SECTION 1 EQUIPMENT IN ANCHORS AND CHAIN CABLES

Symbols

EN : Equipment Number defined in [2]

σ_{ALL} : Allowable stress, in N/mm^2, used for the Yielding check in [3.7], to be taken as the lesser of:

- $\sigma_{ALL} = R_{eH}$
- $\sigma_{ALL} = 0,64\ R_m$

R_{eH} : Minimum Yield stress, in N/mm^2, of the material, defined in the Rule Note NR216 Materials and Welding

R_m : Tensile strength, in N/mm^2, of the material, defined in the Rule Note NR216 Materials and Welding.

1 General

1.1 Design assumptions for anchoring equipment

1.1.1 The requirements in [2] and [3] only apply to temporary mooring of a ship within a harbour or sheltered area, where the yacht is awaiting for berth, tide, etc.

The attention of owners, shipyards and designers is drawn to the fact that loads on anchoring equipment due to emergencies increase to such a degree that its components may be damaged or lost owing to high energy forces generated, particularly in large yachts.

1.1.2 The equipment complying with the requirement [2] and [3], is not designed to hold a yacht off fully exposed coast in rough weather or for stopping the yacht which is moving or drifting. In this conditions the loads on anchoring equipment increase to such a degree that its components be damaged or lost owing to high energy forces generated, particularly in large yachts.

1.1.3 The Equipment Number (EN) formulae for anchoring equipment, as stipulated in [2] are based on following assumptions:

- Wind speed of 25 m/s
- Current speed of 2,5 m/s
- Scope of chain cable between 6 and 10, the scope being the ratio between length of chain paid out and water depth.

  A length of chain cable greater than the one obtained from [2.1.1] may be accepted by the Society, on the basis of justificative calculation submitted by the shipyard.

1.1.4 For yachts where frequent anchoring in open sea is expected, owner's, shipyard's and designer's attention is drawn to the fact that anchoring equipment should be provided in excess to the requirements of this Rules.

1.1.5 The equipment complying with the requirements in [2] to [3] is intended for holding a ship in good holding sea bottom, where the conditions are such as to avoid dragging of the anchor. In poor holding sea bottom, the holding power of the anchors is to be significantly reduced.

1.1.6 For small ships, equipement in anchors and cables may be reduced on a case-by-case basis. Nevertheless, it belongs to designer and/or shipyard to submit all the relevant information demonstrating that reduced equipement - its configuration - and all its components, fully copes with the energy forces most frequently encountered during service.

1.1.7 It is assumed that under normal circumstances a yacht will use one anchor only.

1.1.8 Towline and mooring lines are not required as a condition of classification.

1.1.9 Anchors and mooring line components - chain cable and its accessories, wire rope, etc - are to be manufactured in accordance with relevant requirements of the Rule Note NR216 Materials and Welding.

1.1.10 The bow anchors, connected to their own chain cables, are to be so stowed as to always be ready for use. For small ships, other arrangements of equivalent provision in security and safety may be foreseen, they are subjected to Society's agreement.

Hawse pipes are to be of a suitable size and so arranged as to create, as far as possible, an easy lead for the chain cables and efficient housing for the anchors.

For this purpose, chafing lips of suitable form with ample lay-up and radius adequate for the size of the chain cable are to be provided at the shell and deck. The shell plating at the hawse pipes is to be reinforced as necessary.

2 Equipment Number

2.1 General

2.1.1 All yachts are to be provided with equipement in anchors and cables - chain cable or ropes - to be obtained from Tab 1 based on their Equipment Number EN.

2.1.2 All yachts are to be equiped with High Holding Power - HHP - or Very High Holding Power anchors - VHHP - anchors. Anchors are to be of an Approved Type.

2.1.3 For ships having a navigation notation coastal area the equipement in anchors and cables may be reduced. This reduction consists of entering in Tab 1 one line higher, based on their Equipement Number EN.

Table 1 : Equipment

Equipment Number EN		HHP bow anchor		Stud link chain cable for bow anchor		
A < EN ≤ B		Mass of each anchor, in kg	Number of anchors **(2)**	Total length, in m	Diameter **(1)**	
A	B				grade Q2 steel, in mm	grade Q3 steel, in mm
10	12	8	2	75,0	(6,0)	(5,5)
12	14	10	2	80,0	(6,0)	(5,5)
14	16	11	2	85,0	(6,0)	(5,5)
16	18	13	2	95,0	(8,0)	(7,0)
18	20	14	2	100,0	(8,0)	(7,0)
20	22	16	2	105,0	(8,0)	(7,0)
22	24	18	2	110,0	(8,0)	(7,0)
24	26	19	2	115,0	(8,0)	(7,0)
26	28	21	2	120,0	(8,0)	(7,0)
28	30	23	2	125,0	(8,0)	(7,5)
30	34	26	2	130,0	(10)	(9,0)
34	38	30	2	137,5	(10)	(9,0)
38	42	35	2	137,5	(10)	(9,0)
42	46	40	2	152,0	(10)	(9,0)
46	50	45	2	165,0	11,0	(10,0)
50	58	50	2	165,0	11,0	(10,0)
58	66	62	2	180,0	12,5	11,0
66	74	75	2	192,5	12,5	11,0
74	82	85	2	192,5	14,0	12,5
82	102	110	2	220,0	16,0	14,0
102	122	145	2	220,0	16,0	14,0
122	142	185	2	247,5	17,5	16,0
142	162	230	2	275,0	19,0	17,5
162	182	280	2	275,0	20,5	19,0
182	202	340	2	275,0	22,0	20,5
202	222	400	2	302,5	22,0	20,5
222	242	465	2	302,5	24,0	22,0
242	262	535	2	302,5	24,0	22,0
262	288	620	2	302,5	26,0	24,0
288	318	680	2	330,0	28,0	26,0
318	348	750	2	330,0	28,0	26,0
348	378	820	2	357,5	30,0	28,0
378	408	880	2	357,5	30,0	28,0
408	438	950	2	385,0	32,0	28,0
438	468	1020	2	385,0	32,0	30,0
468	498	1090	2	385,0	34,0	30,0
498	528	1150	2	412,5	36,0	32,0
528	556	1220	2	412,5	36,0	32,0
556	584	1280	2	412,5	36,0	32,0
584	616	1350	2	412,5	38,0	34,0
616	656	1430	2	440,0	38,0	34,0
656	696	1520	2	440,0	40,0	36,0
696	736	1610	2	440,0	42,0	38,0
736	776	1700	2	467,5	42,0	38,0
776	816	1790	2	467,5	44,0	40,0
816	876	1900	2	467,5	44,0	40,0
876	956	2060	2	495,0	46,0	42,0
956	1046	2250	2	495,0	48,0	42,0
1046	1140	2460	2	495,0	50,0	46,0

(1) Values of chain cable diameters shown in brackets are given only to allow determination of the corresponding studless chain cable.

(2) For yachts and charter yachts with anchors weighing not more than 20 kg it may be accepted to have only one anchor and relevant chain cable length ready for use. In such case the second anchor and the relevant mooring line are to be so located that they can be easily accessed and handled.

2.1.4 For ships having a EN greater than 1140, the determination of the equipement will be considered by the Society on a case-by-case basis.

2.1.5 For yachts of special design or for yachts engaged in special services or on special voyage the Society may consider equipment other than that in Tab 1.

2.2 Equipment number calculation

2.2.1 Additional Service features approach

a) For yachts granted with service notation charter yacht-motor or yacht-motor:

$EN_m = EN$

where EN is to be calculated as per defined in [2.2.2] and [2.2.3] as relevant.

b) For yachts granted with service notation charter yacht-sailing or yacht-sailing:

$EN_S = EN + EN_E$

Where:

- EN is to be calculated as per defined in [2.2.2] to [2.2.3], as relevant.
- EN_E is to be calculated as per defined in [2.2.4].

2.2.2 Monohull yacht

The equipment number EN is to be calculated as follows:

$$EN = \Delta^{2/3} + 2 \cdot \left[a \cdot B + \sum_i (b_i \cdot h_i \cdot \sin\Theta_i) \right] + 0,1 \cdot A$$

where:

Δ : Maximum displacement, in t

a : Distance, in m, from summer load waterline amidships to the upper deck at side

h_i : Height, in m, on the centreline of each tier of deck houses having an actual breadth b_i greater than B/4, where B is the breadth, in m, as defined in Ch 1, Sec 2, [3.5]

Θ_i : Angle of inclination aft of each front bulkhead, as shown on Fig 1

A : Area, in m^2, in profile view of the hull, superstructures and deck houses above the summer load waterline, which is within the rule length of the yacht defined in Ch 1, Sec 2, [3.2] and with a breadth greater than B/4.

In the measurement of h_i, sheer and trim are to be ignored.

If a deck house broader than B/4 is placed on top of another deck house equal to or less than B/4 in breadth, only the widest is to be considered and the narrowest may be ignored.

Windscreens or bulwarks more than 1,5 m in height above the deck at side are to be regarded as parts of superstructures and houses where determining h_i and A. The height of hatch coamings may be ignored in the evaluation of h_i and A.

In the calculation of A, where a bulwark is more than 1,5 m in height, the cross hatched area of Fig 1 is to be considered.

2.2.3 Multihull yacht

The equipment number is to be calculated as follows:

$$EN = K_m \cdot \Delta^{2/3} + 2 \cdot \left[a \cdot B + \sum_i (b_i \cdot h_i \cdot \sin\Theta_i) - S_t \right] + 0,1 \cdot A$$

where:

- for yacht with N identical hulls:

  $K_m = N^{1/3}$

  i.e.:

  - for catamarans: $K_m = 1,26$
  - for trimarans: $K_m = 1,44$
  - for quadrimarans: $K_m = 1,59$
- for yacht with one mid hull and $2 \cdot n$ non-identical lateral hulls ($N = 2 \cdot n+1$):

$$K_m = \frac{(B_o \cdot T_o)^{2/3} + 2 \cdot \sum_{i=1}^{n} (B_i \cdot T_i)^{2/3}}{\left(B_o \cdot T_o + 2 \cdot \sum_{i=1}^{n} B_i \cdot T_i \right)^{2/3}} \quad \text{(N odd)}$$

- for yacht with non-identical hulls, but of an even number ($N = 2 \cdot n$):

$$K_m = 2^{1/3} \cdot \frac{\sum_{i=1}^{n} (B_i \cdot T_i)^{2/3}}{\left(\sum_{i=1}^{n} B_i \cdot T_i \right)^{2/3}} \quad \text{(N even)}$$

S_t : Transverse area, amidships, of the tunnel(s) existing between the hulls and the waterline

B_o, T_o : Breadth and draught, in m, of the mid full hull (if any), measured amidship (see Fig 2)

B_i, T_i : Breadth and draught, in m, of the lateral hulls, measured amidship (see Fig 2)

N : Total number of yacht hulls

n : Number of lateral hulls on one side of the longitudinal symmetry plane of the yacht

Δ : Total displacement of the yacht, in t.

Other symbols are defined in [2.2.2].

2.2.4 Windage effect on mast and standing rigging

For yachts granted with service notation charter yacht-sailing or yacht-sailing, the additional Eolian equipment number terme EN_E, is to be calculated by direct calculation according to point a) below. However, where information is missing EN_E may be calculated according to point b) below

Special consideration will be given in case of unusual mast and standing rigging arrangement.

a) Direct calculation

$$EN_E = 2 \cdot \sum_{i=1}^{n} h_i \cdot b_{Yi} \cdot \frac{C_{TXi}}{1,22} + 0,1 \cdot \sum_{i=1}^{n} h_i \cdot b_{xi} \cdot \frac{C_{TYi}}{1,22}$$

where:

h_i : Height, in m, of the i-th mast measured from the implantation point at deck

b_{Yi} : Average width, in m, of the i-th mast, measured in the Y direction of the yacht as defined in Ch 1, Sec 2, [4]

C_{TXi} : Longitudinal drag coefficient of the i-th mast in the X direction of the yacht as defined in Ch 1, Sec 2, [4]

Note 1: Where no information is available, C_{TXi} may be taken equal to 1.

Note 2: Drag coefficient C_{TXi} is to be taken such as

$$1 \leq C_{TXi} \leq 2,05$$

b_{Xi} : Average width, in m, of the i-th mast, measured in the X direction of the yacht as defined in Ch 1, Sec 2, [4]

C_{TYi} : Longitudinal drag coefficient of the i-th mast, in the Y direction of the yacht as defined in Ch 1, Sec 2, [4]

Note 3: Where no information is available, C_{TYi} may be taken equal to 1.

Note 4: Drag coefficient C_{TYi} is to be taken such as

$$1 \leq C_{TYi} \leq 2,05$$

i : Designates the i-th mast. Index one for the first mast up to index n for the last mast of the yacht

$$1 \leq 2 \leq \ldots \leq i \leq \ldots \leq n$$

b) Gross calculation

- For L_{WL} not greater than 40 m:

$$EN_E = EN$$

- For L_{WL} greater than 40 m:

$$EN_E = EN \cdot [(13/9) - (L_{WL}/90)]$$

where:

EN : Relevant Equipement Number as per defined in [2.2.2] and [2.2.3]

L_{WL} : Waterline length, in m, defined in Ch 1, Sec 2, [2.1.1].

3 Equipment

3.1 Shipboard fitting and supporting hull structures associated with towing and mooring

3.1.1 Additional Service features approach

a) For yachts granted with service notation charter yacht-motor or yacht-motor, all relevant requirements of this sub-article are to be complied with.

b) For yachts granted with service notation charter yacht-sailing or yacht-sailing, all relevant Regulations of this subarticle are to be complied with. Additionnally, if sailing winches are used as towing fittings, all relevant regulations of this sub-article apply.

Figure 1 :

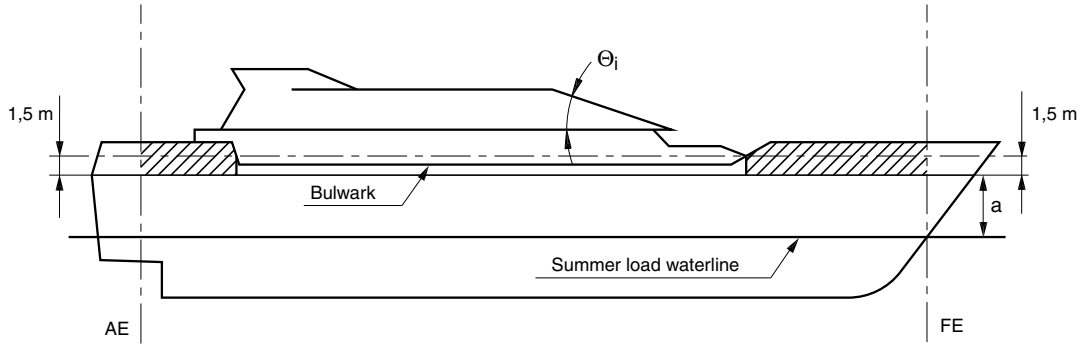
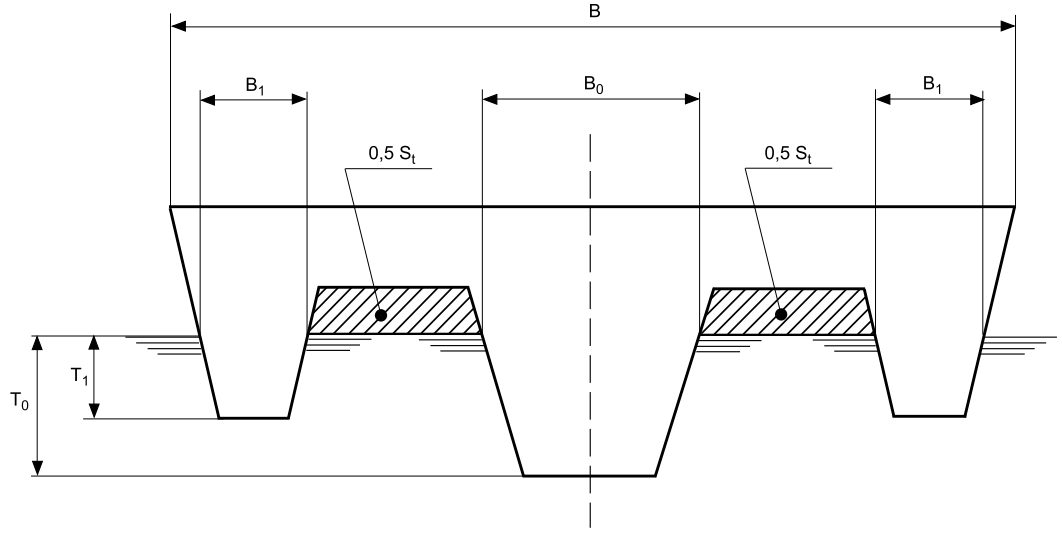


Figure 2 :



In this example: N = 3 and n = 1. In cases where N is even: $B_o = T_o = 0$

3.1.2 Definitions and applications

Requirements under the present sub-article apply to yachts of 500 GT and above. Nevertheless, they may be considered for yachts below 500 GT.

Shippyard fittings are limited to the following components used for normal mooring of the yachts and similar components used for towing and emergency towing of the yachts:

- Bitts and bollards
- Fairleads
- Stand rollers
- Chocks.

Other components such as capstans, winches, etc. are not covered by the present requirements. Nevertheless, hull structure supporting these components are to comply with [3.1.7].

Welded or bolted equivalent device connecting the shipyboard fitting to the supporting structure is a part of the shipboard fitting and subject to recognised standard applicable to the shipboard fitting.

3.1.3 Arrangements

Shipyard fittings for towing are to be located on longitudials, beams and/or girders, which are a part of the deck construction so as to facilitate efficient distribution of the towing load. Equivalent provision arrangements may be accepted.

3.1.4 Load

The force, in kN, acting on shipboard fittings at the attachement point of the towline or mooring lines, is to be taken as 1,25 times the Breaking Load BL, in kN, of the towline and mooring line, anticipated to be used throughout the service life of the yacht.

3.1.5 Shipboard fittings

The selection of shipboard fittings is to be made by the shipyard in accordance with a recognised standard accepted by the Society. Whatever is the selection methode of the shipboard fitting, the design load used to assess its strength and its attachment to the ship is to be in accordance with [3.1.4].

3.1.6 Towing and mooring arrangements

They are to be such that any surface against which the towing cable may chafe (for example, fairleads) is of sufficient radius to prevent the cable being damaged where under load.

Where necessary, suitable fairleads, bitts and mooring ropes shall be provided.

Adequate storage space for mooring lines shall be provided such that they are readily available and secured against the high relative wind speeds and accelerations which may be experienced.

3.1.7 Supporting Hull Structures

a) Arrangement

The arrangement of reinforced members (carling) beneath shipboard fittings is to consider any variation of direction laterally and vertically, of the towing forces, which are to be calculated in accordance with [3.1.4]

b) Admissible stresses

Where assessing the supporting hull structure, the allowable stresses are to be considered as follows:

- For metallic materials
  - Bending stress: 100% of the minimum specified material yield stress
  - Shear stress: 60% of the minimum specified material yield stress
- For composite structures

Case-by-case basis. Details to be submitted for review.

3.1.8 Safe working Load (SWL)

The following requirements on SWL, applicable for a single post basis, i.e. no more than one turn of the cable, are to be considered:

- The SWL is not to exceed one half of the design load defined in [3.1.4]
- The SWL of each shipboard fitting is to be marked by weld bead or equivalent, at the place of deck fittings used for towing
- The SWL with its intended use, for normal and/or emergency conditions, for each shipboard fitting is to be noted in the towing and mooring arrangement plan or in any other available document on board, for guidance of the Master. This arrangement plan is to explicitly prohibit the use of mooring and/or towing lines outside of their intended use and fonction and/or having different characteristics.

3.2 Anchors

3.2.1 General

Normally “high holding power anchor” (HHP) or “Very high holding power anchors” (VHHP) are to be used. Possible use of ordinary anchors will be specially considered by the Society.

Anchors are to be from an Approved Type.

3.2.2 Mass of anchors

Tab 1 indicates the mass of a “high holding power anchor” (HHP) i.e. anchor having a holding power greater than that of a Society’s Type Approved ordinary anchor.

“Very high holding power anchors” (VHHP), i.e. anchors having a holding power equal to, at least, four times that of a Society’s Type Approved ordinary anchor, may be used.

The individual mass of each anchor may vary within (+7, –3) per cent from the individual mass required in Tab 1, provided that the total mass of anchors is not less than the total mass required in Tab 1.

The mass of a VHHP anchor is to be not less than 2/3 of the mass required for the HHP anchor it replaces.

3.2.3 Anchor design and performance tests

Anchors are to be from an Approved Type. Therefore, Holding power - performance - assessment, Desing review and Tests and examination on manufactured product are to be carried-out.

Anchors are to have appropriate shape and scantlings in compliance with Society requirements. Moreover, they are to be constructed in compliance with Society requirements.

A high or very high holding power anchor is to be suitable for use on board without any prior adjustment or special placement on the sea bottom.

For approval and/or acceptance as a high or very high holding power anchor, the anchor is to have a holding power equal, respectively, to at least twice or four times that of an Type Approved ordinary stockless anchor of the same mass.

Holding power is to be assessed by full-scale comparative tests.

For very high holding power anchors, the holding power test load is to be less than or equal to the proof load of the anchor, specified in the Rule Note NR216 Materials and Welding, Ch 4, Sec 1, [1.5.2].

Comparative tests on Type Approved Ordinary stockless anchors are to be carried out at sea and are to provide satisfactory results on various types of seabeds.

Alternatively sea trials by comparison with a previously approved HHP anchor may be accepted as a basis for approval.

Such tests are to be carried out on anchors whose masses are, as far as possible, representative of the full range of sizes proposed for the approval.

At least two anchors of different sizes are to be tested. The mass of the greatest anchor to be approved is not to be in excess of 10 times that of the maximum size tested and the mass of the smallest is to be not less than 0,1 times that of the minimum size tested.

Tests are normally to be carried out by means of a tug, but, alternatively, shore-based tests may be accepted.

The length of the chain cable connected to the tested anchor, having a diameter appropriate to its mass, is to be such that the pull acting on the shank remains practically horizontal. For this purpose a scope of chain cable equal to 10 is deemed normal; however lower values may be accepted.

Three tests are to be carried out for each anchor and type of sea bottom. Three are the types of sea bottoms in which tests are to be performed, e.g. soft mud or silt, sand or gravel and hard clay or similar compounded.

The pull is to be measured by means of a dynamometer; measurements based on the bollard pull against propeller's revolutions per minute curve may be accepted instead of dynamometer readings.

Anchor stability and its ease of dragging are to be noted down, whenever possible.

Upon satisfactory outcome of the above tests, the Society will issue a certificate declaring the compliance of high or very high holding power anchors with its relevant Rules.

3.2.4 Manufacturing and materials

Manufacturing and materials are to comply with relevant requirements of the Rule Note NR216 Materials and Welding.

3.2.5 Test and examination

Tests and examination requirements are to comply with the Rule Note NR216 Materials and welding Ch 4, Sec 1, [1.5].

3.3 Chain cables

3.3.1 Chain cables arrangements

Bow anchors are to be used in connection with stud link chain cables whose scantlings and steel grades are to be in accordance with the requirements of the Society.

Normally grade Q2 or grade Q3 stud link chain cables are to be used with HHP anchors. In case of VHHP anchors, grade Q3 chain cables are to be used.

Proposal for use of grade Q1 chain cables connected to ordinary anchors will be specially considered by the Society.

For yacht with an Equipment Number $EN \leq 82$, studless short link chain cables may be used, provided that:

- steel grade of the studless chain is to be equivalent to the steel grade of the stud chains it replaces, i.e., referring to ISO standard 1834:
  - Class M (4) [grade 400], i.e. grade SL2 as defined in the Rule Note NR216 Materials and welding, Ch 4, Sec 1, [3] , in lieu of grade Q2
  - Class P (5) [grade 500], i.e. grade SL3 as defined in the Rule Note NR216 Materials and Welding, Ch 4, Sec 1 [3] in lieu of grade Q3
- equivalence in strength is to be based on proof load (not on breaking load)
- the studless chain cable meets the requirements of the Society.

The proof loads PL and breaking loads BL, in kN, required for the studless link chain cables are given by the following formulae, where d, in mm, is the required diameter of grade Q2 and grade Q3 stud chain cables taken from Tab 1:

- grade Q2:

  $PL_2 = 9{,}807\ d^2\ (44 - 0{,}08\ d)\ 10^{-3}$

  $BL_2 = 2\ PL_2$
- grade Q3:

  $PL_3 = 13{,}73\ \cdot d^2\ \cdot\ (44 - 0{,}08 \cdot d) \cdot 10^{-3}$

  $BL_3 = 2 \cdot PL_3$

The method of manufacture of chain cables and the characteristics of the steel used are to be approved by the Society for each manufacturer. The material from which chain cables are manufactured and the completed chain cables themselves are to be tested in accordance with the appropriate requirements.

Chain cables are to be made of unit lengths ("shots") of 27,5 m minimum joined together by Dee or lugless shackles.

3.4 Synthetic fibre ropes

3.4.1 Synthetic fibre ropes may be used as an alternative to stud link chain cables required in Tab 1 where relevant EN (EN_s or EN_m calculated according to [2.2]) is not greater than 60, provided that the following requirements are complied with.

Fibre ropes are to be made of polyamide or other equivalent synthetic fibres, excluding polypropylene.

The length L_{sfr}, in m, of the synthetic fibre rope is to be equal to the Total lenght, in m, of Stud link chain cable for bow anchors required by Tab 1.

The effective breaking load P_s, in kN, of the synthetic fibre rope is to be not less than the following value:

$P_s = 2,2 \cdot BL^{8/9}$

where BL, in kN, is the required breaking load of the chain cable replaced by the synthetic fibre rope (BL can be determined by the formulae given in [3.3]).

A short length of chain cable having scantlings complying [3.3] with is to be fitted between the synthetic fibre rope and the bow anchor. The length of this chain part is not to be less than 12,5 m or the distance from the anchor to its stowed position to the windlass whichever is the lesser. In any case this lenght is to be less than 6,25 m.

3.5 Attachement pieces

3.5.1 Both attachment pieces and connection fittings for chain cables are to be designed and constructed in such a way as to offer the same strength as the chain cable and are to be tested in accordance with the appropriate requirements.

3.6 Hawse pipe and bow sheave

3.6.1 They are to be of a subtancial construction. Their position slope and arrangement are to be arranged so as to facilitate the housing and dropping of the anchors and avoid damage of the hull during these operations. The parts on which the chains, ropes and/or cables - as relevant - may bear are to be rounded to a suitable radius.

3.6.2 All mooring units and accessories, such as timbler riding and trip stoppers are to be secured to surveyors satisfaction.

3.7 Windlass

3.7.1 The windlass is to be power driven and suitable for the size of chain cable, and is to have the characteristics stated below.

The windlass is to be fitted in a suitable position in order to ensure an easy lead of the chain cable to and through the hawse pipe; the deck, at the windlass, is to be suitably reinforced.

The windlass is to be able to supply, for at least 30 minutes, a continuous duty pull P_C, in N, corresponding to the grade of the chain cables, given by the following formulae:

- for grade Q2 chain cables:
  $P_C = 42,5 \cdot d^2$
- for grade Q3 chain cables:
  $P_C = 47,5 \cdot d^2$

where d is the stud link chain cable diameter of the intended steel grade, in mm.

The windlass unit prime mover is to provide the necessary temporary overload capacity for breaking out the anchor.

The temporary overload capacity or “short term pull” is to be not less than 1,5 times the continuous duty pull P_C for at least two minutes.

The speed in this overload period may be lower than the nominal speed specified above.

The nominal speed of the chain cable where hoisting the anchor and cable may be a mean speed only and is to be not less than 0,15 m/s.

The speed is to be measured over two shots of chain cable during the entire trip; the test is to commence with 3 shots (82,5 m) of chain fully submerged, or with the longest practicable submerged chain length where the chain length does not allow 3 shots to be paid out.

The windlass is to be provided with a brake having sufficient capacity to stop chain cable and anchor where paying out, even in the event of failure of the power supply.

Windlass and brake not combined with a chain stopper have to be designed to withstand a pull of 80% of the breaking load of the chain cable without any permanent deformation of the stressed parts and without brake slip.

Windlass and brake combined with a chain stopper have to be designed to withstand a pull of 45% of the breaking load of the chain cable.

The stresses on the parts of the windlass, its frame and brake are to be below the yield point of the material used.

The windlass, its frame and the brake are to be efficiently anchored to the deck.

Performance criteria and strength of windlasses are to be verified by means of workshop testing according to the Society Rules.

Anchoring sea trails are to be carried out as per [3.10].

3.8 Chain stoppers

3.8.1 A chain stopper is normally to be fitted between the windlass and the hawse pipe in order to relieve the windlass of the pull of the chain cable where the ship is at anchor.

The deck at the chain stopper is to be suitably reinforced to withstand load defined is [3.8.2].

However, fitting of a chain stopper is not compulsory.

Chain tensioners or lashing devices supporting the weight of the anchor where housed in the anchor pocket are not to be considered as chain stoppers.

Where the windlass is at a distance from the hawse pipe and no chain stopper is fitted, suitable arrangements are to be provided to lead the chain cable to the windlass.

3.8.2 Load

A chain stopper with all its parts is to be capable of withstanding a pull of 80% of the breaking load of the chain cable; the deck at the chain stopper is to be suitably reinforced.

3.8.3 Yielding check

The equivalent von Mises stress s_E, in N/mm^2 induced in the chain stopper by a load equal to the load defined in [3.8.2] is to comply with the following formula:

$\sigma_E \leq \sigma_{ALL}$

Where chain stoppers are analysed by through fine mesh finite element models, the allowable stress may be taken as $1,1 \cdot s_{ALL}$.

3.9 Chain locker

3.9.1 The chain locker is to be of a capacity adequate to stow all chain cable equipment and provide an easy direct lead to the windlass.

Where two anchor lines are fitted, the port and starboard chain cables are to be separated by a steel bulkhead in the locker.

The inboard ends of chain cables are to be secured to the structure by a fastening able to withstand a force not less than 15% nor more than 30% of the breaking load of the chain cable.

In an emergency, the attachments are to be easily released from outside the chain locker.

Where the chain locker is arranged aft of the collision bulkhead, its boundary bulkheads are to be watertight and a drainage system provided.

3.10 Anchoring sea trials

3.10.1 General

The anchoring sea trials are to be carried out on board in the presence of a Society surveyor.

3.10.2 Single windlass arrangement

The test is to demonstrate that the windlass complies with the requirements given in [3.7] particulary that it works adequately and has sufficient power to simultaneously weigh the two anchors - excluding the housing in the house pipe - where both are suspended to a 55 m of chain cable in not more than 6 min.

3.10.3 One windlass per mooring line arrangement

Where two windlasses operating separately on each chain cable are adopted , the weighing test is to be carried out for both, weighing an anchor suspended to 82,5 m of chain cable and verifying that the time required for the weighing - excluding the housing on the hawse pipe - does not exceeds 9 min.

3.10.4 The brake is to be tested during lowering operations.