



2010

**Guidance for
Floating Structures**

KOREAN REGISTER OF SHIPPING



2010

Guidance for Floating Structures

GC-02-E

KOREAN REGISTER OF SHIPPING

APPLICATION OF "Guidance for Floating Structures"

1. Unless expressly specified otherwise, the requirements in the Guidance apply to Floating Structures constructed on or after 1 July 2010.
2. The amendments to the Rules for 2009 edition and their effective date are as follow;

Effective Date : 1 July 2010

Chapter 4 MOORING AND ANCHORINGS, ETC.

Section 1 Standard for Ship's Facilities

- 101. has been amended.
- 102.1. has been amended.

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CHAPTER 1 GENERAL

Section 1 General

101. Application

This Guidance is to apply to the floating structures(except those permanently fixed on the water)(hereinafter referred to as "floating structures"), which have a carrying capacity of not less than 13 persons other than employees, such as floating hotel, floating restaurant and floating performing place, etc. intended to be registered and classed.

102. Application of related requirements

1. The requirements not specified in this Guidance are to be in accordance with the Rules for the Classification of Steel Ships(hereinafter referred to as "the Rules").
2. The floating structures of unusual construction, which are considered by the Society that it is not practicable or not applicable to apply the requirements of this Guidance from the view point of its construction, are to be at the discretion of the Society in spite of the requirements specified in this Guidance.
3. The Society may accept the reports and/or certificates, etc. made by others considered appropriate by the Society in spite of the requirements specified in this Guidance, where it is acceptable by the Society to apply the related laws of the Administration such as the Building Act of its flag state, etc. because it is not practicable or not applicable to apply the requirements of this Guidance to the parts of floating structures such as its hotel, restaurant, performing place, etc.

103. Equivalence

Special equipment, which is not appropriate to apply the requirements of this Guidance or not specified in this Guidance, may be accepted by the Society provided that the Society is satisfied that such equipment is equivalent to or above those complying with the requirements of this Guidance.

104. Classification

The Classification is to be in accordance with the requirements specified in **Pt 1** of the Rules.

105. Class notations

The class notations assigned to the floating structures classed with the Society are to be in accordance with the requirements specified in **Pt 1, Ch 1, 201.** of the Rules. However, the notation "Floating Structure" shall be assigned as a ship type notation. ⤵

CHAPTER 2 CLASSIFICATION SURVEYS

Section 1 General

101. General

The classification surveys of floating structures, except where specially required in this Guidance, are to comply with the requirements specified in **Pt 1, Ch 2** of the Rules.

Section 2 Periodical Surveys

301. General

To maintain the classification after Classification Survey, the floating structures are to be subject to the Intermediate Survey and Special Survey, and the due range of each survey is in accordance with the requirements specified in **Pt 1, Ch 2** of the Rules.

302. Intermediate Survey

1. Intermediate Survey is to be in accordance with the requirements specified in **Pt 1, Ch 2, 302.** and **303.** of the Rules.
2. At the Intermediate Survey, the surveys required in **Pt 1, Ch 2, 603.** of the Rules are to be carried out in drydock or on a slipway. However, an in-water survey deemed appropriate by the Society may be considered as equivalent.

303. Special Survey

Special Survey is to be in accordance with the requirements specified in **Pt 1, Ch 2, Sec 4** and **Sec 5-1** of the Rules, However, an in-water survey deemed appropriate by the Society may be considered as equivalent in lieu of the survey to be carried out in drydock or on a slipway. ⤵

CHAPTER 3 HULL STRUCTURES

Section 1 Materials and Structures

101. Materials and structures

Materials and structures of floating structures are to comply with the relevant Chapter of the Rules and Other Technical Rules. For floating structures having unconventional construction, structural analysis may be accepted where it is difficult to apply to this Guidance.

102. Local strength

Local strength of floating structures is to comply with "**Rules for the Classification of Steel Barges**".

103. Corrosion additions

The corrosion additions of floating structures are to comply with **Pt 11, Ch 3, Sec 3** of the Rules.

104. Corrosion protection measures

The steels used for structures are to be coated with coating materials of good quality or are applied with corrosion protection measures having equivalent quality. However, special consideration is to be given to the corrosion protection, where deemed necessary by the Society. ↓

CHAPTER 4 MOORING AND ANCHORING, ETC.

Section 1 Standard for Ship's Facilities

101. Assessment of total resistances

Total resistance(R)(kg) of floating structures is to be determined by using each mooring method, such that most severe condition can be considered when mooring force is calculated in accordance with the following R_{aL} , R_{aT} , R_t , R_{sL} and R_{sT} .

R_{aL} and R_{aT} : the value obtained from the following

For longitudinal wind : $R_{aL} = K_{aL} \times A_a \times V_a^2$ (kg)

For transverse wind : $R_{aT} = K_{aT} \times A_a \times V_a^2$ (kg)

K_{aL} : 0.0429 (longitudinal wind pressure factor) (kg · sec²/m⁴)

K_{aT} : 0.0735 (lateral wind pressure factor) (kg · sec²/m⁴)

A_a : projected area on the wind directional section above the load line (m²)

V_a : relative wind speed (m/s) (normal: min. 15 m/s, typhoon: min. 44 m/s.

However, maximum wind speed of the data from Meteorological Administration may be used.)

R_t : the value obtained from the following

$R_t = 0.1212 A_t \{ (V_t + V_s)^2 + 0.330 (V_t + V_s) \}$ (kg)

A_t : surface area below the waterline (m²)

V_t : current speed (m/s)

V_s : moving speed of the structures (m/s)

R_{sL} and R_{sT} : the value obtained from the following

For longitudinal fluid flow : $R_{sL} = 0.5 \cdot \rho \cdot C_{bd} \cdot A_s \cdot (V_t + V_s)^2$ (kg)

For lateral fluid flow : $R_{sT} = 73.2 A_s \cdot (V_t + V_s)^2$ (kg)

ρ : water density (sea water : 104.5 kg · sec²/m⁴, fresh water : 102.0 kg · sec²/m⁴)

A_s : projected area on direction of fluid flow below the load line of the structure (m²)

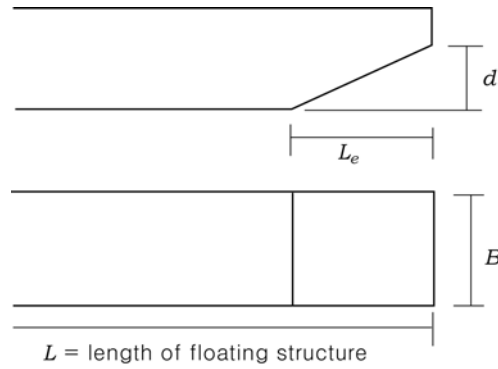
V_t : current speed (m/s)

V_s : moving speed of the structures (m/s)

C_{bd} : the value according to the geometry of bow, as given in **Table 4.1.1**

Table 4.1.1 Resistance factor, C_{bd}

V_t / \sqrt{Lg} \diagdown L_c/d	0	1	2	3	4	5	6	7
0.08	0.710	0.245	0.150	0.117	0.106	0.100	0.098	0.096
0.10	0.755	0.260	0.160	0.128	0.111	0.107	0.103	0.102
0.12	0.805	0.280	0.180	0.138	0.121	0.113	0.108	0.105
0.14	0.850	0.305	0.200	0.152	0.131	0.122	0.115	0.111
0.16	0.905	0.325	0.225	0.165	0.144	0.131	0.122	0.117
0.18	0.960	0.380	0.249	0.181	0.156	0.142	0.130	0.120
0.20	1.025	0.455	0.285	0.201	0.170	0.154	0.140	0.132
0.22	1.120	0.550	0.335	0.222	0.187	0.168	0.153	0.141
0.24	1.230	0.670	0.400	0.258	0.208	0.187	0.170	0.156
(NOTES)								
g : gravity acceleration (9.8 m/sec ²)								



102. Standard and provisions for anchor, etc.

1. The floating structures are to be provided with anchors, anchor chains, etc. of which strength are not less than total resistance according to 101. In this case, safety factor, tensile force acting on the anchor chain and mass of anchor are as follows:

- (1) Safety factor is to be not less than 4.
- (2) Tensile force(T_c) acting on the anchor chain is to be obtained from the following formula. However, inclined angle of anchor chain on direction of total resistance should be considered when necessary to be considered.

$$T_c = R / \cos \theta \quad (\theta : \text{inclined angle of anchor chain on direction of total resistance in horizontal plane})$$

(3) Mass of anchor is to be obtained from the following formula:

$$W = W_a \div 0.869$$

W_a : mass of anchor in the underwater, as obtained from following formula:

$$W_a = P - K_c \times L_c \times W_c / K_a$$

P : the value multiplying the tensile force(T_c) of the anchor chain by the safety factor.

When there are provided more than one anchor, the value divided by number of anchors

L_c : length of anchor chain

W_c : mass of 1 meter of anchor chain under water, to be taken the value multiplying the mass of anchor chain in the air by 0.869.

K_a and K_c : holding power factor of anchor and anchor chain, as given in **Table 4.1.2**

Table 4.1.2 Holding power factor

Type	clay	silt	sandy soil	sand	coarse sand
K_a	2	2	2	3~4	3~4
K_c	0.6	0.6	-	0.75	0.75

(4) Tensile force(T_r) acting on the mooring rope is to be taken from following formula:

$$T_r = R / \cos \theta \quad (\theta : \text{inclined angle of the mooring rope on direction of total resistance in horizontal plane})$$

(5) The specification, etc. of the wire rope and fibre rope are to be given in **Table 4.1.3** to **Table 4.1.6**.

2. The floating structures are to be provided with more than two anchors and anchors and anchor chains are to be capable of sustaining total resistance specified in **101**.
3. Where stock anchors are used, the mass of anchor excluding the stock may be 0.8 times the mass of stockless anchor.
4. Where anchor having the holding power of 2 times of stockless anchor is used, the mass of anchor may be 0.75 times the mass of stockless anchor.
5. The anchor providing in forward direction are linked with anchor chains and the length of holding area of chains is to be more than 3 shackles. The length of each chain linked anchor is to be more than the sum length of catenary part and holding part.
6. The anchors to hold a lateral position of structures are to be linked by chains.

103. Anchoring Arrangements

For the floating structures having an anchor of more than 150 kg, appropriate anchoring arrangements are to be provided. However, for the floating structures which are not maneuvering except repairing or deteriorating weather conditions, etc, it may not be provided.

104. Mooring Arrangements

The requirements and types of mooring arrangements of floating structures are to comply with **Pt 4, Ch 10** of the Rules.

105. Towing Arrangements

The towing arrangements of floating structures are to comply with **Pt 3** in "**Rules for the Towing Survey of Barges and Tugboats**". However, for the floating structures which are not maneuvering except repairing or deteriorating weather conditions, etc, it may not be applied.

Table 4.1.3 Grades of steel wire rope








Grade		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 21
Sectional view								
Composition	Number of wire	7	12	19	24	30	37	36
	Number of strands	6	6	6	6	6	6	6
	Fibre core	Centre	Centre and Centre of strand	Centre	Centre and Centre of strand	Centre and Centre of strand	Centre	Centre
Composition mark		(6×7)	(6×12)	(6×19)	(6×24)	(6×30)	(6×37)	(6×WS(36))

Table 4.1.4 Masses and breaking test loads for steel wire ropes

Grade	No. 1		No. 2		No. 3		No. 4		No. 5		No. 6		No. 21	
Composition mark	(6×7)		(6×12)		(6×19)		(6×24)		(6×30)		(6×37)		(6×WS(36))	
Diameter of steel wire rope (mm)	Breaking test load (kN)	Mass per metre in length (kg)	Breaking test load (kN)	Mass per metre in length (kg)	Breaking test load (kN)	Mass per metre in length (kg)	Breaking test load (kN)	Mass per metre in length (kg)	Breaking test load (kN)	Mass per metre in length (kg)	Breaking test load (kN)	Mass per metre in length (kg)	Breaking test load (kN)	Mass per metre in length (kg)
10	52.4	0.371	33.3	0.273	47.9	0.364	45.5	0.332	41.1	0.310	48.9	0.359	50.5	0.396
12	75.4	0.534	48.0	0.393	71.6	0.524	65.5	0.478	59.1	0.446	70.5	0.517	72.8	0.570
14	103	0.727	65.3	0.535	97.4	0.713	89.1	0.651	80.5	0.607	96.2	0.704	99.0	0.776
16	134	0.950	85.2	0.699	127	0.932	117	0.850	105	0.793	126	0.920	129	1.01
18	170	1.20	108	0.885	161	1.18	147	1.08	133	1.00	159	1.16	164	1.28
20	210	1.48	133	1.09	199	1.46	181	1.33	164	1.24	195	1.44	202	1.58
22	253	1.80	161	1.32	240	1.77	221	1.61	199	1.50	237	1.74	244	1.92
24	302	2.14	192	1.57	286	2.10	262	1.91	236	1.79	281	2.07	291	2.28
26	354	2.51	225	1.85	336	2.47	308	2.24	278	2.10	330	2.43	341	2.68
28	411	2.91	261	2.14	389	2.85	357	2.60	322	2.43	382	2.82	396	3.10
30	472	3.34	300	2.46	447	3.28	410	2.99	369	2.79	439	3.23	454	3.56
32	536	3.80	341	2.80	509	3.73	466	3.40	421	3.17	501	3.68	517	4.06
34	605	4.29	385	3.16	575	4.21	526	3.84	475	3.58	566	4.16	583	4.58
36	679	4.81	432	3.54	644	4.72	589	4.30	533	4.02	634	4.66	654	5.13
38	756	5.36	481	3.94	718	5.26	657	4.79	593	4.48	707	5.19	730	5.72
40	838	5.93	533	4.37	795	5.82	728	5.31	657	4.95	782	5.75	808	6.34
42					877	6.42	802	5.86	725	5.47	863	6.34	890	6.99
44					963	7.05	881	6.43	794	6.00	947	6.96	978	7.67
46					1050	7.70	963	7.03	869	6.56	1040	7.61	1070	8.38
48					1150	8.39	1050	7.65	945	7.14	1130	8.28	1140	9.12
50					1250	9.10	1150	8.30	1020	7.74	1230	8.98	1260	9.90
52							1230	8.98	1110	8.38	1320	9.73	1360	10.7
54							1320	9.68	1200	9.04	1420	10.5	1470	11.5
56							1420	10.4	1280	9.71	1530	11.3	1590	12.4
58							1530	11.2	1380	10.4	1650	12.1	1700	13.3
60							1640	12.0	1470	11.1	1760	12.9	1810	14.3
62							1750	12.8	1580	11.9	1880	13.8	1940	15.2
65							1920	14.0	1740	13.1	2070	15.2	2140	16.7

Table 4.1.5 Kind of fibre ropes

Kind of fibre rope		Filament (material)	
Hemp rope		Manila hemp	
Synthetic fibre rope	Vinylon rope	Grade 1 Grade 2	Vinylon
	Polyethylene rope	Grade 1 Grade 2	Polyethylene
	Polyester rope		Polyester
	Polypropylene rope	Grade 1 Grade 2	Polypropylene
	Polyamide rope		Polyamide

Table 4.1.6 Breaking test load for fibre ropes (unit : kN)

Diameter of rope (mm)	Hemp rope ⁽¹⁾	Synthetic fibre rope							Polyamide ⁽¹⁾
		Vinylon ⁽¹⁾		Polyethylene ⁽²⁾		Polyester ⁽¹⁾	Polypropylene ⁽²⁾		
		Grade 1	Grade 2	Grade 1	Grade 2		Grade 1	Grade 2	
10	7.06	9.32	15.7	9.71	12.7	15.6	10.8	12.7	18.1
12	9.90	13.4	21.8	13.9	17.7	22.0	15.7	17.7	27.5
14	13.1	17.9	28.4	18.6	23.5	29.2	20.6	23.5	36.6
16	16.9	22.9	36.3	23.8	29.4	37.5	26.5	29.4	46.9
18	21.0	28.6	45.1	29.7	37.3	46.7	32.4	37.3	58.3
20	25.6	34.8	54.9	36.1	44.1	56.8	39.2	44.1	70.9
22	30.5	41.6	65.7	43.1	54.9	67.8	47.1	54.9	84.6
24	35.9	48.8	77.5	50.7	63.7	79.6	54.9	63.7	100
26	41.6	56.7	89.2	58.8	73.5	92.4	63.7	73.5	116
28	47.8	65.1	103	67.5	83.4	106	73.5	83.4	132
30	54.3	74.0	117	76.8	97.1	121	83.4	97.1	151
32	61.2	83.5	131	86.5	108	136	94.1	108	170
35	72.3	99.0	155	102	127	161	111	127	201
40	95.4	127	198	131	164	206	142	164	258
45	119	157	247	163	203	260	177	203	321
50	144	191	300	198	250	312	214	250	390
55	173	228	358	237	294	373	255	294	466
60	203	269	421	279	348	438	300	348	547
65	235	312	487	324	402	508	348	402	635
70	271	358	559	371	461	583	399	461	729
75	307	407	635	422	525	663	453	525	829
80	346	459	716	476	593	747	511	593	935
85	387	514	801	533	667	837	572	667	1050
90	431	571	895	592	735	931	635	735	1170
95	477	632	981	655	814	1030	702	814	1280
100	525	694	1080	721	897	1140	772	897	1410

(NOTES)

⁽¹⁾ Breaking load at room temperature in dried condition

⁽²⁾ Breaking load at room temperature after having been immersed in warm water at 35 ± 2 °C for more than 30 minutes

Section 2 Load Lines, etc.

201. Load lines

The load lines marked on floating structures are to comply with the National Regulations of the nation to which the ship is registered or to be registered.

202. Stability

The stability calculations of floating structures are to comply with the National Regulations of the nation to which the ship is registered or to be registered. ↓

CHAPTER 5 FIRE PROTECTION

Section 1 General

101. Usage limit of combustible materials, etc.

Usage limit of combustible materials used in the exposed surfaces on board should comply with the requirements of **Pt 8, Ch 2, 202.** of the Rules.

102. Furniture, furnishings, etc.

1. Furniture shall be provided preferably in the corridor and the wall of above stairways.
2. Furniture and furnishings provided in the accommodation spaces or control stations of floating structures less than 1,000 tons gross tonnage shall be minor fire risk. However, when deemed appropriate by the Society, considering fire protection, which does not require.

103. Installation of stoves, etc.

Where stoves, gas/electric ranges or heaters are installed in the floating structures, these are to be as follows.

1. These shall be fixed in position not to move and so constructed as to reduce fire risks to a minimum. No such radiators shall be fitted with an element so exposed that clothing, curtains, or other similar materials can be scorched or set on fire by heat from the element.
2. Combustible parts from stoves, gas/electric ranges or heater bedplates and floor installing these things are to be non-combustible materials.
3. Except bedplates and floor by requirements of **Par 2**, in case of non-combustible materials, these are to be the side of stoves and not less than 0.3 meter from the top, in case of except non-combustible material, these are to be not less than 0.6 meter from the stove sides, not less than 0.9 meter from the top.
4. Except the floor by **Par 2**, in case of except non-combustible materials, gas/electric ranges or heaters are to be not less than 0.3 meter from the their sides, not less than 0.9 meter from the top.
5. Funnel parts not insulated are to be not less than 0.3 meter from except non-combustible material.
6. The height of on weather deck is to be not less than 1 meter.
7. The parts of exhaust ducts passing the accommodation spaces are to be insulated.

104. Installation of flame screens

Flame screens to be able to protect fires from the related spaces are to be installed for the air pipe openings and other openings of the spaces having fuel oil tanks and accumulation possibility of other flammable vapours.

105. Installation of waste receptacles

Waste receptacles installed in the floating structures shall be constructed of non-combustible materials with no openings in the sides and bottom. This requirement is not intended to preclude the use of containers constructed of combustible materials in galleys, pantries, bars, garbage handling or storage spaces and incinerator rooms provided they are intended purely for the carriage of wet waste, glass bottles and metal cans and are suitably marked.

106. Boundary bulkheads

Boundary bulkheads of accommodation spaces and public spaces are to be constructed of non-combustible materials. ↓

CHAPTER 6 MACHINERY INSTALLATIONS

Section 1 General

101. Machinery installations

Machinery installations of floating structures are to be in accordance with **Ch 10 of the Rules for the Classification of Mobile offshore Units**. However, requirements of **Ch 7** of this Guidance are to be applied for electrical equipment. ↓

CHAPTER 7 ELECTRICAL INSTALLATIONS

Section 1 General

101. Electrical Installations

Electrical Installations installed in floating structures are to be complied with the requirements in **Pt 6, Ch 1** of the Rules. In this case, the main source of electrical power(including generating installations) and the emergency source of electrical power are to comply with **102.** and **103.**

102. Main source of electrical power

Electrical power supply installations of usage that can supply enough electrical power for installations such as electrical appliances, etc. installed in floating structures should be provided. In this case, capacity calculation should consider diversity factor.

103. Emergency source of electrical power

1. Independent emergency source of electrical power complied with either requirement of the following items should be installed in the floating structures.
 - (1) Battery (discharge indicator is to be installed) that necessary electric power is always charged and electric power is to provide without excessive voltage drop.
 - (2) Independent oil supply system and generator operated by effective prime movers(it is to use oil fuel having a flashpoint of not less than 60 °C) having starter deemed appropriate by the Society. In this case, emergency switchboard is to be installed to emergency source of electrical power as closely as possible.
2. Emergency source of electrical power by **Par 1** is to be provided automatically in case main source of electrical power is out of order and then it is lost.
3. Emergency source of electrical power installed by **Par 1** is to be provided not less than 6 hours at least for the following each item.
 - (1) Anchor lights
 - (2) Emergency electric lighting system installed in the following each station
 - (A) Corridor, stairway, ladder and exit
 - (B) Main generating system room and engine control room
 - (C) Others considered station necessary by this Society
 - (3) Electrical alarm system and indicators
 - (4) Fire detection system and manual fire alarm system
 - (5) Communication systems
 - (6) Fire pumps
 - (7) Automatic sprinkler systems
 - (8) Elevator
 - (9) Emergency indicating lights
4. Emergency source of electrical power installed by **Par 1** is to be installed in accordance with the requirements of following each item.
 - (1) It is to be above the uppermost continuous deck.
 - (2) The operation of the emergency services are not to be influenced due to firing and other casualties of engine room spaces.
 - (3) It is to be segregated and purged from firing and electric sparks.
5. Wires used for the emergency source of electrical power system are to be flame-retardant. ↓

CHAPTER 8 FIRE-FIGHTING APPLIANCES

Section 1 General

101. Fire-fighting Appliances

Fire fighting appliances to be installed on floating structures are to comply with the requirements in **Pt 8** of the Rules. In this case, arrangement of a Siamese connection, fire fighting appliances of accommodation spaces, automatic sprinkler and fire detection systems shall be in accordance with articles **102.** to **104.**

102. Arrangement of a Siamese connection

1. In floating structures which are not less than 500 gross tonnages, a Siamese connection, which is in accordance with the *Fire safety standard Siamese connection pipe appliances*, shall be installed.

103. Fire-fighting Appliances of accommodation spaces, etc.

1. In accommodation, office and control spaces of floating structures, fire-fighting appliances shall be provided according to the following table. In this case, if floating structures are not less than 1,000 tonnages, 5 portable fire extinguishers shall be arranged at least.

Corridor	One for each 30 m of the corridor length or part thereof One of liquid, foam or dry powder fire extinguisher(it is to be a kind of phosphate)
Public spaces and living room where not less than 8 people are living per 1 room (except galleys)	One of liquid, foam or dry powder fire extinguisher(it is to be a kind of phosphate) for each lower area 250 m ² or part thereof
Galleys	One of foam, carbon dioxide gas or dry powder fire extinguisher
Paint lockers and flammable liquid lockers	1. Entrances to the accommodation spaces or lockers having a deck area 4 m ² or more : fire fighting system complied with any one of the following items and operated at out-sides of paint lockers and flammable liquid lockers (A)Carbon dioxide gas fire extinguisher capable of supplying carbon dioxide 40 % or above of protected area's total volume (B)Dry powder fire extinguisher capable of supplying dry powder of 0.5 kg/m ³ or more (C)Water spray or sprinkler system capable of supplying water of 5 l/(m ² • min). Water spray system is to be connected to the fire main of floating structures. (D)Fire extinguisher deemed by the Society same as fire extinguisher of (A) to (C) 2. Less than 4 m ² lockers has no entrances to the accommodation spaces : One portable carbon dioxide gas fire extinguisher capable of delivering through one discharge outlet of locker boundary
Luggage room and lockers	One of liquid, foam or dry powder fire extinguisher located near the entrances(it is to be a kind of phosphate)
Sales shop	One of liquid, foam or dry powder fire extinguisher(it is to be a kind of phosphate)

2. In floating structures, in case exhaust ducts from galley ranges pass accommodation spaces or spaces where flammable substance is, exhaust ducts are to comply with the requirements in **Pt 8, Ch 3, 306. 5 (2)** of the Rules.
3. In floating structures having not less than 1,000 tonnages, cooking equipment is to comply with the requirements in **Pt 8, Ch 3, 405. 4** of the Rules.

104. Automatic sprinkler system and fire detection system

In floating structures, automatic sprinkler systems or fire detection systems according to the requirements in the ***law for fire fighting facility installation maintenance & safety management*** are to be installed. ↓

GUIDANCE FOR FLOATING STRUCTURES

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60 Sinseongno, 23-7 Jang-Dong, Yuseong-Gu,
DAEJEON, KOREA
TEL : +82 42 869 9114
FAX : +82 42 862 6011
Website : <http://www.krs.co.kr>

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