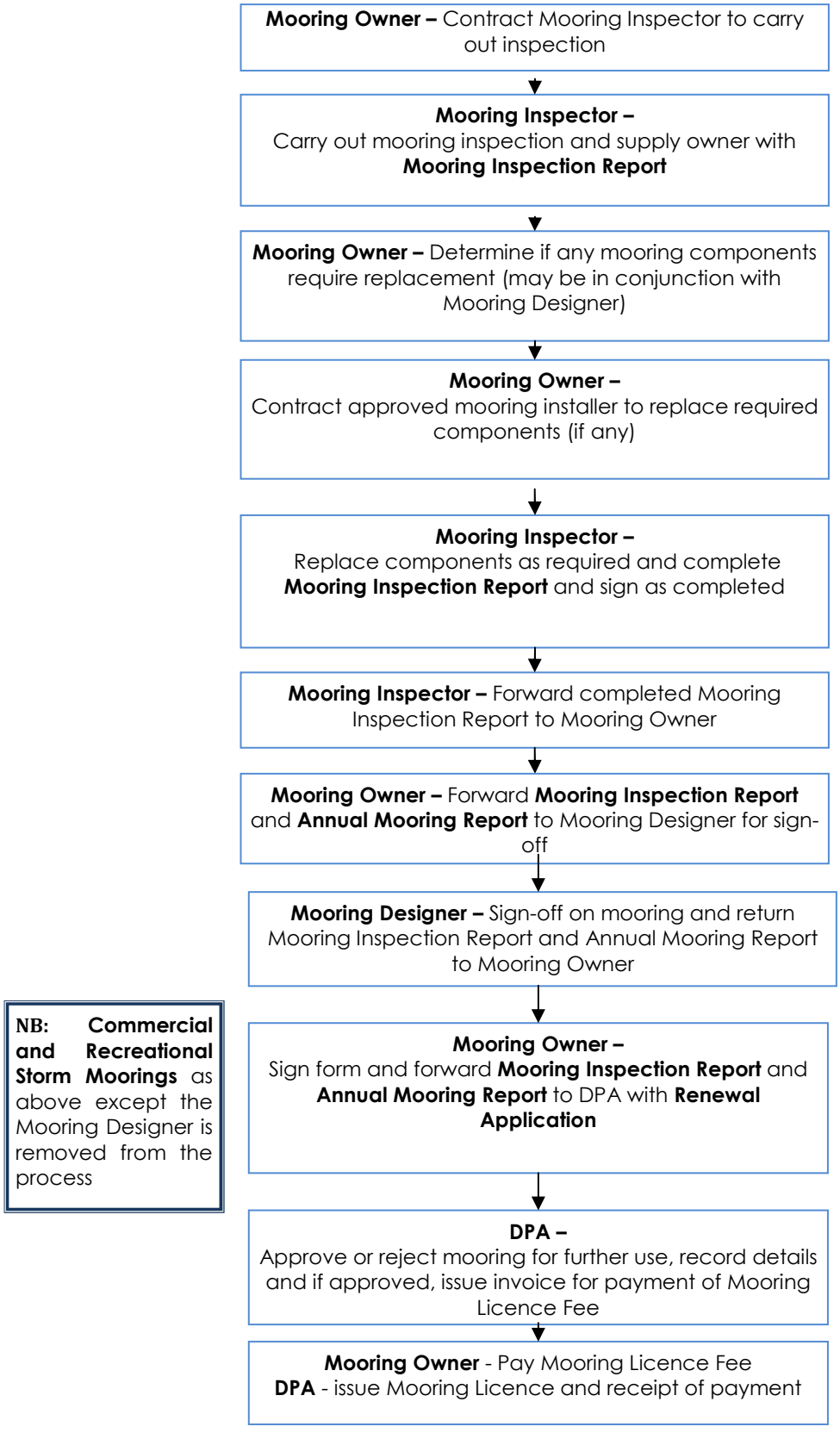
See Annual Cyclone Mooring Installation Procedure Flow Chart on the next page.

8.2 Payment of Fees

The Mooring Owner must pay to the DPA the Annual Mooring Fee and any other applicable fees and charges as set out in the Schedule of Fees at Appendix A. The mooring cannot be used unless the fee is paid and licence issued.

Figure 0-2 Annual Cyclone Mooring Approval Procedure

ANNUAL CYCLONE MOORING APPROVAL PROCEDURE



9.0 MOORING INSPECTIONS

9.1 Responsibility for Inspections

The Mooring Owner is responsible for the inspection, care, use and maintenance of mooring components including but not limited to the anchor, chain, buoy, pennant, and associated swivels, shackles, thimbles and eye splices, and the cost of their replacement. The Mooring User must arrange and pay for all inspections required by these Mooring Standards and Mooring Licence Terms and Conditions.

9.2 Annual Inspections

The frequency and scheduling of the different types of inspections shall be determined by the Mooring Owner and the Harbour Master taking into account inputs such as: mooring type; location; usage; previous mooring reports and climatic events. As a minimum, each mooring must be inspected by a Mooring Inspector once per year.

9.3 Inspection required before sale or assignment of Mooring

Before a mooring is sold, assigned or otherwise transferred, the Mooring Owner must:

a) Arrange and pay for an inspection to be performed by a Mooring Inspector; and

b) Provide a copy of the Mooring Inspection Report to both the DPA and the new Mooring Owner.

9.4 Additional inspections

An additional inspection may be required where a mooring:

(a) is intended to be used by a vessel larger than that currently permitted;

(b) is intended to be configured differently; or

(c) has been dragged.

9.5 Inspection Reports

(a) Following any mooring inspection, the Mooring Inspector must submit a Mooring Inspection Report to the Mooring Owner. Mooring inspections shall incorporate information as contained in the **Mooring Inspection Report**.

(b) The Mooring Owner must provide the **Annual Mooring Report** and all **Mooring Inspection Reports** to the DPA together with evidence of recertification by a Mooring Designer, and maintenance work, inclusive of current photographs. Inspection reports must be submitted to the DPA before the 1st November each year. Annual Mooring Reports and Mooring Inspection Report forms can be downloaded from the DPA website www.dpa.wa.gov.au.

(c) Mooring inspections and maintenance performed underwater should be recorded on video (if possible) with copies on CD ROM delivered to the Harbour Master together with copies of relevant inspection and maintenance compliance documentation. Any discrepancies arising from the inspection shall be described in the **Mooring Inspection Report**.

9.6 Deterioration and non-compliance of Moorings

(a) If excessive deterioration is observed by the Mooring Inspector, the mooring is not to be used until all worn components are replaced and re-endorsed by a Mooring Designer. Mooring Users are to forward maintenance details to the Harbour Master.

(b) If 15% deterioration is observed, the mooring is not to be used until all worn components are replaced and details of maintenance forwarded to the Harbour Master.

(c) If a mooring does not comply with design specifications, the Harbour Master in consultation with the Mooring Designers may either downgrade the mooring's rating to a smaller vessel size or reclassify it from cyclone mooring to storm mooring.

(d) If the Mooring Designer determines the mooring components do not conform with relevant standards and specifications, the DPA may, amongst other things, suspend the relevant Mooring Licence. The Mooring Owner must remove the assigned vessel from the mooring immediately after receiving notice from DPA in the form of a **Breach Notice** set out in Appendix A. A Mooring Owners failure to remove the vessel may result in the immediate termination of the Mooring Licence by the DPA.

(e) Further, if the nonconformity specified in the Breach Notice is not rectified within fourteen (14) days after the **Breach Notice** has been given by the DPA, the DPA may deem the mooring to be abandoned and the Mooring Licence for that location may be terminated.

9.7 Mooring Inspectors

All inspections of moorings and its components shall be undertaken by a Mooring Inspector (approved by the Harbour Master) each year. Organisations wishing to be listed as Mooring Inspectors should apply to the DPA in writing, listing qualifications by 1st June each year.

9.8 Types of Inspections

Three types of mooring inspection are conducted at Dampier – in water, partial raising and shore inspection:

- **In water inspections** are conducted by divers without removing the mooring to examine the anchors, chains and fittings for wear, corrosion and marine growth fouling and to check that shackle pins are not loose. The subsequent report should contain and recommendations for work required.
- **Partial raising inspections** involve bringing the mooring buoy and chain components onboard a vessel for inspection. This is required for major works, e.g. repositioning, chain replacement, clearing marine growth, end-for-ending chain etc.
- **Shore inspections** involve complete removal of the mooring to a shore location for a detailed inspection of all components. This operation might be required for change of ownership, repositioning the mooring, or for assessment following an insurance claim.

9.8.1 In-Water Inspection Report

Personnel conducting the in-water inspections should have access to as-built drawings of the moorings. The in water inspection report should be comprehensive and include a diagram of the mooring and be in the form of the Mooring Inspection Report set out in Appendix A and available from the DPA website www.dpa.wa.gov.au. The report should contain sufficient technical detail to support the Mooring Inspector's observations and recommendations and clear photographs and videos (if any) must be included.

An in water inspection after a significant climatic event such as a tsunami or cyclone is a prudent risk minimisation measure.

9.8.2 Partial Raising Inspections

Partial Raisings and shore inspections of moorings on the Western Australian coast are generally carried out with a much lower frequency than in water inspections. The frequency of these inspections would generally be determined by the Mooring Designer with reference to the relevant Mooring Inspection Reports and records of mooring usage.

10.0 INFORMATION FOR MOORING INSPECTIONS

10.1 Preamble

The following standards may be added to or amplified by a Mooring Designer, and are to be utilised in conjunction with the **Mooring Inspection Report**.

10.2 Anchors

If visible each anchor should be inspected and the following should be recorded.

- Anchor type and size.
- A small 'pop' float should be used to ascertain the anchor position by GPS.
- Anchor orientation (i.e. flukes buried, flukes up, anchor on its side, anchor facing wrong direction etc.).
- Three good quality photographs should be taken of each anchor to show embedment and orientation.

10.3 Ground Leg Sub Assembly

Each ground leg sub assembly should be inspected and the following information recorded:

10.3.1 Chain

- Chain type.
- Using appropriate tools clean the following for measurement, noting where sections are buried and cannot be observed:
  - a chain section of each leg below the ground ring;
  - a chain section above the seabed (thrash zone); and
  - a chain section about half way between these two areas.

- Measure and record double link measurements of the cleaned links. If one or more legs extend considerable distances before entering the bottom, clean links and take measurements at both ends and near the centre of each visible shot. If the chain is not in tension, single link measurements should be taken and recorded.
- Record length of one of the links at each area.
- Check for and record manufacturer's markings.
- Check for pitting, measure diameter and depth of any pits found, and record results.
- Record each anchor leg length from ground ring to bottom and from where it touches bottom to where it becomes buried.
- Using a compass, note and record the relative bearing of each leg from the ground ring.

10.3.2 Connecting Hardware – Ground Tackle

- Identify and record component type (shackle, detachable link, anchor joining shackle etc.).
- Record components overall length and diameter.
- Report any loose, broken or missing parts.
- Check and report condition of locking safety pins.
- Record any manufacturer's markings.
- Record position of each connection component by leg number and number of metres from ground ring.

10.3.3 Ground Ring

- Record type of ground ring assembly observed.
- Measure and record the inside diameter of the ring.
- Check and report any distortion of the ring from circular that might indicate over-stressing.

10.3.4 Riser Chain Sub Assembly

- Record chain type.
- Using appropriate tools clean the following locations in readiness for measurements:
  - a chain section below buoy;
  - a chain section above the ground ring;
  - a chain section about half way between these two areas; and
  - if the riser contains more than one shot of chain, clean links and take measurements at both ends and near the centre of each shot.
- Measure and record double link measurements at the cleaned links.
- Record length of one of the links at each area.
- Check for and record any manufacturer's markings.
- Check for pitting, measure diameter and depth of any pits found, and record results.
- Record water depth below buoy where each measurement is taken.

10.3.5 Connecting Hardware - Riser

- Identify and record component type (shackle, detachable link, anchor joining shackle etc.).
- Record components overall length and diameter.
- Report any loose, broken or missing parts.
- Check and report condition of locking safety pins.
- Record water depth below buoy of each component.
- Record any manufacturer's markings.
- Measure least diameter of shackle pin immediately below the buoy, inspect whether these pins exhibit any outward movement.

10.3.6 Swivel

- Check swivel for marine growth.
- Record components overall length and diameter.
- Report any loose, broken or missing parts.
- Record water depth below buoy of swivel.

10.3.7 Buoy Upper Portion

- Record buoy type, position and any markings. Comparison should be made to the original buoy GPS position to determine if drag has occurred.
- Measure and record buoy freeboard and orientation (i.e. listing). If the buoy is listing determine which compartment has water in it (if applicable).
- Record buoy overall condition (i.e. indents, paint condition, corrosion) and report any visible damage.
- Identify each component attached to buoy (i.e. shackles, rings etc) and measure diameter of each.
- Check and report the condition of buoy mooring arrangements (diameter, plate thickness etc.).
- Check and report condition of buoy tension bar if applicable (diameter, thickness etc.).
- Ensure a good quality photograph is taken of buoy upper portion.

10.3.8 Illumination

Inspectors should report the navigation lighting, solar charging and reflective materials on the moorings.

10.3.9 Buoy Lower Portion

- Record marine growth thickness.
- If there is little or no marine growth check and record the type and condition of the protective coating.
- Report any dents or other visible damage.

- Check and report on condition of buoy lower mooring arrangements (diameter, plate thickness etc.).
- Check and report on condition of buoy tension bar if applicable (diameter, thickness etc.).
- Record number size and location of installed anodes (if applicable).
- Ensure that each anode is securely attached to the buoy.

11.0 Unacceptable Mooring Designs

- Moorings which will not be accepted are those moorings designs where the hawser is attached to the riser chain below the buoy. Please see figure 11-1.

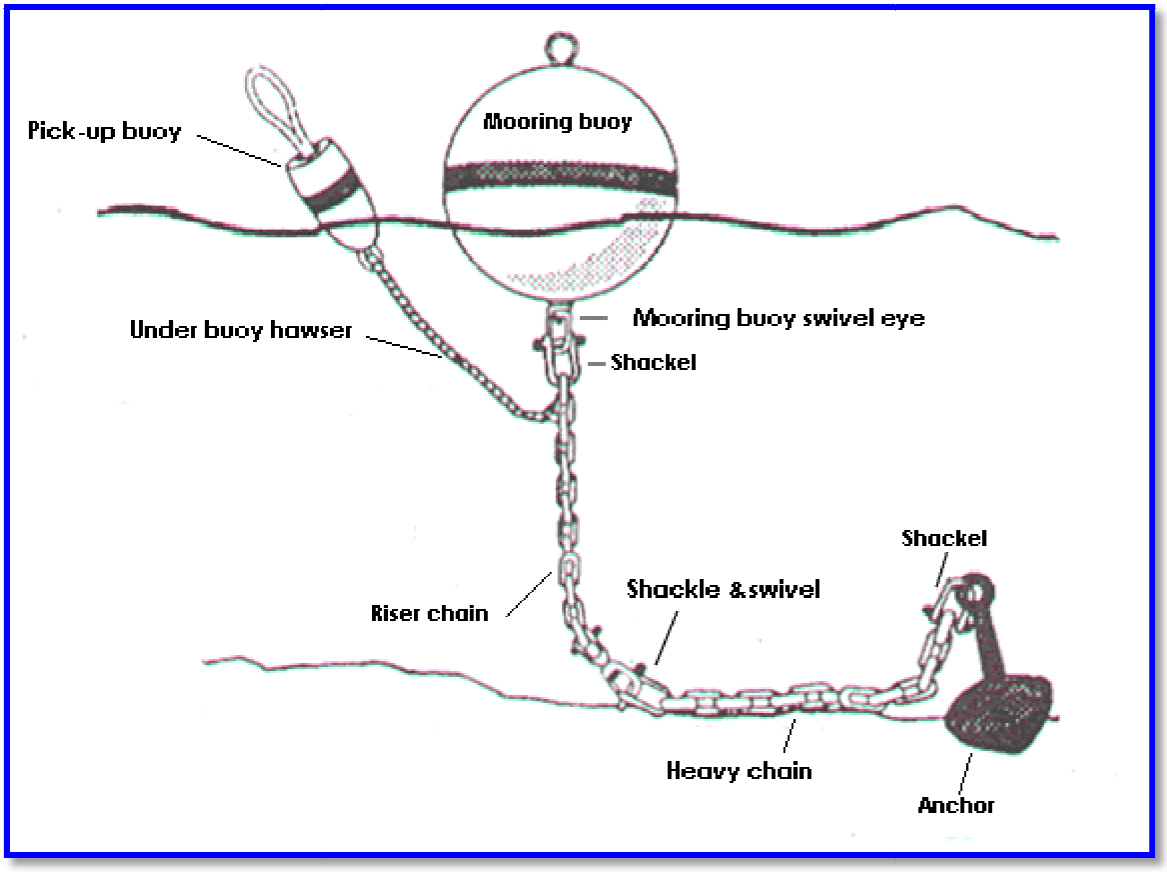


Figure 11-1

12.0 REFERENCES

Appendix B 'Vessel Cyclone Moorings – Critical Aspects for Consideration by Vessel Owners and Operators'

Port and Harbour Consultants. (1998), "Vessel Cyclone Moorings – Critical Aspects for Consideration by Vessel Owners and Operators", Document Number 032/07210/1

Date: 16 July 1998 Project 032/07210, Perth

13.0 APPENDIX

Appendix A Forms

SHEQ-SYS-F-068 Application for installation of mooring

SHEQ-SYS-F-090 Renewal Application for use of Mooring

SHEQ-SYS-F-057 Change of mooring ownership

SHEQ-SYS-F-055 Mooring inspection report

SHEQ-SYS-F-056Annual mooring report

SHEQ-SYS-F-071 Schedule of fees

SHEQ-SYS-F-082 Breach notice

SHEQ-SYS-F-083 Mooring Licence

Appendix B List of Mooring Inspectors and Designers

Appendix C Mooring Licence Terms and Conditions