

No. 10 Equipment

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(Rev.2 June
2005)

1. Anchoring equipment

1.1 Anchoring equipment for ships having EN below 205 to 50

- (a) The design of the anchoring equipment for ships having EN < 205 to 50 is that given in A1 for ships having EN ≥ 205.
- (b) These requirements are applicable to ships operating in unrestricted service. Reductions of equipment may be permitted for ships operating in restricted service.

1.1.1 Equipment number EN

The equipment of anchors and chain cables is to be as given in Table 1 and it is to be based on an Equipment Number EN calculated in compliance with A1.2

**Table 1
Equipment**

E.N.	Stockless bower anchors		Stud link chain cable for bower anchors				Stream wire or chain	
	No.	Mass per anchor	Stockless stream anchor	Total length	Min. dia.		Length	Breaking strength
		(kg)			(kg)	Mild steel Gr. 1 (mm)		
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>
50–70	2	180	60	220	14	12.5	80	65 (64.7)
70–90	2	240	80	220	16	14	85	75 (73.5)
90–110	2	300	100	247.5	17.5	16	85	80 (81.4)
110–130	2	360	120	247.5	19	17.5	90	90 (89.2)
130–150	2	420	140	275	20.5	17.5	90	100 (98.1)
150–175	2	480	165	275	22	19	90	110 (107.9)
175–205	2	570	190	302.5	24	20.5	90	120 (117.7)

NOTE: The stream anchor and stream wire or chain may not be condition of classification of the concerned Society



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1.1.2 Anchors

1.1.2.1 Types of anchors

1.1.2.1.1 Ordinary anchors

- (a) The requirements under A1.4.1.1 are to be complied with.
- (b) The mass of the stocked anchor, when used, and that of stream anchor, excluding the stock, is to be 80% of the mass required in Table 1 for stockless bower anchors and the mass of the stock is to be 20%.

1.1.2.1.2 High holding power (HHP) anchors

The requirements under A1.4.1.2 are to be complied with.

1.1.2.1.3 Super high holding power (SHHP) anchors

The requirements under A1.4.1.3 are to be complied with.

1.1.2.2 Installation of the anchors on board

The bower anchors are to be connected to their chain cables and are to be ready for use. The stream anchor is to be ready to be connected with its cable.

1.1.2.3 Proof testing of anchors

The requirements under A.1.4.3 are to be complied with.

Table 2 (Blank)



Table 2 (Blank)

1.1.3 Chain cables and wire ropes for anchors

1.1.3.1 Chain cables

- (a) The anchors are to be associated with stud link chain cables of one of the grades under A1.5.2, Table 3. For equipment number EN up to 90, as an alternative to stud link chain cables, short link chain cables may be considered, for acceptance, by the concerned Society on the basis of their design, strength and steel quality.
- (b) Wire ropes for anchors may be adopted in compliance with 1.1.3.3.1

1.1.3.2 Proof and breaking loads of stud link chain cables

- (a) The breaking loads BL and proof loads PL are to be in compliance with the requirements under A1.5.3.
- (b) The test loads values, rounded off from the loads in (a) above, which are to be used for testing and acceptance of chain cables are given in Table 4.



Table 4
Test Load Values for Stud Link Chains

Chain diameter mm	Grade 1				Grade 2				Grade 3			
	Proof load kN		Breaking load kN		Proof load kN		Breaking load kN		Proof load kN		Breaking load kN	
<i>1</i>	<i>2</i>		<i>3</i>		<i>4</i>		<i>5</i>		<i>6</i>		<i>7</i>	
	2a	2b*	3a	3b*	4a	4b*	5a	5b*	6a	6b*	7a	7b*
11	36	35.8	51	51.2	51	51.2	72	71.7	72	71.7	102	102.4
12.5	46	46.1	66	65.7	66	65.7	92	92.2	92	92.2		132
14	58	57.9	82	82.4	82	82.4			116	116		165
16	76	75.5		107		107			150	150		216
17.5	89	89.2		127		127			179	179		256
19		105		150		150			211	211		301

* The values of the columns 2b, 3b, 4b, 5b, 6b and 7b may be adopted in alternative to the correspondent values of the columns 2a, 3a, 4a, 5a, 6a and 7a.

1.1.3.3 Wire ropes for anchors

1.1.3.3.1 In alternative to the stud link or short link chain cables under 1.1.3.1, wire ropes may be used for:

- both the bower anchors of ships below 30 m in length
- one of the two bower anchors of ships between 30 m and 40 m in length
- stream anchor as stipulated in Table 1.

1.1.3.3.2 The wire ropes under (a) and (b) above are to have:

- length equal to 1,5 times the corresponding tabular length of chain cable (col. 5 of Table 1)
- strength equal to that of tabular chain cable of Grade 1.

A short length cable is to be fitted between the wire ropes and bower or stream anchor having a length of 12,5 m or the distance between anchor in stowed position and winch, whichever is less.

1.2 Installation of the chain cables on board (see Note)

1.2.1 Capacity and arrangement of anchor chains locker

- The chain locker is to be of capacity and depth adequate to provide an easy direct lead of the cables through the chain pipes and a self-stowing of the cables. The chain locker is to be provided with an internal division so that the port and starboard chain cables may be fully and separately stowed.
- The chain locker boundaries and their access openings are to be watertight as necessary to prevent accidental flooding of the chain locker from damaging essential auxiliaries or equipment or affecting the proper operation of the vessel.
- Adequate drainage facilities of the chain locker are to be adopted.



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1.2.2 Securing of the inboard ends of chain cables

- (a) The inboard ends of the chain cables are to be secured to the structures by a fastening able to withstand a force not less than 15% BL nor more than 30% BL (BL = breaking load of the chain cable).
- (b) The fastening is to be provided with a mean suitable to permit, in case of emergency, an easy slipping of the chain cables to sea, operable from an accessible position outside the chain locker.

NOTE

The statements under 1.2.1 and 1.2.2 may not be condition of classification of the concerned Society.

Table 3
Mass of stud link chain cables

Chain Diameter	Minimum mass per length of 27.5 m		Chain Diameter	Minimum mass per length of 27.5 m	
	With Dee Shackle	With Lugless Shackle		With Dee Shackle	With Lugless Shackle
<i>mm</i>	<i>kg</i>	<i>kg</i>	<i>mm</i>	<i>kg</i>	<i>kg</i>
26	410	405	78	3640	3535
28	480	475	81	3940	3820
30	550	545	84	4240	4105
32	620	615	87	4555	4405
34	700	690	90	4870	4705
36	785	775	92	5085	4905
38	875	860	95	5405	5210
40	965	950	97	5630	5425
42	1055	1040	100	5970	5745
44	1150	1130	102	6210	5970
46	1260	1240	105	6580	6320
48	1370	1345	107	6845	6575
50	1485	1455	111	7380	7080
52	1605	1575	114	7795	7475
54	1725	1690	117	8220	7870
56	1850	1810	120	8650	8270
58	1985	1945	122	8960	8550
60	2125	2075	124	9275	8835
62	2275	2220	127	9740	9270
64	2430	2370	130	10210	9710
66	2590	2525	132	10540	10005
68	2755	2685	137	11320	10750
70	2925	2850	142	12110	11500
73	3185	3100	147	12950	12300
76	3460	3360	152	13890	13200

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1.3 Windlass design and testing

1.3.1 A windlass suitable for the size of chain cable and complying with the following criteria is to be fitted to the ship.

1.3.2 The windlass unit prime mover is to be able to supply for at least 30 minutes a continuous duty pull Z_{cont} , corresponding to the grade of chain cables given by:

$$\begin{aligned} Z_{cont} = & 37.5 d^2 \text{ N (4.33 } d^2 \text{ kgf) grade 1} \\ & 42.5 d^2 \text{ N (4.33 } d^2 \text{ kgf) grade 2} \\ & 47.5 d^2 \text{ N (4.84 } d^2 \text{ kgf) grade 3} \end{aligned}$$

where d = chain diameter (mm).

These figures were determined taking into account the following conditions:

- (i) wind force equal to 6 on Beaufort Scale, corresponding, approximately, to 14 m/sec;
 - (ii) water current velocity 3 knots = 1,54 m/sec.
 - (iii) anchorage depth 100 m;
- using ordinary stockless anchor.

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" should not be less than 1.5 the continuous duty pull and should be provided for at least two minutes. The speed in this period can be lower than nominal.

NOTE

- (a) The values of Z_{cont} include the influences of buoyancy and hawse pipe efficiency which is assumed to be 70 percent.
- (b) The anchor masses are assumed to be the masses, excluding tolerances, as given in Table 2 above and in A1.4.3 Table 2. The chain masses are assumed, owing to the buoyancy, smaller than those in Table 3 and as given by $P = 0,0218 d^2 \text{ kg}$ per meter length.
- (c) Only one anchor is assumed to be raised at a time.

1.3.3 Nominal speed of the chain cable when hoisting the anchor and cable can be a mean speed only and this speed shall be not less than 0,15 m/sec. The speed is to be measured over two shots of chain cable during the total trip; the trial should be commenced with 3 shots (82,5 m) of chain fully submerged.

1.3.4 The capacity of the windlass brake is to be sufficient for safe stopping of anchor and chain cable when paying out the chain cable. If a chain stopper is not fitted, the windlass is to be able to withstand a pull of 80% of the breaking load of the chain without any permanent deformation of the stressed part and without brake slip. If a chain stopper is fitted it should withstand a pull of 80% of the breaking load of the chain. The windlass with brakes engaged and cable lifters disengaged is to be able to withstand a pull of 45% of the breaking load of the chain without any permanent deformation of the stressed parts and without brake slip.

1.3.5 The stresses in the involved parts of the windlass, windlass frame and stopper have to be below the yield point of the material used. The windlass, its frame and the stoppers are to be efficiently bedded to the deck.

Attention is to be paid to:

- (a) stress concentrations in keyways and at other stress raisers;
- (b) dynamic effects due to sudden starting or stopping of the prime mover or anchor chain;
- (c) calculation methods and approximation used when deriving the design stresses.



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2. Mooring and towing equipment (See Note)

2.1 Mooring lines and towing line

- (a) The mooring lines and towing line are given in Table 5 and are based in an Equipment Number EN calculated in compliance with A1.2 Table 1 or, as appropriate, with paragraph 1.
- (b) For ferry boat ships, car ferries and passenger ships having the ratio $A/EN > 0,9$ the following number of ropes should be added to the number required by Table 5 for mooring lines:

one rope where $0,9 < \frac{A}{EN} \leq 1,1$

two ropes where $1,1 < \frac{A}{EN} \leq 1,2$

three ropes where $1,2 < \frac{A}{EN}$

- (c) The tow lines given in col. 6 of Table 5 are intended as own towline of a ship to be towed by a tug or other ship.

NOTE This section may not be condition of classification of the concerned Society.

2.2 Mooring and towing ropes

Towlines and mooring lines may be of wire, natural fibre or synthetic fibre construction or of a mixture of wire and fibre. The lengths of individual mooring ropes may be reduced by up to 7% of the table length, provided that the total length of mooring ropes is not less than would have resulted had all ropes been of equal length.

Notwithstanding the strength requirements given in Table 5, no fibre rope is to be less than 20 mm diameter.

2.2.1 Wire ropes

- (a) Where wire ropes are used, they are to be of a flexible construction with not less than:
- (i) 72 wires in 6 strands with 7 fibre cores for the loads up to 216 kN
 - (ii) 144 wires in 6 strands with 7 fibre cores for loads of 216 kN to 490 kN
 - (iii) 222 wires in 6 strands with 1 fibre core for loads exceeding 490 kN.
- (b) Tensile strength of wires for wire rope mooring lines shall be within the following ranges:

$$\begin{aligned} &1420 - 1570 \text{ N/mm}^2 \\ &1570 - 1770 \text{ N/mm}^2 \\ &1770 - 1960 \text{ N/mm}^2 \end{aligned}$$

- (c) Wire ropes with 216 wires in 6 strands with 1 fibre core are substituted for 222 wired.
- (d) Wire ropes for use in association with mooring winches where the rope is to be stored on the drum may be constructed with an independent wire rope core instead of fibre core.



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Mooring lines and tow line

EQUIPMENT NUMBER			MOORING LINES				TOW LINE	
Exceeding	Not exceeding	No.	Minimum length of each line (m)	Minimum breaking strength (kN)			minimum length (m)	Breaking strength (kN)
1	2	3	4	5a	5	5b*	6	7
50	70	3	80	34		34.3	180	98
70	90	3	100	37		36.8	180	98
90	110	3	110	39		39.2	180	98
110	130	3	110	44		44.1	180	98
130	150	3	120	49		–	180	98
150	175	3	120	54		–	180	98
175	205	3	120	59		–	180	112
205	240	4	120	64		63.7	180	129
240	280	4	120	69		68.6	180	150
280	320	4	140	74		73.6	180	174
320	360	4	140	78		78.4	180	207
360	400	4	140	88		88.3	180	224
400	450	4	140	98		98.1	180	250
450	500	4	140		108		180	277
500	550	4	160		123		190	306
550	600	4	160		132		190	338
600	660	4	160		147		190	370
660	720	4	160		157		190	406
720	780	4	170		172		190	441
780	840	4	170		186		190	479
840	910	4	170		201		190	518
910	980	4	170		216		190	559
980	1060	4	180		230		200	603
1060	1140	4	180		250		200	647
1140	1220	4	180		270		200	691
1220	1300	4	180		284		200	738
1300	1390	4	180		309		200	786
1390	1480	4	180		324		200	836
1480	1570	5	190		324		220	888
1570	1670	5	190		333		220	941
1670	1790	5	190		353		220	1024
1790	1930	5	190		378		220	1109
1930	2080	5	190		402		220	1168
2080	2230	5	200		422		240	1259
2230	2380	5	200		451		240	1356
2380	2530	5	200		480		240	1453
2530	2700	6	200		480		260	1471
2700	2870	6	200		490		260	1471
2870	3040	6	200		500		260	1471
3040	3210	6	200		520		280	1471
3210	3400	6	200		554		280	1471
3400	3600	6	200		588		280	1471

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Table 5 (continued)

EQUIPMENT NUMBER			MOORING LINES			TOW LINE		
Exceeding	Not exceeding	No.	Minimum length of each line (m)	Minimum breaking strength (kN)			minimum length (m)	Breaking strength (kN)
1	2	3	4	5a	5	5b*	6	7
3600	3800	6	200		618		300	1471
3800	4000	6	200		647		300	1471
4000	4200	7	200		647		300	1471
4200	4400	7	200		657		300	1471
4400	4600	7	200		667		300	1471
4600	4800	7	200		677		300	1471
4800	5000	7	200		686		300	1471
5000	5200	8	200		686		300	1471
5200	5500	8	200		696		300	1471
5500	5800	8	200		706		300	1471
5800	6100	9	200		706		300	1471
6100	6500	9	200		716			
6500	6900	9	200		726			
6900	7400	10	200		726			
7400	7900	11	200		726			
7900	8400	11	200		736			
8400	8900	12	200		736			
8900	9400	13	200		736			
9400	10000	14	200		736			
10000	10700	15	200		736			
10700	11500	16	200		736			
11500	12400	17	200		736			
12400	13400	18	200		736			
13400	14600	19	200		736			
14600	16000	21	200		736			

* The values of column 5b may be adopted in alternative to the corresponding values of column 5a.

- For individual mooring lines with breaking strength above 490 kN (50000 kg) the latter may be reduced with corresponding increase of the number of the mooring lines and vice versa, provided that the total breaking load of all lines aboard the ship is not less than the Rules value. The number of lines is not to be less than 6 and no one line is to have a strength less than 490 kN (50000 kg).

2.3 Mooring winches*

2.3.1 Each winch should be fitted with drum brakes the strength of which is sufficient to prevent unreeling of the mooring line when the rope tension is equal to 80 percent of the breaking strength of the rope as fitted on the first layer.

2.3.2 For powered winches the maximum hauling tension which can be applied to the mooring line (the reeled first layer) should not be less than 1/4.5 times the rope's breaking strength and not more than 1/3 times the rope's breaking strength. For automatic winches these figures shall apply when the winch is set on the maximum power with automatic control.

* Requirements of this paragraph are to be considered as a guidance.



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2.3.3 For rendering which the winch can exert on the mooring line (reeled 1st layer) should not exceed 1.5 times, nor be less than 1.05 times the hauling tension for that particular power setting of the winch on automatic control. The winch is to be marked with the range of rope strength for which it is designed.

3. Anchoring and mooring equipment for special purpose ships - fishing vessels

3.1 Anchoring equipment

3.1.1 Application

The present Chapter 3 applies to the fishing vessels operating in unrestricted service.*

3.1.2 General requirements

- (a) Each vessel is to be provided with anchoring equipment designed for quick and safe operation in all foreseeable service conditions. Anchor equipment should consist of anchors, anchor chain cables and a windlass or other arrangements for dropping and weighing the anchors for holding the ship at anchor.
- (b) The equipment of anchors and chain cables given in the following Table is based on an "Equipment Number" which is to be calculated as follows:

$$EN = \Delta^{2/3} + 2Bh + 0.1A;$$

where EN – Equipment Number,

Δ – moulded displacement (t) - to the maximum design waterline,

B – greatest moulded breadth (m)

h – effective height (m) from the maximum design waterline to the top of the uppermost house.

$$h = a + \sum h_i;$$

where a - distance (m) from the maximum design waterline to the upper edge of the uppermost complete deck at the side amidship,

h_i - height (m) on the centreline of each tier of houses having breadth greater than B/4.

For the lowest tier "h" is to be measured at centreline from the upper deck or from a notional deck line where there is local discontinuity in the upper deck.

When calculating h, sheer and trim are to be ignored.

A - area (m²) in profile view of the hull, within the length of the vessel between perpendiculars, and of superstructures and houses above the maximum design waterline having a width greater than B/4.

Screens and bulwarks more than 1.5 m in height are to be regarded as parts of houses when determining h and A.

* NOTE

Reduction of equipment may be permitted for fishing vessels operating in restricted services.



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3.1.3 Particular requirements

- (a) For vessels below 30m in length the anchor chain may be replaced with wire ropes of equal strength of the tabular anchor cables of Grade 1.

For vessels of length between 30 m and 40 m the chain cable of one anchoring line may be replaced with wire ropes of equal strength of the tabular chain cables of Grade 1 provided normal chain cable is maintained for the second line.

Wire ropes of trawl winches complying with this requirement may be used as anchor chain cables.

- (b) When wire ropes are substituted for anchor chain cables then:

the length of the ropes is to be equal to 1.5 times the corresponding tabular length of chain cable.

a short length of chain cable is to be provided between anchor and wire rope having a length of 12.5 m or the distance between anchor in stowed position and winch, whichever is less.

- (c) "High Holding Power Anchors" of approved design may be used as bower anchors, the mass of each such anchor may be 75 percent of the Table mass for ordinary stockless bower anchors.
- (d) The Table anchor equipment may be increased for vessels fishing in very rough waters.

Table 3.1

Equipment Number		Stockless Bower Anchors	Stud Link Chain Cables for Bower Anchors			
Exceeding	Not Exceeding	Number	Mass per Anchor (kg)	Total Length (m)	Diameter (mm)	
1	2	3	4	5	Mild Steel (Grade 1) (**)	Special Quality Steel Grade 2
					6	7
30	40	2	80	165	11	—
40	50	2	100	192.5	11	—
50	60	2	120	192.5	12.5	—
60	70	2	140	192.5	12.5	—
70	80	2	160	220	14	12.5
80	90	2	180	220	14	12.5
90	100	2	210	220	16	14
100	110	2	240	220	16	14
110	120	2	270	247.5	17.5	16
120	130	2	300	247.5	17.5	16
130	140	2	340	275	19	17.5
140	150	2	390	275	19	17.5



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Equipment Number		Stockless Bower Anchors	Stud Link Chain Cables for Bower Anchors			
Exceeding	Not Exceeding	Number	Mass per Anchor (kg)	Total Length (m)	Diameter (mm)	
1	2	3	4	5	Mild Steel (Grade 1) (**)	Special Quality Steel Grade 2 7
150	175	2	480	275	22	19
175	205	2	570	302.5	24	20.5
205	240	2	660	302.5	26	22
240	280	2	780	330	28	24
280	320	2	900	357.5	30	26
320	360	2	1020	357.5	32	28
360	400	2	1140	385	34	30
400	450	2	1290	385	36	32
450	500	2	1440	412.5	38	34
500	550	2	1590	412.5	40	34
550	600	2	1740	440	42	36
600	660	2	1920	440	44	38
660	720	2	2100	440	46	40

NOTES

* In alternative to stud link chain cables, short link chain cables may be considered, for acceptance, by the concerned Society on the basis of their design, strength and steel quality.

** The steel grades of the chain cables are covered by A1.



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3.2 Mooring equipment

The mooring equipment is given by Table 3.2

Table 3.2

Equipment Number			Mooring Lines			
exceeding	not exceeding	Number	Minimum Length of each line (m)	Minimum breaking strength (kN)		
1	2	3	4	5		
				5a	5b*	
30	40	2	50	29	29,4	
40	50	2	60	29	29,4	
50	60	2	60	29	29,4	
60	70	2	80	29	29,4	
70	80	2	100	34	34,3	
80	90	2	100	37	36,8	
90	100	2	110	37	36,8	
100	110	2	110	39	39,2	
110	120	2	110	39	39,2	
120	130	2	110	44	44,1	
130	140	2	120	44	44,1	
140	150	2	120	49	–	
150	175	2	120	54	–	
175	205	2	120	59	–	
205	240	2	120	64	64,2	
240	280	3	120	71	71,1	
280	320	3	140	78	78,4	
320	360	3	140	86	85,8	
360	400	3	140	93	93,2	
400	450	3	140	101	–	
450	500	3	140	108	–	
500	550	4	160	113	–	
550	600	4	160	118	–	
600	660	4	160	123	–	
660	720	4	160	127	–	

* The values of the column 5b may be adopted in alternative to the correspondent values of the column 5a.

