No. 10 Anchoring, Mooring and Towing Equipment

(1982) (Rev.1 Aug 1999) (Corr. Dec 2004) Rev.2 Jun 2005) (Rev.3 Oct 2016) (Corr.1 Dec 2016)

1. Anchoring equipment

1.1 Anchoring equipment for ships having Equipment Number EN below 205 to 50.

(a) The anchoring equipment given here under applies to ships which are not covered under UR A1, i.e. for ships having 50 ≤ EN < 205.

(b) The design basis of the anchoring equipment, i.e. the Equipment Number EN, is that given in UR A1.

(c) These recommendations are applicable to ships operating in unrestricted service. Reductions of equipment may be considered for ships operating in restricted service.

Note:

References to UR A1 are preceded by 'A1' throughout this document.

1.1.1 Equipment number EN

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

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Table 1 Anchoring equipment

	Stockless bower anchors		Stockless stream anchor	Stud link chain cable for bower anchors			Stream wire or chain	
EN	No.	Mass per anchor (kg)	Mass per anchor (kg)	Total length (m)	Min. diameter Mild steel Gr. 1 (mm)	Min. diameter Special quality Gr. 2 or 3 (mm)	Length (m)	Breaking strength (kN)
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
50-70	2	180	60	220	14	12.5	80	64.7
70-90	2	240	80	220	16	14	85	73.5
90-110	2	300	100	247.5	17.5	16	85	80.0
110-130	2	360	120	247.5	19	17.5	90	89.2
130-150	2	420	140	275	20.5	17.5	90	98.1
150-175	2	480	165	275	22	19	90	107.9
175-205	2	570	190	302.5	24	20.5	90	117.7

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 should be complied with.

(b) The mass of stocked anchors, when used, and that of stream anchors, excluding the stock should be 80% and the mass of the stock should be 20% of the mass as given in Table 1 for stockless bower anchors.

1.1.2.1.2 High Holding Power (HHP) anchors

The requirements under A1.4.1.2 and A1.4.2 should be complied with.

1.1.2.1.3 Super High Holding Power (SHHP) anchors

The requirements under A1.4.1.3 and A1.4.2 should be complied with.

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1.1.2.2 Installation of the anchors on board

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

1.1.2.3 Proof testing of anchors

The requirements under A1.4.4 should be complied with.

1.1.3 Chain cables and wire ropes for anchors

1.1.3.1 Chain cables

(a) The anchors should be associated with stud link chain cables of one of the grades under A1.5.2, Table 3. For equipment numbers EN up to 90, as an alternative to stud link chain cables, short link chain cables may be used.

(b) Wire ropes for anchors may be adopted in compliance with 1.1.3.3

1.1.3.2 Proof and breaking loads of stud link chain cables

(a) The breaking loads (BL) and proof loads (PL) should be in compliance with the requirements under A1.5.3.

(b) The test load values, rounded off from the loads defined in (a) above, which should be used for testing and acceptance of chain cables with diameter between 11 and 19 mm are given in Table 2.

Table 2 Test load values for stud link chain cables

Chain cable diameter	Grade 1		Grade 2		Grade 3	
	Proof load	Breaking load	Proof load	Breaking load	Proof load	Breaking load
(mm)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)
1	*2*	*3*	*4*	*5*	*6*	*7*
11	35.8	51	51	71.7	71.7	102
12.5	46	65.7	65.7	92	92	132
14	57.9	82	82	116	116	165
16	75.5	107	107	150	150	216
17.5	89	127	127	179	179	256
19	105	150	150	211	211	301

1.1.3.3 Wire ropes for anchors

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

(a) bower anchors of ships below 40 m in length

(b) stream anchor as stipulated in Table 1.

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The wire ropes under (a) above should have:

(i) length equal to 1.5 times the corresponding tabular length of chain cable (col. 5 of Table 1)

(ii) strength equal to that of tabular chain cable of Grade 1 (col. 2 and 3 of Table 2).

A short length of chain cable should be fitted between the wire rope 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. All surfaces being in contact with the wire need to be rounded with a radius of not less than 10 times the wire rope diameter (including stem).

Table 3 Mass of stud link chain cables

Chain cable diameter (mm)	Minimum mass per length of 27.5 m With Dee shackle (Kg)	Minimum mass per length of 27.5 m With lugless shackle (Kg)	Chain cable diameter (mm)	Minimum mass per length of 27.5 m With Dee shackle (Kg)	Minimum mass per length of 27.5 m With lugless shackle (Kg)
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

1.2 Anchoring equipment for ships in deep and unsheltered water

1.2.1 Scope and application

The hereunder given recommendations address anchoring equipment for ships in deep and unsheltered water which is not covered by UR A1 and 1.1. These recommendations may be used to design or assess the adequacy of the anchoring equipment for ships intended to anchor in water with depth up to 120 m, current with up to 1.54 m/s, wind with up to 14 m/s

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and waves with significant height of up to 3 m. The scope of chain cable, being the ratio between the length of chain paid out and water depth, is assumed to be not less than 3 to 4. Furthermore, these recommendations are applicable to ships with an equipment length, as defined in A1.2, of not less than 135 m.

1.2.2 Equipment Number for deep and unsheltered water

Anchors and chain cables should be in accordance with Table 4 and based on the Equipment Number EN_1 obtained from the following equation:

$$EN_1 = 0.628\left[a\left(\frac{EN}{0.628}\right)^{1/2.3} + b(1-a)\right]^{2.3}$$

where

$a = 1.83 \cdot 10^{-9} \cdot L^3 + 2.09 \cdot 10^{-6} \cdot L^2 - 6.21 \cdot 10^{-4} \cdot L + 0.0866$

$b = 0.156 \cdot L + 8.372$

L = Equipment length of the ship in compliance with A1.2

EN = Equipment Number calculated in compliance with A1.2.

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Table 4 Anchoring equipment for ships in unsheltered water with depth up to 120 m

Equipment Number EN_1		High holding power stockless bower anchors		Stud link chain cable for bower anchors		
					Min. diameter	
Exceeding	Not exceeding	Number	Mass per anchor	Length	Special quality (Grade 2)	Extra special quality (Grade 3)
			(kg)	(m)	(mm)	(mm)
	1790	2	14150	1017.5	105	84
1790	1930	2	14400	990	105	84
1930	2080	2	14800	990	105	84
2080	2230	2	15200	990	105	84
2230	2380	2	15600	990	105	84
2380	2530	2	16000	990	105	84
2530	2700	2	15900	990	105	84
2700	2870	2	15800	990	105	84
2870	3040	2	15700	990	105	84
3040	3210	2	15600	990	105	84
3210	3400	2	15500	990	105	84
3400	3600	2	15400	990	105	84
3600	3800	2	16600	990	107	87
3800	4000	2	17800	962.5	107	87
4000	4200	2	18900	962.5	111	90
4200	4400	2	20100	962.5	114	92
4400	4600	2	22000	962.5	117	95
4600	4800	2	22400	962.5	120	97
4800	5000	2	23500	962.5	124	99
5000	5200	2	24000	935	127	102
5200	5500	2	24500	907.5	132	107
5500	5800	2	25000	907.5	132	107
5800	6100	2	25500	880	137	111
6100	6500	2	25500	880	142	114
6500	6900	2	26000	852.5	142	117
6900	7400	2	26500	852.5	147	117
7400	7900	2	27000	825	152	122
7900	8400	2	27000	825	-	127
8400	8900	2	27000	797.5	-	127
8900	9400	2	27000	770	-	132
9400	10000	2	27000	770	-	137
10000	10700	2	27000	770	-	142
10700	11500	2	27000	770	-	142
11500	12400	2	29500	770	-	147
12400	13400	2	31500	770	-	152
13400	14600	2	34500	770	-	157
14600		2	38000	770	-	162

1.2.3 Anchors

The bower anchors should be connected to their chain cables and positioned on board ready for use.

Anchors should be of the stockless High Holding Power (HHP) type. The mass of the head of a stockless anchor, including pins and fittings, should not be less than 60% of the total mass of the anchor. For the conditions of HHP anchors reference is made to A1.4.1.2 (a) and for the approval and/or acceptance of HHP anchors reference is made to A1.4.1.2 (c).

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The mass, per anchor, of bower anchors given in Table 4 is for anchors of equal mass. The mass of individual anchors may vary to 7% of the tabular mass, but the total mass of anchors should not be less than that recommended for anchors of equal mass.

Suitable arrangements should be provided for securing the anchors when stowed, see 1.3.3.

For manufacture of anchors reference is made to UR W29. For proof testing of the anchors reference is made to A1.4.4.2.

1.2.4 Chain cables for bower anchors

Bower anchors should be associated with stud link chain cables of special (Grade 2) or extra special (Grade 3) quality. The total length of chain cable, as given in Table 4 should be reasonably divided between the two bower anchors. For the proof and breaking loads of stud link chain cables reference is made to A1.5.3, Table 4.

For manufacture of anchor chain cables reference is made to UR W18.

For the installation of the chain cables on board, 1.3 should be observed.

1.2.5 Anchor windlass and chain stopper

The windlass unit prime mover should be able to supply for at least 30 minutes a continuous duty pull Z_{cont}, in N, given by:

$$Z_{cont} = 35\ d^2 + 13.4\ m_A$$

where

d = chain diameter, in mm, as per Table 4
m_A = HHP anchor mass, in kg, as per Table 4

As far as practicable, for testing purpose the speed of the chain cable during hoisting of the anchor and cable should be measured over 37.5 m of chain cable and initially with at least 120 m of chain and the anchor submerged and hanging free. The mean speed of the chain cable during hoisting of the anchor from the depth of 120 m to the depth of 82.5 m should be at least 4.5 m/min.

For the hull supporting structure of anchor windlass and chain stopper reference is made to A1.7.

1.3 Installation of chain cables and anchors on board

1.3.1 Capacity and arrangement of anchor chain locker

(a) The chain locker should 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 should be provided with an internal division so that the port and starboard chain cables may be fully and separately stowed.

(b) The chain locker boundaries and their access openings should be watertight as necessary to prevent accidental flooding of the chain locker and damaging essential auxiliaries or equipment or affecting the proper operation of the ship.

(c) Adequate drainage facilities of the chain locker should be adopted.

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1.3.2 Securing of the inboard ends of chain cables

(a) The inboard ends of the chain cables should 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 should 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.

1.3.3 Securing of stowed anchors

(a) To hold the anchor tight in against the hull or the anchor pocket, respectively, it is recommended to fit anchor lashings, e.g., a ‘devil’s claw’.

(b) Anchor lashings should be designed to resist a load at least corresponding to twice the anchor mass plus 10 m of cable without exceeding 40% of the yield strength of the material.

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2. Mooring and towing equipment

2.1 Mooring lines

The mooring lines for ships with Equipment Number EN of less than or equal to 2000 are given in 2.1.1. For other ships the mooring lines are given in 2.1.2.

The Equipment Number EN should be calculated in compliance with A1.2. Deck cargo as given by the loading manual should be included for the determination of side-projected area A.

2.1.1 Mooring lines for ships with EN ≤ 2000

The minimum recommended mooring lines for ships having an Equipment Number EN of less than or equal to 2000 are given in Table 5.

For ships having the ratio A/EN > 0.9 the following number of lines should be added to the number of mooring lines as given by Table 5:

One line where $0.9 < \frac{A}{EN} \leq 1.1$,

two lines where $1.1 < \frac{A}{EN} \leq 1.2$,

three lines where $1.2 < \frac{A}{EN}$.

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Table 5 Mooring lines for ships with EN ≤ 2000

EQUIPMENT NUMBER		MOORING LINES		
Exceeding	Not exceeding	No. of mooring lines	Minimum length of each line * (m)	Minimum breaking strength (kN)
1	*2*	*3*	*4*	*5*
50	70	3	80	37
70	90	3	100	40
90	110	3	110	42
110	130	3	110	48
130	150	3	120	53
150	175	3	120	59
175	205	3	120	64
205	240	4	120	69
240	280	4	120	75
280	320	4	140	80
320	360	4	140	85
360	400	4	140	96
400	450	4	140	107
450	500	4	140	117
500	550	4	160	134
550	600	4	160	143
600	660	4	160	160
660	720	4	160	171
720	780	4	170	187
780	840	4	170	202
840	910	4	170	218
910	980	4	170	235
980	1060	4	180	250
1060	1140	4	180	272
1140	1220	4	180	293
1220	1300	4	180	309
1300	1390	4	180	336
1390	1480	4	180	352
1480	1570	5	190	352
1570	1670	5	190	362
1670	1790	5	190	384
1790	1930	5	190	411
1930	2000	5	190	437

* 2.1.3 should be observed

2.1.2 Mooring lines for ships with EN > 2000

The minimum recommended strength and number of mooring lines for ships with an Equipment Number EN > 2000 are given in 2.1.2.1 and 2.1.2.2, respectively. The length of mooring lines is given by 2.1.3.

The strength of mooring lines and the number of head, stern, and breast lines (see Note) for ships with an Equipment Number EN > 2000 are based on the side-projected area A_1. Side projected area A_1 should be calculated similar to the side-projected area A according to A1.2 but considering the following conditions:

- For oil tankers, chemical tankers, bulk carriers, and ore carriers the lightest ballast draft should be considered for the calculation of the side-projected area A_1. For other ships the lightest draft of usual loading conditions should be considered if the ratio of the freeboard in the lightest draft and the full load condition is equal to or above two. Usual loading conditions mean loading conditions as given by the trim and stability booklet

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that are to be expected to regularly occur during operation and, in particular, excluding light weight conditions, propeller inspection conditions, etc.

- Wind shielding of the pier can be considered for the calculation of the side-projected area A_1 unless the ship is intended to be regularly moored to jetty type piers. A height of the pier surface of 3 m over waterline may be assumed, i.e. the lower part of the side-projected area with a height of 3 m above the waterline for the considered loading condition may be disregarded for the calculation of the side-projected area A_1.

- Deck cargo as given by the loading manual should be included for the determination of side-projected area A_1. Deck cargo may not need to be considered if a usual light draft condition without cargo on deck generates a larger side-projected area A_1 than the full load condition with cargo on deck. The larger of both side-projected areas should be chosen as side-projected area A_1.

The mooring lines as given here under are based on a maximum current speed of 1.0 m/s and the following maximum wind speed v_w, in m/s:

v_w =	$25.0 - 0.002 (A_1 - 2000)$	for passenger ships, ferries, and car carriers with $2000\ m^2 < A_1 \leq 4000\ m^2$
=	21.0	for passenger ships, ferries, and car carriers with $A_1 > 4000\ m^2$
=	25.0	for other ships

The wind speed is considered representative of a 30 second mean speed from any direction and at a height of 10 m above the ground. The current speed is considered representative of the maximum current speed acting on bow or stern (±10°) and at a depth of one-half of the mean draft. Furthermore, it is considered that ships are moored to solid piers that provide shielding against cross current.

Additional loads caused by, e.g., higher wind or current speeds, cross currents, additional wave loads, or reduced shielding from non-solid piers may need to be particularly considered. Furthermore, it should be observed that unbeneficial mooring layouts can considerably increase the loads on single mooring lines.

Note:

The following is defined with respect to the purpose of mooring lines, see also figure below:

Breast line: A mooring line that is deployed perpendicular to the ship, restraining the ship in the off-berth direction.

Spring line: A mooring line that is deployed almost parallel to the ship, restraining the ship in fore or aft direction.

Head/Stern line: A mooring line that is oriented between longitudinal and transverse direction, restraining the ship in the off-berth and in fore or aft direction. The amount of restraint in fore or aft and off-berth direction depends on the line angle relative to these directions.

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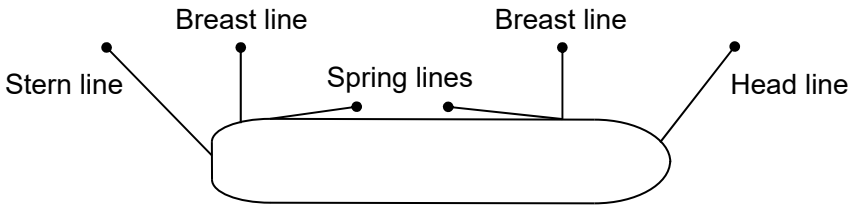

2.1.2.1 Minimum breaking strength

The minimum breaking strength, in kN, of the mooring lines should be taken as:

$$MBL = 0.1 \cdot A_1 + 350$$

The minimum breaking strength may be limited to 1275 kN (130 t). However, in this case the moorings are to be considered as not sufficient for environmental conditions given by 2.1.2. For these ships, the acceptable wind speed v_w*, in m/s, can be estimated as follows:

$$v_w^* = v_w \cdot \sqrt{\frac{MBL^*}{MBL}}$$

where v_w is the wind speed as per 2.1.2, MBL* the breaking strength of the mooring lines intended to be supplied and MBL the breaking strength as recommended according to the above formula. However, the minimum breaking strength should not be taken less than corresponding to an acceptable wind speed of 21 m/s:

$$MBL^* \geq \left(\frac{21}{v_w}\right)^2 \cdot MBL$$

If lines are intended to be supplied for an acceptable wind speed v_w* higher than v_w as per 2.1.2, the minimum breaking strength should be taken as:

$$MBL^* = \left(\frac{v_w^*}{v_w}\right)^2 \cdot MBL$$

2.1.2.2 Number of mooring lines

The total number of head, stern and breast lines (see Note in 2.1.2) should be taken as:

$$n = 8.3 \cdot 10^{-4} \cdot A_1 + 6$$

For oil tankers, chemical tankers, bulk carriers, and ore carriers the total number of head, stern and breast lines should be taken as:

$$n = 8.3 \cdot 10^{-4} \cdot A_1 + 4$$

The total number of head, stern and breast lines should be rounded to the nearest whole number.

The number of head, stern and breast lines may be increased or decreased in conjunction with an adjustment to the strength of the lines. The adjusted strength, MBL*, should be taken as:

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MBL* = 1.2 · MBL · n/n* ≤ MBL for increased number of lines,

MBL* = MBL · n/n* for reduced number of lines.

where n* is the increased or decreased total number of head, stern and breast lines and n the number of lines for the considered ship type as calculated by the above formulas without rounding.

Vice versa, the strength of head, stern and breast lines may be increased or decreased in conjunction with an adjustment to the number of lines.

The total number of spring lines (see Note in 2.1.2) should be taken not less than:

Two lines where EN < 5000,

Four lines where EN ≥ 5000.

The strength of spring lines should be the same as that of the head, stern and breast lines. If the number of head, stern and breast lines is increased in conjunction with an adjustment to the strength of the lines, the number of spring lines should be likewise increased, but rounded up to the nearest even number.

2.1.3 Length of mooring lines

The length of mooring lines for ships with EN of less than or equal to 2000 may be taken from Table 5. For ships with EN > 2000 the length of mooring lines may be taken as 200 m.

The lengths of individual mooring lines may be reduced by up to 7% of the above given lengths, but the total length of mooring lines should not be less than would have resulted had all lines been of equal length.

2.2 Tow line

The tow lines are given in Table 6 and are intended as own tow line of a ship to be towed by a tug or other ship. For the selection of the tow line from Table 6, the Equipment Number EN should be taken according to 2.1.

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Table 6 Tow lines

EQUIPMENT NUMBER		TOW LINE	
Exceeding	Not exceeding	Minimum length (m)	Minimum breaking strength (kN)
1	*2*	*3*	*4*
50	70	180	98
70	90	180	98
90	110	180	98
110	130	180	98
130	150	180	98
150	175	180	98
175	205	180	112
205	240	180	129
240	280	180	150
280	320	180	174
320	360	180	207
360	400	180	224
400	450	180	250
450	500	180	277
500	550	190	306
550	600	190	338
600	660	190	370
660	720	190	406
720	780	190	441
780	840	190	479
840	910	190	518
910	980	190	559
980	1060	200	603
1060	1140	200	647
1140	1220	200	691
1220	1300	200	738
1300	1390	200	786
1390	1480	200	836
1480	1570	220	888
1570	1670	220	941
1670	1790	220	1024
1790	1930	220	1109
1930	2080	220	1168
2080	2230	240	1259
2230	2380	240	1356
2380	2530	240	1453
2530	2700	260	1471
2700	2870	260	1471
2870	3040	260	1471
3040	3210	280	1471
3210	3400	280	1471
3400	3600	280	1471
3600	-	300	1471

2.3 Mooring and tow line construction

Tow lines and mooring lines may be of wire, natural fibre or synthetic fibre construction or of a mixture of wire and fibre. For synthetic fibre ropes it is recommended to use lines with reduced risk of recoil (snap-back) to mitigate the risk of injuries or fatalities in the case of breaking mooring lines.

Notwithstanding the strength recommendations given in 2.1 and 2.2, no fibre rope should be less than 20 mm in diameter. For polyamide ropes the minimum breaking strength should be increased by 20% and for other synthetic ropes by 10% to account for strength loss due to, among others, aging and wear.

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2.4 Mooring winches

2.4.1 Each winch should be fitted with brakes the holding capacity of which is sufficient to prevent unreeling of the mooring line when the rope tension is equal to 80% of the minimum breaking strength of the rope as fitted on the first layer. The winch should be fitted with brakes that will allow for the reliable setting of the brake rendering load.

2.4.2 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, nor be more than 1/3 times the rope's minimum breaking strength. For automatic winches these figures apply when the winch is set to the maximum power with automatic control.

2.4.3 For powered winches on automatic control, the rendering tension which the winch can exert on the mooring line (the reeled first 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. The winch should be marked with the range of rope strength for which it is designed.

2.5 Mooring and towing arrangement

2.5.1 Mooring arrangement

Mooring lines in the same service (e.g. breast lines, see Note in 2.1.2) should be of the same characteristic in terms of strength and elasticity.

As far as possible, sufficient number of mooring winches should be fitted to allow for all mooring lines to be belayed on winches. This allows for an efficient distribution of the load to all mooring lines in the same service and for the mooring lines to shed load before they break. If the mooring arrangement is designed such that mooring lines are partly to be belayed on bitts or bollards, it should be considered that these lines may not be as effective as the mooring lines belayed on winches.

Mooring lines should have as straight a lead as is practicable from the mooring drum to the fairlead.

At points of change in direction sufficiently large radii of the contact surface of a rope on a fitting should be provided to minimize the wear experienced by mooring lines and as recommended by the rope manufacturer for the rope type intended to be used.

2.5.2 Towing arrangement

Towing lines should be led through a closed chock. The use of open fairleads with rollers or closed roller fairleads should be avoided.

For towing purpose it is recommended to provide at least one chock close to centreline of the ship forward and aft. It is also beneficial to provide additional chocks on port and starboard side at the transom and at the bow.

Towing lines should have a straight lead from the towing bitt or bollard to the chock.

For the purpose of towing, bitts or bollards serving a chock should be located slightly offset and in a distance of at least 2 m away from the chock, see figure below:

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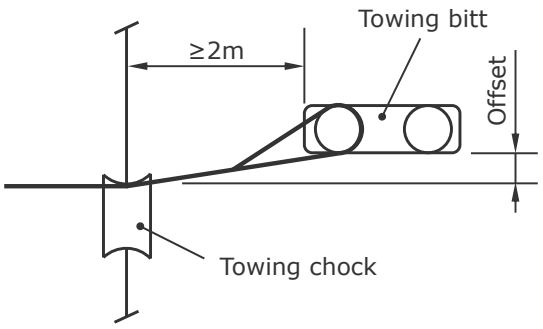

Warping drums should preferably be positioned not more than 20 m away from the chock, measured along the path of the line.

Attention should be given to the arrangement of the equipment for towing and mooring operations in order to prevent interference of mooring and towing lines as far as practicable. It is beneficial to provide dedicated towing arrangements separate from the mooring equipment.

For emergency towing arrangements for tankers reference should be made to SOLAS Chapter II-1, Regulation 3-4. For all ships other than tankers it is recommended to provide towing arrangements fore and aft of sufficient strength for ‘other towing’ service as defined in UR A2.0.

No. 10 (cont)

3. Anchoring and mooring equipment for fishing vessels

3.1 Anchoring equipment

3.1.1 Application

The following provisions apply to fishing vessels operating in unrestricted service. Reduction of equipment may be considered for fishing vessels operating in restricted services.

3.1.2 General recommendations

(a) Each ship should 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 and for holding the ship at anchor.

(b) The equipment of anchors and chain cables given in Table 7 is based on the Equipment Number EN which should be calculated as follows:

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

where

Δ = moulded displacement, in t, to the maximum design waterline,
B = greatest moulded breadth, in m,
h = effective height, in m, from the maximum design waterline to the top of the uppermost house.
= $a + \Sigma h_i$
a = distance, in m, from the maximum design waterline to the upper edge of the uppermost complete deck at the side amidships,
h_i = height, in m, on the centreline of each tier of houses having breadth greater than B/4.

For the lowest tier h is 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 can be ignored.

A = side-projected area, in m^2, of the hull, within the length of the ship 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 should be regarded as parts of houses when determining h and A.

3.1.3 Particular recommendations

(a) For ships below 40 m in length the anchor chain may be replaced with wire ropes of equal strength of the tabular anchor cables of Grade 1. Wire ropes of trawl winches complying with this recommendation may be used as anchor chain cables.

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

(i) the length of the ropes should be equal to 1.5 times the corresponding tabular length of chain cable (col. 5 of Table 7),

No. 10 (cont)

(ii) a short length of chain cable should be fitted between the wire rope and anchor having a length of 12.5 m or the distance between anchor in stowed position and winch, whichever is less,

(iii) all surfaces being in contact with the wire should be rounded with a radius of not less than 10 times the wire rope diameter (including stem).

(c) High holding power anchors of approved design may be used as bower anchors. The mass of each such anchor may be 75% of the tabular mass for ordinary stockless bower anchors.

(d) The tabular anchor equipment may be increased for ships fishing in very rough waters.

No. 10 (cont)

Table 7 Equipment for fishing vessels

Equipment Number		Stockless bower anchors			Stud link chain cables for bower anchors	
					Min. diameter (mm)	
Exceeding	Not exceeding	Number	Mass per anchor (kg)	Total length (m)	Mild steel (Grade 1)**	Special quality steel (Grade 2)**
1	*2*	*3*	*4*	*5*	*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
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
* Alternative to stud link chain cables, short link chain cables may be considered.
** The steel grades of the chain cables are covered by UR A1, A1.5.2.

3.2 Mooring equipment

The mooring equipment is given by Table 8.

No. 10 (cont)

Table 8 Mooring lines for fishing vessels

Equipment Number		Mooring lines		
Exceeding	Not exceeding	Number	Minimum length of each line (m)	Minimum breaking strength (kN)
1	*2*	*3*	*4*	*5*
30	40	2	50	29
40	50	2	60	29
50	60	2	60	29
60	70	2	80	29
70	80	2	100	34
80	90	2	100	36.8
90	100	2	110	36.8
100	110	2	110	39
110	120	2	110	39
120	130	2	110	44
130	140	2	120	44
140	150	2	120	49
150	175	2	120	54
175	205	2	120	59
205	240	2	120	64
240	280	3	120	71
280	320	3	140	78
320	360	3	140	85.8
360	400	3	140	93
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

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