Percuil River Moorings Limited

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Mooring Contractor Guidelines - From 1 December 2009

1. The Licensees of moorings on the River are responsible for ensuring that their moorings are laid and maintained by an Approved Mooring Contractor (AMC) and that the mooring is inspected and serviced each season by an AMC before it is used.

2. The Company's prime concerns when making these rules are the safety of everyone using the River moorings, their boats and property and the conservation of the environment. In addition, the Company must comply with conditions imposed by its lease and its duties under the law.

3. AMCs are designated as either Commercial (laying and maintaining moorings for financial gain) or Self (laying and maintaining their own moorings). The requirements in this document apply to both Commercial and Self AMCs. A list of Commercial AMCs is available to Licensees and AMCs. The Company reserves the right to inspect the work of AMCs.

4. AMCs are required to confirm to the Company that they will meet the criteria and standards in the Mooring Contractor Guidelines. The Company's guidelines are to be taken as the minimum standards to be met and should always be exceeded if in the AMC's judgement it is necessary to do so. When making decisions on the configuration of a mooring, the AMC's expertise takes precedence over any guidelines the Company has given.

Competence and Equipment

5. To lay and maintain moorings in the Percuil River, an AMC must, to the complete satisfaction of the Company:

    a. Provide evidence of, or already be known to have, sufficient knowledge and experience for this role.

    b. Have and use suitable equipment.

6. For cases where there are limitations to the equipment available to an AMC, limitations on the types of moorings to be laid and maintained will be imposed on that AMC.

Diving

7. Mooring Contractors who dive to maintain moorings for financial gain must comply with diving industry legislation: the Health and Safety at Work Act 1974; the Diving at Work Regulations 1997; and the Approved Codes of Practice for Commercial Inland/Inshore sector.

8. When signing the declaration at the end of this document, AMCs who dive to maintain moorings are confirming that they meet these requirements.

Insurance

9. Commercial AMCs must be suitably insured to cover the risks associated with laying and maintaining moorings. This must include cover, at not less than £2M for any one occurrence, for Public Liability, and for Product Liability arising out of defective design or configuration, defective workmanship and defective materials.

10. Self AMCs must certify, for each of the boats using their moorings, that they have insurance which covers the liabilities arising out of a failure of their mooring and that they have third party insurance for each boat as required by 4)c)vii) of the Licence Conditions.

11. The Company reserves the right to have sight of evidence of such insurance upon request.

Investigation of Mooring Failures and Boat Contacts

12. AMCs are often the first to be aware of issues that arise with moorings by messages from their clients or by their own observations. Sometimes it is the Company which is the first to hear about an issue. Problems should be investigated and resolved as quickly as possible, ideally between the relevant AMCs. The Company will assist in contacting Licensees or resolving issues when requested. Cooperation between AMCs and the Company is needed to resolve some issues, and all parties must respond quickly to letters, emails and telephone calls and share all relevant information.

13. To assist in investigations the Company strongly recommends that AMCs maintain records showing the configuration and maintenance details of all moorings they service.

14. If a mooring requires moving from its existing position it must not be moved without the prior consent of a PRML Director, normally the Moorings Director.

15. As a principle, Licensees and Sub-Licensees should be always be informed of any reports of contact or near contact with adjacent boats or other damage to their boats or moorings.

16. All mooring failures must be reported and investigated, whether there is a boat on the mooring or not. The findings and details of any preventative action must be made available to the Company.

Additional Notes

17. AMCs are required to work within the Company's Mooring Licence Conditions and also to support the Company by ensuring that their clients understand and observe these conditions.

18. AMCs must not accept from Licensees, their agents or Sub-Licensees any instruction that would compromise the AMC's decision on the configuration or condition of a mooring. Any attempt to reduce the cost of maintenance in this way would be considered a breach of the Licence Conditions.

19. AMCs are responsible for ensuring that any subcontractors employed by them, for example to lift or dive on moorings, meet these guidelines.

20. Commercial AMCs are required to provide to the Company, by 30th June each year, a list of moorings contracted to be serviced which will be used by the Company to ensure that all moorings are serviced in accordance with the Mooring Licence Conditions.

21. The Company reserves the right to remove a Mooring Contractor from the list of AMCs at its complete discretion. It has a procedure for ensuring good practice by AMCs which is designed to ensure they are treated fairly and consistently. A copy of the procedure is available from the Company.

Minimum Mooring Specification

This specification is intended to achieve a consistent configuration of moorings in the River and promote the use of best practice in their construction and maintenance. The main elements of the configuration above the block are a higher than usual weight of chain and reduced chain length. This is to limit swinging circles in the densely packed river so that boat contacts are reduced to a minimum. For this reason the scope of a mooring must not exceed the limit specified without informing PRML.

Basic Configuration

22. The scope of a swinging mooring is all important in keeping to the irreducible minimum the consequences of swinging circles which overlap. The maximum overall scope of a mooring – from block to buoy - is 10.67metres (35ft) plus the depth at Mean Low Water Springs (MLWS) which is 0.6metre (2ft) above Chart Datum. The depth at MLWS must be measured as accurately as possible. Further details are at paragraphs 32-34. For moorings which dry out, the scope is reduced by the height which the mooring dries out above MLWS.

23. For Bands of Authorised Boat Length, the minimum sizes of the major components [1 & 2] in Percuil River swinging moorings are outlined in the following table:

	Band of Authorised Boat Length			
	12-20ft	21-30ft	31-40ft	41-46ft
Typical Displacement	Up to 1ton	1-4tons	4-7tons	7+tons
Block [1]	2.5-10cwt	6-20cwt	10-40cwt	15-50cwt
Eye-Bolt	25mm	32mm	38mm	38mm
Ground-Chain	25mm	32mm	38mm	50mm
Lower Riser	16mm	25mm	32mm	38mm
Middle Riser	12mm	16mm	25mm	25mm
Swivel	12-16mm	16mm	19mm	25mm
Upper Riser [3]	10mm	16mm	16mm	19mm

24. In addition to the prime considerations of length and displacement, the following examples highlight some other factors which have a bearing on decisions about the configuration of a particular mooring:

    a. Within each Band there is some allowance for different boat types. For instance, in the 12-20ft Band, a 19ft 1ton Shrimper would warrant the heavier block and swivel; whereas for a lightweight 14ft 0.38ton Dory, the lighter components would be appropriate. Similarly, in mooring terms, a 23ft 5ton Heard is very different from a 23ft 0.85ton Ajax.

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[1] Note that block weights are guidelines only. Factors to be considered in deciding block weight include: boat type and weight, depth of water, and degree of exposure to wind and waves.

[2] The following conversion table may be useful:

Millimetre	10	12	16	19	25	32	38	50
Inch	⅜	½	⅝	¾	1	1¼	1½	2

[3] For risers in 2 sections, see para. 35.

b. An unusual boat in terms of weight and/or windage at the top end of one Band might well justify a mooring to the configuration of the next higher Band. An 8ton Heard 28, for instance, would warrant a mooring in the 31-40ft Band.

c. The area between Polvarth and Amsterdam Points is open to prevailing winds and seas, and boats in this area would have heavier moorings than similar boats moored in the upper and more-sheltered reaches of the River.

Blocks

25. It is generally accepted that when blocks sink fully into the river bed, their effective weight can be increased considerably depending on the characteristics and depth of the mud/sand. The presence of this 'suction' certainly enhances the security of the mooring. However, the nature of the river bed varies, and there is no guarantee that a block in its correct position will be where the river bed provides maximum 'suction' or even any at all. For this reason, it is prudent to choose the size and weight of a block that will hold the boat in all conditions regardless of 'suction' which should be considered only as a bonus.

26. Granite blocks are preferred, squarish in plan and relatively flat so that there is no protruding part for mooring chains to hook under. Old granite gate posts are not used because they carry the risk of chain looping or even half-hitching around an end.

27. Concrete blocks may also be used, and the following recommendations[4] apply:

    a. Structural Grade concrete should be used, and it should be vibrated immediately after pouring to remove air and maximise density. To minimise the risk of degradation due to salt contamination in the mix, fresh water and salt-free sand should be used. The aggregate should be ¾inch to dust.

    b. Moulds should be filled with a single homogeneous mix. To minimize the risk of concrete splitting or crumbling as a result of corrosion or contaminating dissimilar materials, blocks should be free of rubble and metal.

28. In all but exceptional circumstances, single block moorings are used, but when a high degree of control is necessary in a particularly tight space, the use of bridles on the sea-bed is not ruled out. However, such moorings may not be laid without informing PRML.

Eye-Bolts

29. Eye-bolts should be of mild steel bar. The preferred method of attaching the eye-bolt to the block is for the shank of the eye-bolt to pass down through a hole in the centre of the block, then to be bent horizontally to the edge of the block and vertically up the side of the block. The end of the shank must not protrude above the block. Alternatively, if the eye-bolt shank is to be attached by threads and nuts, a 130x130mm (5x5in) plate of 12mm (½in) mild steel is used as the 'washer' under the block, and the first nut is heavily torqued to eliminate any movement between eye-bolt and block. The second nut is locked to the first with an equally heavy torque and then peened.

30. Also for concrete blocks, one metre of at least 38mm chain may be cast into the block with 1½ links protruding above the block to provide the same function as an eye-bolt.

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[4] Courtesy of the Concrete Centre of the British Concrete Association.

Ground-Chain and Riser combination

31. There are few, if any, swinging circles at low tide that do not overlap with at least one other, and it therefore remains possible in certain conditions of wind and tide for adjacent boats, particularly dissimilar boats, to come into contact. To minimise the risk of contact, for it cannot be eliminated, it is vital that the scope of every mooring be kept to the absolute minimum. It is also important, particularly in areas exposed to large waves, to protect boats from shock loads by having a length of heavy ground-chain to act as a spring. The disadvantage of ground-chains is that different boats extend them in different ways, and this exaggerates the extent to which swinging circles overlap and increases the risk of boats coming into contact. In general, the heavier the mooring, the more the boat's behaviour is moderated. Shackles are the weakest point in a mooring, so as few as possible should be used. These requirements compete with each other, and compromise is inevitable.

Ground-Chains

32. For ground-chains, short-link studded chain is heavier than long or mid-link chain and is therefore preferred. As the general rule, the length of ground-chain is 3metres (10ft). In well-protected areas this should be shortened to reduce scope. If, either for greater weight or for ease of maintenance in deeper water, a longer ground-chain is necessary, the increase in length of the ground-chain is offset by an equal reduction in the length of the riser to maintain the maximum overall scope of 10.67metres (35ft) plus the depth at MLWS (which is 0.6metre (2ft) above Chart Datum).

Risers

33. Grade 30 batch-numbered chain is required for risers, and mid-link chain allows for larger shackles than short-link. From the top of the ground-chain to mooring buoy, the length of the riser, including swivel and shackles, is the depth at MLWS plus a 7.62metres (25ft) constant.

34. The constant is equal to the predicted maximum height of the tide, 5.1metres (16ft 9ins) above MLWS, plus a contingency offset of 2.52metres (8ft 3ins) to allow for extremes of weather and tide. Above the mooring buoy, the riser can be extended by a further 0.6metres (2ft) to form the lower part of the boat strop.

35. The basic configuration table provides for a riser graduated in 3 approximately equal sections of different chain sizes, with the swivel positioned between the upper and middle sections. If 2 sections are preferred, with the swivel between, the smallest chain size is eliminated.

36. For boats needing even more control, such as those with high windage and/or long deep keels, the riser is increased in chain size in the lower section or over the whole length.

37. For moorings which dry out or are in very shallow water, a heavier riser can tend to centre the boat over the block/eyebolt with the consequent risk of boat damage at low water. A lighter riser would be more easily extended away from the block in calm conditions and reduce the risk of boat damage.

Swivels

38. A mooring must incorporate at least one fully-forged mild steel swivel, ideally a size up from the riser, but not smaller. Preferably, it would be positioned somewhere near the mid point of the riser to avoid anything that may prevent the swivel from functioning freely, be it marine growth higher up or some hindrance on the sea-bed. As an alternative to mild steel, Grade 316 (or even better 316L) tested stainless steel swivels may be used.

Shackles

39. As the weakest components in a mooring, shackles need particular care. It is most important that galvanised, mild-steel, tested and certified BS3032 Dee and Bow shackles, as used in the lifting industry and having pin diameter greater than that of the standing part, are used throughout. The correct size is the largest size that will fill the space available in both components being joined.

40. However, there are situations where non-tested shackles, despite their shortcomings, have to be used:

    a. If two components are of the same size – for example 2 lengths of short-link chain - and the pin of a tested shackle just correctly fills the space available in one component, then the standing part of the tested shackle is undersized in the other component. In this case, maximum shackle bulk and strength are achieved by using the biggest possible non-tested shackle with pin and standing part of equal size.

    b. If a tested Dee or Bow shackle is not big enough – such as where a spliced-in thimble of a rope boat strop joins a riser – the biggest possible non-tested bow shackle should be used, again for maximum strength and bulk.

41. Each non-tested shackle that cannot be avoided in a mooring must be hand-picked to reject those with any apparent manufacturing defect or the common problem of loose badly forged threads. Non-tested shackles of 16mm (⅝ in) or less should be replaced annually.

42. Shackle pins are always at risk of coming loose, usually because the pin threads corrode to the extent that pins can fall out. Grease[5] is recommended to prevent corrosion, and strong and reliable mousing is essential.

43. Mousing. There are many successful mousing methods: welding the pins at both ends, nylon cable-ties, stainless steel cable-ties, monel wire, stainless steel wire, galvanised steel wire, and Terylene line. Points to note are:

    a. If a shackle does not need to be undone intact, such as when a riser will be changed as a complete assembly, welding thoroughly – not spot-welding - both ends of the pin to the lugs of the shackle is a very secure method.

    b. Whatever the method, the whole pin eye space should be used for at least 2 separate mousings.

    c. Galvanised wire will corrode more than any other mousing material, so it must be changed every year. It should therefore not be used for heavy duty components that are not lifted and inspected every year.

    d. There are no nylon cable-ties designed for permanent immersion in seawater. Nylon 6/6 will absorb as much as 8.5% which will reduce its strength by 50% compared with dry as moulded. Nevertheless, the most suitable cable ties for shackle-pin mousing are Eurolok Nylon 6/6 to BS EN 50146:2000 [6]. At least 2 cable-ties should be fitted. Only black nylon cable-ties should be used; white ones tend to become brittle in sunlight.

    e. A stainless steel cable-tie[7] covered with one of nylon provides the strongest and most durable mousing.

    f. Monel wire should be of the 1.6mm size and not the 0.9mm size usually available in chandlers.

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[5] 'Green Grease' or Duckams 'Keenol'.

[6] Available from Davico Industrial Ltd (0121-5207101) in the NT/B size ranges: miniature, intermediate, standard, light heavy, heavy duty and extra heavy duty.

[7] Hellerman Tyton Stainless Steel 316 Cable Ties. www.hellermantyton.us 01752-701261.

Boat Strop

44. In keeping swinging circles to the minimum, the length of the mooring components above the water is restricted to the height of the bow fitting from the water, plus the distance from bow fitting to mooring cleat, plus between 0.3metre (1ft) and 0.45metre (1ft 6ins). The boat strop length is equal to this sum minus the 0.6metre (2ft) which the riser may extend above the waterline – see paragraph 34. Note that the boat strop may be lengthened by up to 0.3metre (1ft) for the deeper water moorings in exposed areas.

45. Chain boat strops, typically 10mm (⅜in), are in common use, but they have a shortcoming: the space available in the strop chain link limits significantly the size of the riser-to-strop shackle which becomes by far the weakest link in the mooring and is required to take the full mooring loads. In heavy weather, failures have occurred in this shackle, and even the use of a new and 'tested' shackle is no safeguard. A 12mm (½in) chain boat strop is better, but for many crews it is not easy to handle in rough conditions, and it does not eliminate the problem.

46. When rope is used for boat strops a spliced-in thimble at the bottom end provides plenty of space for a shackle big enough to fill completely the end link of the riser. There have been cases of 3-strand rope twisting open and weakening the thimble splice. Multiplait nylon rope is therefore the preferred material, and the norm is 24mm (1in) diameter. Other points to note:

    a. A swivel may be added between riser and strop.

    b. Grade 316 stainless steel thimbles last a great deal longer than those of galvanised mild steel.

    c. Soft plastic pipe provides protection against chafing between strop and bow fitting.

    d. A soft eye to suit the mooring cleat is spliced in.

    e. If the bow-roller fitting is too small to take a 24mm (1in) rope strop, the largest size that will fit should be used to fill the available space. For boats with a bowsprit, it is prudent not to reduce the size of the strop just because a bow-eye carbine-hook attachment is also available – there is no guarantee it will be used.

Mooring Buoy

47. Light-coloured net buoys of sufficient buoyancy to suspend the mooring at high water are the norm; they are boat-friendly, and sinkings through being damaged are rare. Buoys with metal pick-up rings on top can cause contact damage and are not favoured. Care should be taken to connect the buoy to the riser with a shackle that fills the space available in the buoy attachment hole; this minimises the wear in the buoy and maximises buoy life. The shackle does not carry the full mooring load, and may therefore be non-tested. As an alternative to a shackle, some use a loop of chain that fits snugly in the buoy attachment hole.

48. Mooring buoys must be clearly marked with the PRML mooring number using numbers at least 50mm high.

Mooring Maintenance

49. Each mooring must be inspected and serviced annually, ideally just before being brought into use, and always before a boat is attached to it. In addition, when a mooring is to be used in the winter it is to be checked in the autumn preferably not later than 31 October.

Mooring Blocks, Eye-Bolts, Ground-Chain

50. When a mooring is first laid, replaced or lifted for inspection the AMC's record of the event must include the planned date of the next lifting and inspection of the mooring block, eye bolt and ground-chain. The intervals between inspections are to be based on the measured rate of wear of this and similar moorings. These judgements are dependent on the experience and expertise of the AMC, and must be made such that the integrity of the mooring cannot be compromised. For normal situations a widely accepted frequency of inspection is every 5 years.

51. If there is no maintenance record for the mooring, or the record is incomplete in this respect, the mooring must be lifted and checked during the next maintenance inspection, and appropriate records kept from then on.

52. The shackle between eye-bolt and ground-chain is the greatest concern, particularly if it is a non-tested shackle or of unknown quality.

Mooring Tackle above the Ground-Chain

53. Risers, swivels, boat strops, buoys and tested shackles are inspected and replaced as necessary every year. Non-tested shackles of 16mm (⅝ in) or less and galvanised mild steel wire mousings should be replaced every year regardless of condition.

Rejection Criteria

54. A component must be rejected and replaced when its cross-sectional area has reduced by 40% of that when it was new. This 40% reduction in area is the same as a 22% reduction in diameter. The following table shows the reject and replace diameters for some common sizes of shackles and pins.

Diameter when new (mm)	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
Reject and replace diameter (mm)	9	11	12	14	15	17	19	20	22	23	25	26	28	29	31

55. In addition to these reject and replace criteria, if there is the slightest doubt about a component that has not yet reached the wear limit, it must be replaced anyway.
Examples are: concerns about the condition of shackle threads; a suspicion of embrittlement or weld failure; evidence of corrosion pitting; or a higher-than-expected rate of material loss due to erosion or corrosion.

Marking the Position of a Mooring

56. Before a mooring block is lifted, either a marker buoy with an anchor block of about 100 kg (2 cwt) must be placed as near to the mooring block as is practically possible or, in light winds the vessel lifting it must be anchored securely fore and aft. This is to ensure the block is returned to exactly the same position.

Changing the Position of a Mooring

57. Moorings must not be moved from their existing positions by an AMC without the prior consent of a Director of the Company. This will normally be the Moorings Director.

Dropped Moorings

58. When a mooring is lowered to the riverbed when not in use, there must be no line near the surface that could be caught in the propeller of a passing boat. Floating line must not be used. A length of chain or leaded line under the buoy is the preferred method of avoiding this problem.

Disposal of Materials

59. All chains, shackles or other parts of moorings that are no longer needed must be disposed of ashore. The dumping of redundant materials in the River or on its foreshore is strictly forbidden.