CHAPTER 8.5

(*Reserved*)

CHAPTER 8.6

DOCUMENTS

8.6.1 Certificate of approval

8.6.1.1 *Model for a certificate of approval for dry cargo vessels*

1

Competent authority: .....
Space reserved for the emblem and name of the State

ADN certificate of approval No.:

1. Name of vessel .....
2. Official number .....
3. Type of vessel .....
4. Requirements:
   Vessel referred to in 7.1.2.19.1[1]
   Vessel referred to in 7.2.2.19.3[1]
   The vessel complies with the additional rules of construction referred to in 9.1.0.80 to 9.1.0.95/9.2.0.80 to 9.2.0.95[1]
   Vessel complies with the rules of construction referred to in 9.1.0.12.3 (b) or (c), 9.1.0.51 or 9.1.0.52[1]
   Ventilation system referred to in 9.1.0.12.3 (b)[1]
   in .....
   Vessel complies with the rules of construction referred to in 9.1.0.53[1]
   Stationary electrical and non-electrical installations and equipment for use in protected areas:
   Temperature classification: .....
   Explosion group: .....
5. Permitted derogations[1]: .....
   .....
   .....
   .....
   .....
6. The validity of this certificate of approval expires on ..... (date)
7. The previous certificate of approval No. .....was issued on .....
   by ..... (competent authority)
8. This certificate is delivered on the basis of:
   – Inspection on[1] (date).....
   – The inspection report of a recognized classification society [1]
   (name of the classification society) ..... (date).....
   – The inspection report of a recognized inspection body [1]
   (name of the inspection body) ..... (date).....
9. Subject to permitted equivalence:[1] .....
   .....
   .....
   .....

[1] Delete as appropriate

2

10. Subject to special authorizations:[1] .....
.....
.....
.....

11. Issued at: ..... on .....
(place) (date)

12. (Stamp) .....
(competent authority)

.....
(signature)

Extension of the validity of the certificate of approval

13. The validity of this certificate is extended under Chapter 1.16 of ADN

until .....
(date)

14. ..... on .....
(place) (date)

.....
15. (Stamp) (competent authority)

.....
(signature)

[1] Delete as appropriate

8.6.1.2 ***Model for a provisional certificate of approval for dry cargo vessels***

1

Competent authority: .....
Space reserved for the emblem and name of the State

ADN provisional certificate of approval No: .....

1. Name of vessel .....
2. Official number .....
3. Type of vessel .....
4. Requirements:

Vessel referred to in 7.1.2.19.1[1]
Vessel referred to in 7.2.2.19.3[1]
The vessel complies with the additional rules of construction referred to in 9.1.0.80 to 9.1.0.95/9.2.0.80 to 9.2.0.95[1]
Vessel complies with the rules of construction referred to in 9.1.0.12.3 (b) or (c), 9.1.0.51 or 9.1.0.52[1]
Ventilation system referred to in 9.1.0.12.3 (b)[1]
in .....
Vessel complies with the rules of construction referred to in 9.1.0.53[1]
Stationary electrical and non-electrical installations and equipment for use in protected areas:
Temperature classification: .....
Explosion group: .....

5. Permitted derogations[1]: .....
.....
.....
6. The provisional certificate of approval is valid.....
6.1 until .....[1]

6.2 for a single journey from ..... to .....[1]

7. Issued at ..... on .....
(place) (date)

8. (Stamp) .....
(competent authority)

.....
(signature)

.....

[1] Delete as appropriate.

***NOTE**: This model provisional certificate of approval may be replaced by a single certificate model combining a provisional certificate of inspection and the provisional certificate of approval, provided that this single certificate model contains the same particulars as the model above and is approved by the competent authority.*

8.6.1.3 ***Model for a certificate of approval for tank vessels***

1

Competent authority: .....
Space reserved for the emblem and name of the State

ADN certificate of approval No.:

1. Name of vessel .....
2. Official number .....
3. Type of vessel .....
4. Type of tank vessel .....
5. Cargo tank design
   1. Pressure cargo tanks [1,2]
   2. Closed cargo tanks [1,2]
   3. Open cargo tanks with flame arresters [1,2]
   4. Open cargo tanks [1,2]
6. Types of cargo tanks
   1. Independent cargo tanks [1,2]
   2. Integral cargo tanks [1,2]
   3. Cargo tank with walls distinct from the outer hull [1,2]
   4. Membrane tanks [1,2]
7. Opening pressure of the pressure relief valves/high-velocity vent valves/safety valves ..... kPa[1,2]
8. Additional equipment:
   - Sampling device
     connection for a sampling device.....yes/no [1,2]
     sampling opening ..... yes/no [1,2]
   - Water–spray system ..... yes/no [1,2]
     Internal pressure alarm 40 kPa ..... yes/no [1,2]
   - Cargo heating system:
     possibility of cargo heating from shore ..... yes/no [1,2]
     cargo heating installation on board ..... yes/no [1,2]
   - Cargo refrigeration system ..... yes/no [1,2]
   - Inerting facilities ..... yes/no [1,2]
   - Pump–room below deck ..... yes/no [1]
   - Ventilation system according to 9.3.x.12.4 (b) yes/no [1,3]
     in .....
   - Conforms to the rules of construction referred to in 9.3.x.12.4 (b) or 9.3.x.12.4 (c), 9.3.x.51 and 9.3.x.52 Yes/No [1,3]
   - Venting piping and heated installation Yes/No [1,2]
   - Conforms to the rules of construction resulting from the remark(s) ... in column (20) of Table C of Chapter 3.2 [1,2]
9. Stationary electrical installations and equipment:
   - Temperature class: .....
   - Explosion group: .....
10. Autonomous protection systems:
    Explosion group/subgroup of explosion group II B: .....
11. Loading/unloading rate: ..... m^3/h [1] or see loading instructions on loading and unloading[1]

[1] Delete as appropriate.
[2] If the tanks are not all of the same type, see page 3.
[3] For "x", note the relevant information

2

12. Permitted relative density: .....

13. Additional observations
Vessel complies with the rules of construction referred to in 9.3.x.12, 9.3.x.51, 9.3.x.52 Yes/No [1,3]
.....
.....

14. The validity of this certificate of approval expires on ..... (date)

15. The previous certificate of approval No. ..... was issued on .....
by ..... (competent authority)

16. The vessel is approved for the carriage of the dangerous goods entered in the vessel substance list according to 1.16.1.2.5 based on:
– Inspection on[1] (date).....
– The inspection report of a recognized classification society [1]
(name of the classification society) ..... (date).....
– The inspection report of a recognized inspection body [1]
(name of the inspection body) ..... (date).....

17. Subjected to permitted equivalence:[1]
.....
.....

18. Subject to special authorizations:[1]
.....
.....

19. Issued at: ..... on .....
(place) (date)

20. (Stamp) .....
(competent authority)

.....
(signature)

Extension of the validity of the certificate of approval

21. The validity of this certificate is extended under Chapter 1.16 of ADN

Until .....
(date)

22. ..... on .....
(place) (date)

23. (Stamp) .....
(competent authority)

.....
(signature)

[1] Delete as appropriate.
[3] For "x", note the relevant information

		3											
	If the cargo tanks of the vessel are not all of the same type or the same design or the equipment is not the same, their type, their design and their equipment shall be indicated below:												
1	Cargo tank number	1	2	3	4	5	6	7	8	9	10	11	12
2	Pressure cargo tank												
3	Closed cargo tank												
4	Open cargo tank with flame arrester												
5	Open cargo tank												
6	Independent cargo tank												
7	Integral cargo tank												
8	Cargo tank with walls distinct from the outer hull												
9	Membrane tank												
10	Opening pressure of the pressure relief device/high velocity vent valve/safety valve in kPa												
11	Connection for a sampling device												
12	Sampling opening												
13	Water–spray system												
14	Internal pressure alarm 40 kPa												
15	Possibility of cargo heating from shore												
16	Cargo heating installation on board												
17	Cargo refrigeration installation												
18	Inerting facilities												
19	Venting piping and heated installation												
20	Conforms to the rules of construction resulting from the remark(s) ..... of column (20) of Table C of Chapter 3.2												

8.6.1.4 ***Model for a provisional certificate of approval for tank vessels***

1

Competent authority: .....
Space reserved for the emblem and name of the State

ADN provisional certificate of approval No: .....

1. Name of vessel.....
2. Official number.....
3. Type of vessel.....
4. Type of tank vessel .....
5. Cargo tank design
   1. Pressure cargo tanks [1,2]
   2. Closed cargo tanks [1,2]
   3. Open cargo tanks with flame arresters [1,2]
   4. Open cargo tanks [1,2]
6. Types of cargo tanks
   1. Independent cargo tanks [1,2]
   2. Integral cargo tanks [1,2]
   3. Cargo tank with walls distinct from the outer hull [1,2]
   4. Membrane tanks [1,2]
7. Opening pressure of the pressure relief valves/high-velocity vent valves/ safety valves ..... kPa [1,2]
8. Additional equipment:
   - Sampling device
     connection for a sampling device ..... yes/no [1,2]
     sampling opening ..... yes/no [1,2]
   - Water–spray system ..... yes/no [1,2]
     Internal pressure alarm 40 kPa ..... yes/no [1,2]
   - Cargo heating system:
     possibility of cargo heating from shore ..... yes/no [1,2]
     cargo heating installation on board ..... yes/no [1,2]
   - Cargo refrigeration system ..... yes/no [1,2]
   - Inerting facilities ..... yes/no [1,2]
   - Pump–room below deck ..... yes/no [1]
   - Ventilation system according to 9.3.x.12.4 (b) yes/no [1,3] in.....
   - Conforms to the rules of construction referred to in 9.3.x.12.4 (b) or 9.3.x.12.4 (c), 9.3.x.51 and 9.3.x.52 Yes/No [1,3]
   - Venting piping and heated installation Yes/No [1,2]
   - Conforms to the rules of construction resulting from the remark(s) ... in column (20) of Table C of Chapter 3.2 [1,2]
9. Stationary electrical installations and equipment:
   - Temperature class: .....
   - Explosion group: .....
10. Autonomous protection systems:
    Explosion group/subgroup of explosion group II B: .....

[1] Delete as appropriate.
[2] If the tanks are not all of the same type, see page 3.
[3] For "x", note the relevant information.

2

11. Loading/unloading rate ..... m^3/h[1] or see loading instructions[1] or see instructions on loading and unloading[1].

12. Permitted relative density: .....

13. Additional observations:
Vessel complies with the rules of construction referred to in 9.3.x.12, 9.3.x.51, 9.3.x.52 Yes/No [1,3]

.....

14. The provisional certificate of approval is valid.....
14.1 until [1].....

14.2 for a single journey from [1]..... to .....

15. Issued at ..... on .....
(place) (date)

16. (Stamp) .....
(competent authority)

.....
(signature)

[1] Delete as appropriate.
[2] If the tanks are not all of the same type, see page 3.
[3] For "x", note the relevant information

NOTE: *This model provisional certificate of approval may be replaced by a single certificate model combining a provisional certificate of inspection and the provisional certificate of approval, provided that this single certificate model contains the same particulars as the model above and is approved by the competent authority.*

		3											
	If the cargo tanks of the vessel are not all of the same type or the same design or the equipment is not the same, their type, their design and their equipment shall be indicated below:												
1	Cargo tank number	1	2	3	4	5	6	7	8	9	10	11	12
2	Pressure cargo tank												
3	Closed cargo tank												
4	Open cargo tank with flame arrester												
5	Open cargo tank												
6	Independent cargo tank												
7	Integral cargo tank												
8	Cargo tank with walls distinct from the outer hull												
9	Membrane tank												
10	Opening pressure of the pressure relief device/high velocity vent valve/safety valve in kPa												
11	Connection for a sampling device												
12	Sampling opening												
13	Water–spray system												
14	Internal pressure alarm 40 kPa ……..												
15	Possibility of cargo heating from shore												
16	Cargo heating installation on board												
17	Cargo refrigeration installation												
18	Inerting facilities												
19	Venting piping and heated installation												
20	Conforms to the rules of construction resulting from the remark(s) ……. of column (20) of Table C of Chapter 3.2												

8.6.1.5 Annex to the certificate of approval and provisional certificate of approval according to 1.16.1.3.1 (a)

Annex to the certificate of approval 1. Official number ..... 2. Type of vessel ..... 3. Transitional provisions applicable as from	Competent authority	Issued on	Valid until	Stamp and signature]
ADN certificate of approval No.:				

ADN certificate of approval No.:	Competent authority	Issued on	Valid until	Stamp and signature

8.6.2 Certificate of special knowledge of ADN according to 8.2.1.2, 8.2.1.5 or 8.2.1.7

(Recto)

(**)

Certificate of special knowledge of ADN

1. (No. of certificate)

2. (Name)

3. (First name(s))

4. (Born on DD/MM/YYYY)

5. (Nationality)

6. (Signature of holder)

7. (Issued by)

8. VALID UNTIL: (DD/MM/YYYY)

Photo of holder

(Verso)

1. (No. of certificate)

The certificate is valid for special knowledge of ADN according to: (Insert the corresponding subsection of ADN 8.2.1, if applicable with the mention "only for dry cargo vessels" or "only for tank vessels".)

** *Letter code(s) used for international navigation (CEVNI – Annex 1).*

8.6.3 ADN Checklist

1

ADN Checklist

concerning the observance of safety provisions and the implementation of the necessary measures for loading/unloading

– **Particulars of vessel**

…….. (name of vessel) No. ……... (official number)

…….. (vessel type)

– **Particulars of loading or unloading operations**

……... (shore loading or unloading installation) …….. (place)

……... (date) …….. (time)

– **Particulars of the cargo as indicated in the transport document**

Quantity m^3	Proper shipping name***	UN Number or Identification number	Dangers* ……	Packing Group
……..	……	……..	……	……
……...	……	……..	……	……
……..	……	……..	……	……

– **Particulars of last cargo****

Proper shipping name ***	UN Number or Identification number	Dangers* ……	Packing Group
……	……..	……	……
……	……..	……	……
……	……..	……	……

* *Dangers indicated in column (5) of Table C, as relevant (as mentioned in the transport document in accordance with 5.4.1.1.2 (c)).*

** *To be filled in only if vessel is to be loaded.*

*** *The proper shipping name given in column (2) of Table C of Chapter 3.2, supplemented, when applicable, by the technical name in parenthesis.*

2

Loading/unloading rate (not to be filled in if vessel is to be loaded with gas or have gas unloaded)

Proper shipping name**	Cargo tank number	agreed rate of loading/unloading					
		start		half way		end	
		rate m^3/h	quantity m^3	rate m^3/h	quantity m^3	rate m^3/h	quantity m^3
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....

Will the cargo piping be drained after loading or unloading by stripping or by blowing residual quantities to the shore installation/to the vessel?*

by blowing*
by stripping*

If drained by blowing, how?

.....
(e.g. air, inert gas, sleeve)

..... kPa
(permissible maximum pressure in the cargo tank)

.....litres
(estimated residual quantity)

Questions to the master or the person mandated by him and the person in charge at the loading/unloading place

Loading/unloading may only be started after all questions on the checklist have been checked off by "X", i.e. answered with YES and the list has been signed by both persons.

Non–applicable questions have to be deleted.

If not all questions can be answered with YES, loading/unloading is only allowed with consent of the competent authority.

* *Delete as appropriate.*

** *The proper shipping name given in column (2) of Table C of Chapter 3.2, supplemented, when applicable, by the technical name in parenthesis.*

		3	
		vessel	loading/ unloading place
1.	Is the vessel permitted to carry this cargo?	O*	O*
2.	*(Reserved)*		
3.	Is the vessel well moored in view of local circumstances?	O	–
4.	Have suitable means in accordance with 7.2.4.77 been provided for leaving the vessel, including in cases of emergency?	O	O
5.	Are the escape routes and the loading/unloading place adequately lighted?	O	O
6.	Vessel/shore connection		
	6.1 Is the piping for loading or unloading between vessel and shore in satisfactory condition?	–	O
	Is it correctly connected?	–	O
	6.2 Are all the connecting flanges fitted with suitable gaskets?	–	O
	6.3 Are all the connecting bolts fitted and tightened?	O	O
	6.4 Are the shoreside loading arms free to move in all directions and do the hose assemblies have enough room for easy movement?	–	O
7.	Are all flanges of the connections of the piping for loading and unloading and of the venting piping not in use, correctly blanked off?	O	O
8.1	Are suitable means of collecting leakages placed under the pipe connections which are in use and are they empty??	O	O
8.2	Is a water film as mentioned in 9.3.1.21.11 activated?	O	O
9.	Are the movable connecting pieces between the ballast and bilge piping on the one hand and the piping for loading and unloading on the other hand disconnected?	O	–
10.	Is continuous and suitable supervision of loading/unloading ensured for the whole period of the operation?	O	O
11.	Is communication between vessel and shore ensured?	O	O
12.1	For the loading of the vessel, is the venting piping, where required, or if it exists, connected with the vapour return piping?	O	O
12.2	Is it ensured that the shore installation is such that the pressure at the connecting-point of the vapour return piping and the venting piping cannot exceed the opening pressure of the pressure relief devices/high velocity vent valves (pressure at connecting point __ kPa)?	–	O*
12.3	When anti–explosion protection is required in Chapter 3.2, Table C, column (17) does the shore installation ensure that its vapour return piping is such that the vessel is protected against detonations and flame fronts from the shore.	–	O
13.	Is it known what actions are to be taken in the event of an "Emergency–stop" and an "Alarm"?	O	O

* *To be filled in only if vessel is to be loaded.*

		4 vessel	loading/ unloading place
14.	Check on the most important operational requirements:		
	– Are the required fire extinguishing systems and appliances operational?	O	O
	– Have all valves and other closing devices been checked for correct open – or closed position?	O	O
	– Has smoking been generally prohibited?	O	O
	– Are the flame operated heating applications on board turned off?	O	–
	– Is the voltage cut off from the radar installations?	O	–
	– Are all electrical installations and equipment marked red switched off?	O	–
	– Are all windows and doors closed?	O	–
15.1	Has the starting working pressure of the vessel's cargo discharge pump been adjusted to the permissible working pressure of the shore installation? (agreed pressure __ kPa)	O	–
15.2	Has the starting working pressure of the shore pump been adjusted to the permissible working pressure of the on–board installation? (agreed pressure __ kPa)	–	O
16.	Is the liquid level alarm–installation operational?	O	–
17.	Is the following system plugged in, in working order and tested?		
	Overflow prevention device □ when loading □ when unloading	O	O
	Device for switching off the on–board pump from the shore facility (only when unloading the vessel)	O	O
18.	To be filled in only in the case of loading or unloading of substances for the carriage of which a closed cargo tank or an open cargo tank with flame arrester is required:		
	Are the cargo tank hatches and cargo tank inspection and sampling openings closed or protected by flame arresters fulfilling the requirements of column (16) of Table C of Chapter 3.2?	O	–
19.	When transporting refrigerated liquefied gases, has the holding time been determined according to 7.2.4.16.16, and is known and documented on board?	O**	O**
20	Is the loading temperature within the range of the maximum permissible temperature as prescribed in 7.2.3.28?	O**	O**

Checked, filled in and signed	
for the vessel:	for the installation of loading and unloading:
.....	.....
(name in capital letters)	(name in capital letters)
.....	.....
(signature)	(signature)

** *To be filled in only if the vessel is to be loaded.*

Explanation

Question 3

"Well moored" means that the vessel is fastened to the pier or the cargo transfer station in such a way that, without intervention of a third person, movements of the vessel in any direction that could hamper the operation of the cargo transfer gear will be prevented. Established or predictable variations of the water–level at that location and special factors have to be taken into account.

Question 4

It must be possible to escape safely from the vessel at any time. If there is none or only one protected escape route available at the shoreside for a quick escape from the vessel in case of emergency, a suitable means of escape has to be provided on the vessel side if required in accordance with 7.2.4.77.

Question 6

A valid inspection certificate for the hose assemblies must be available on board. The material of the piping for loading and unloading must be able to withstand the expected loads and be suitable for cargo transfer of the respective substances. The piping for loading and unloading between vessel and shore must be placed so that it cannot be damaged by ordinary movements of the vessel during the loading and unloading process or by variations of the water. In addition, all flanged joints must be fitted with appropriate gaskets and sufficient bolt connections in order to exclude the possibility of leakage.

Question 10

Loading/unloading must be supervised on board and ashore so that dangers which may occur in the vicinity of piping for loading and unloading between vessel and shore can be recognized immediately. When supervision is effected by additional technical means it must be agreed between the shore installation and the vessel how it is to be ensured.

Question 11

For a safe loading/unloading operation good communications between vessel and shore are required. For this purpose telephone and radio equipment may be used only if of an explosion protected type and located within reach of the supervisor.

Question 13

Before the start of the loading/unloading operation the representative of the shore installation and the master or the person mandated by him must agree on the applicable procedure. The specific properties of the substances to be loaded/unloaded have to be taken into account.

Question 17

To prevent backflow from the shore, it is also necessary to activate the overflow prevention device on the vessel under certain circumstances when unloading. It is obligatory during loading and optional during unloading. Delete this item if it is not necessary during unloading.

8.6.4 Checklist degassing to reception facilities

1

ADN Checklist

concerning the observance of safety provisions and the implementation of the necessary measures for degassing to reception facilities

– **Particulars of vessel**

…….. No. ……..
(name of vessel) (official number)

……..
(vessel type)

– **Particulars of reception facility**

……... ……..
(reception facility) (place)

……... ……..
(date) (time)

Reception facility approved according CDNI ☐ Yes ☐ No

– **Particulars of the previous cargo in the tank before degassing as indicated in the transport document**

Cargo tank #	Quantity m^3	Proper shipping name**	UN Number or Identification number	Dangers* ……	Packing Group
…… …… ……	…… ……	…… …… ……	…….. …….. ……..	…… …… ……	…… ……

* *Dangers indicated in column (5) of Table C, as relevant (as mentioned in the transport document in accordance with 5.4.1.1.2 (c)).*

** *The proper shipping name given in column (2) of Table C of Chapter 3.2, supplemented, when applicable, by the technical name in parenthesis.*

		2
Degassing rate		
Proper shipping name**	Cargo tank number	agreed rate of degassing rate m^3/h
.....	.....	.....
.....	.....	.....
.....	.....	.....

Questions to the master or the person mandated by him and the person in charge at the reception facility

Degassing may only be started after all questions on the checklist have been checked off by "X", i.e. answered with YES and the list has been signed by both persons.

Non–applicable questions have to be deleted.

If not all questions can be answered with YES, degassing is only allowed with consent of the competent authority.

** *The proper shipping name given in column (2) of Table C of Chapter 3.2, supplemented, when applicable, by the technical name in parenthesis.*

		vessel	3 reception facility
1.	Is the vessel well moored in view of local circumstances?	O	–
2.	Are the pipings for degassing between vessel and reception facility in satisfactory condition?	–	O
	Are they correctly connected and are appropriate flame arresters fitted in the piping between the vessel and the reception facility?	O	O
3.	Are all flanges of the connections of the piping for loading and unloading and of the venting piping not in use, correctly blanked off?	O	O
4.	Is continuous and suitable supervision of degassing ensured for the whole period of the operation?	O	O
5.	Is communication between vessel and reception facility ensured?	O	O
6.1	Is it ensured that the reception facility is such that the pressure at the connecting point cannot exceed the opening pressure of the high–velocity vent valves (pressure at connecting point __ kPa)?	–	O*
6.2 (a)	Is the air inlet for equalization of pressure in the cargo tank part of a closed system or is it equipped with an additional vacuum valve on board of the vessel?	O**	–
6.2 (b)	Is the air inlet for equalization of pressure in the cargo tank part of a closed system or is it equipped with an additional vacuum valve on shore?	–	O**, ***
6.3	When anti–explosion protection is required in Chapter 3.2, Table C, column (17) does the reception facility ensure that its piping is such that the vessel is protected against detonations and passage of flames from the reception facility.	–	O
7.	Is it known what actions are to be taken in the event of an "Emergency–stop" and an "Alarm"?	O	O

* *Not applicable if vacuum is used to generate air flows.*

** *Only applicable is vacuum is used to generate air flows.*

*** *Only applicable if air inlet is in piping of the shore-based reception facility.*

		vessel	4 reception facility
8.	Check on the most important operational requirements:		
	– Are the required fire extinguishing systems and appliances operational?	O	O
	– Have all valves and other closing devices been checked for correct open or closed position?	O	O
	– Has smoking been generally prohibited?	O	O
	– Are the flame operated heating applications on board turned off?	O	–
	– Is the voltage cut off from the radar installations?	O	–
	– Is all electrical equipment marked red switched off?	O	–
	– Are all windows and doors closed?	O	–
9.1	Has the pressure of the vessel's piping been adjusted to the permissible working pressure of the reception facility? (agreed pressure __ kPa)	O	–
9.2	Has the pressure of the reception facility piping been adjusted to the permissible working pressure of the on–board installation? (agreed pressure __ kPa)	–	O
10.	Are all cargo tank hatches and other cargo tanks openings closed or, if appropriate, protected by flame arresters in good condition?	O	–

Checked, filled in and signed	
for the vessel:	for the reception facility:
.....	.....
(name in capital letters)	(name in capital letters)
.....	.....
(signature)	(signature)

Explanation

Question 1

"Well moored" means that the vessel is fastened to the pier or the reception facility in such a way that, without intervention of a third person, movements of the vessel in any direction that could hamper the degassing operation will be prevented. Established or predictable variations of the water–level at that location and special factors have to be taken into account.

Question 2

The material of the piping must be able to withstand the expected rates and be suitable for degassing. The piping between vessel and reception facility must be placed so that it cannot be damaged by ordinary movements of the vessel during the degassing process or by variations of the water.

Question 4

Degassing must be supervised on board and at the reception facility so that dangers which may occur in the vicinity of the piping between vessel and reception facility can be recognized immediately. When supervision is effected by additional technical means it must be agreed between the reception facility and the vessel how it is to be ensured.

Question 5

For a safe degassing operation good communications between vessel and shore are required. For this purpose telephone and radio equipment may be used only if of an explosion protected type and located within reach of the supervisor.

Question 7

Before the start of the degassing operation the representative of the reception facility and the master or the person mandated by him must agree on the applicable procedure. The specific properties of the substances to be degassed have to be taken into account.

PART 9

Rules for construction

CHAPTER 9.1

RULES FOR CONSTRUCTION OF DRY CARGO VESSELS

9.1.0 Rules for construction applicable to dry cargo vessels

Provisions of 9.1.0.0 to 9.1.0.79 apply to dry cargo vessels.

9.1.0.0 ***Materials of construction***

The vessel's hull shall be constructed of shipbuilding steel or other metal, provided that this metal has at least equivalent mechanical properties and resistance to the effects of temperature and fire.

9.1.0.1 ***Vessel record***

NOTE: *For the purpose of this paragraph, the term "owner" has the same meaning as in 1.16.0.*

The vessel record shall be retained by the owner who shall be able to provide this documentation at the request of the competent authority and the recognized classification society.

The vessel record shall be maintained and updated throughout the life of the vessel and shall be retained for 6 months after the vessel is taken out of service.

Should a change of owner occur during the life of the vessel the vessel record shall be transferred to the new owner.

Copies of the vessel record or all necessary documents shall be made available on request to the competent authority for the issuance of the certificate of approval and for the recognized classification society or inspection body for first inspection, periodic inspection, special inspection or exceptional checks.

9.1.0.2 to 9.1.0.10 *(Reserved)*

9.1.0.11 Holds

9.1.0.11.1 (a) Each hold shall be bounded fore and aft by watertight metal bulkheads.

(b) The holds shall have no common bulkhead with the oil fuel tanks.

9.1.0.11.2 The bottom of the holds shall be such as to permit them to be cleaned and dried.

9.1.0.11.3 The hatchway covers shall be spraytight and weathertight or be covered by waterproof tarpaulins.

Tarpaulins used to cover the holds shall not readily ignite.

9.1.0.11.4 No heating appliances shall be installed in the holds.

9.1.0.12 ***Ventilation***

9.1.0.12.1 It must be possible to ventilate each hold by means of two mutually independent extraction ventilators having a capacity of not less than five changes of air per hour based on the volume of the empty hold. The extraction ducts shall be positioned at the extreme ends of the hold and extend down to not more than 50 mm above the bottom. The extraction of gases and vapours through the duct shall also be ensured for carriage in bulk.

If the extraction ducts are movable they shall be suitable for the ventilator assembly and capable of being firmly fixed. Protection shall be ensured against bad weather and spray. The air intake shall be ensured during ventilation.

9.1.0.12.2 The ventilation system of a hold shall be arranged so that dangerous gases cannot penetrate into the accommodation, wheelhouse or engine rooms.

9.1.0.12.3 (a) Ventilation shall be provided for the accommodation, wheelhouse and for service spaces;

(b) The ventilation system in such spaces shall meet the following requirements:

(i) The air intakes of the ventilation system shall be located as far away as possible, and not less than 6.00 m from the protected area and not less than 2.00 m above the deck;

(ii) Overpressure of at least 0.1 kPa (0.001 bar) may be maintained in the premises;

(iii) A breakdown alarm is integrated;

(iv) The ventilation system, including the breakdown alarm, shall be at least of the 'limited explosion risk' type;

(v) A gas detection system conforming to conditions 1. to 4. below is connected to the ventilation system:

1. It is appropriate at least for use in zone 1, explosion group IIC and temperature class T4;
2. It is equipped with sensors:
   - On the suction inlets of the ventilation systems; and
   - Directly below the top edge of the sill of the entrance doors;
3. Its t90-time is lower than or equal to 4 s;
4. Measurement shall be continuous;

(vi) In the service spaces, the ventilation system is linked to the emergency lighting, which shall be at least of the 'limited explosion risk' type;

This emergency lighting is not necessary if the lighting installations in the service spaces are of at least the 'limited explosion risk' type;

(vii) The suction of the ventilation system and installations and equipment that do not meet the requirements of 9.1.0.51 and 9.1.0.52.1 shall be shut down when a concentration equal to 20% of the LEL of n-Hexane is reached;

The switching-off shall be indicated in the accommodation and wheelhouse by visual and audible signals;

(viii) In the event of failure of the ventilation system or of the gas detection installations in the accommodation, installations and equipment in the accommodation that do not comply with the requirements of 9.1.0.51 and 9.1.0.52.1 shall be switched off;

The switching-off shall be indicated in the accommodation, the wheelhouse and on the deck by visual and audible signals;

(ix) In the event of failure of the ventilation system or of the gas detection installations in the wheelhouse or the service spaces, installations and equipment in those spaces that do not comply with the requirements of 9.1.0.51 and 9.1.0.52.1 shall be switched off;

The switching-off shall be indicated in the wheelhouse and on the deck by visual and audible signals. The alarm must be relayed to the accommodation automatically if it has not been switched off;

(x) Any switching-off shall take place immediately and automatically and, if necessary, shall switch on the emergency lighting;

The automatic switch-off device is set so that no automatic switching-off may occur while the vessel is under way;

(c) If there is no ventilation system or the ventilation system of a space does not comply with all the requirements set out in (b) above, any installations or equipment present in that space that may, if switched on, give rise to surface temperatures higher than those mentioned in 9.1.0.51 or that do not meet the requirements set out in 9.1.0.52.1 must be capable of being switched off.

9.1.0.12.4 Notice boards shall be fitted at the ventilation inlets indicating the conditions under which they shall be closed. All ventilation inlets of accommodation, wheelhouse and service spaces leading into the open air outside of the protected area shall be located not less than 2.00 m from the protected area.

All ventilation inlets shall be fitted with fixed devices according to 9.1.0.40.2.2 (c) enabling them to be closed rapidly. It shall be clear whether they are open or closed.

9.1.0.12.5 Ventilators including their motors used within the protected area and motors for hold ventilators which are arranged in the air flow shall fulfil at least the requirements for use in zone 1. They shall meet at least the requirements for temperature class T4 and explosion group II B.

9.1.0.12.6 The requirements of 9.1.0.12.3 (b) or (c) must be met only if the vessel is located within or in the immediate vicinity of a shoreside assigned zone.

9.1.0.13 to 9.1.0.16 *(Reserved)*

9.1.0.17 ***Accommodation and service spaces***

9.1.0.17.1 The accommodation shall be separated from the holds by metal bulkheads having no openings.

9.1.0.17.2 Gastight closing appliances shall be provided for openings in the accommodation and wheelhouse facing the holds.

9.1.0.17.3 No entrances or openings of the engine rooms and service spaces shall face the protected area.

9.1.0.18 and 9.1.0.19 *(Reserved)*

9.1.0.20 ***Water ballast***

The double-hull spaces and double bottoms may be arranged for being filled with water ballast.

9.1.0.21 to 9.1.0.30 *(Reserved)*

9.1.0.31 ***Engines***

9.1.0.31.1 Only internal combustion engines running on fuel having a flashpoint above 55 °C are allowed. This provision does not apply to internal combustion engines which are part of propulsion and auxiliary systems. These systems shall meet the requirements of Chapter 30 and Annex 8, Section II, Chapter 1, and Section III, Chapter 2 of the European Standard laying down Technical Requirements for Inland Navigation vessels (ES-TRIN) as amended.[1]

9.1.0.31.2 The air vents in the engine rooms and the air intakes of the engines which do not take air in directly from the engine room shall be located not less than 2.00 m from the protected area.

9.1.0.31.3 Sparking shall not be possible in the protected area.

9.1.0.32 ***Oil fuel tanks***

9.1.0.32.1 Double bottoms within the hold area may be arranged as oil fuel tanks provided their depth is not less than 0.6 m. Oil fuel pipes and openings to such tanks are not permitted in the holds.

9.1.0.32.2 The open ends of the air pipes of each oil fuel tanks shall be extended to not less than 0.50 m above the open deck. These open ends and the open ends of overflow pipes leading to the deck shall be fitted with a protective device consisting of a gauze diaphragm or a perforated plate.

9.1.0.33 *(Reserved)*

9.1.0.34 ***Exhaust pipes***

9.1.0.34.1 Exhausts shall be evacuated from the vessel into the open air either upwards through an exhaust pipe or through the shell plating. The exhaust outlet shall be located not less than 2.00 m from the hatchway openings. The exhaust pipes of engines shall be arranged so that the exhausts are led away from the vessel. The exhaust pipes shall not be located within the protected area.

9.1.0.34.2 Exhaust pipes shall be provided with a device preventing the escape of sparks, e.g. spark arresters.

9.1.0.35 ***Bilge system***

The bilge pumps intended for the holds shall be located in the protected area. This requirement shall not apply when draining is effected by eductors.

9.1.0.36 to 9.1.0.39 *(Reserved)*

[1] *As available on the website of the Comité Européen pour l'Élaboration de Standards dans le Domaine de Navigation Intérieure – CESNI, https://www.cesni.eu/en/documents/es-trin/*

9.1.0.40 ***Fire-extinguishing arrangements***

9.1.0.40.1 A fire-extinguishing system shall be installed on the vessel. This system shall comply with the following requirements:

- It shall be supplied by two independent fire or ballast pumps one of which shall be ready for use at any time. These pumps and their means of propulsion and electrical equipment shall not be installed in the same space;
- It shall be provided with a water main fitted with at least three hydrants in the protected area above deck. Three suitable and sufficiently long hoses with jet/spray nozzles having a diameter of not less than 12 mm shall be provided. Alternatively one or more of the hose assemblies may be substituted by directable jet/spray nozzles having a diameter of not less than 12 mm. It shall be possible to reach any point of the deck in the protected area simultaneously with at least two jets of water which do not emanate from the same hydrant. A spring-loaded non-return valve shall be fitted to ensure that no gases can escape through the fire-extinguishing system into the accommodation or service spaces outside the protected area;
- The capacity of the system shall be at least sufficient for a jet of water to reach a distance of not less than the vessel's breadth from any location on board with two spray nozzles being used at the same time;
- The water supply system shall be capable of being put into operation from the wheelhouse and from the deck;
- Measures shall be taken to prevent the freezing of fire-mains and hydrants.

A single fire or ballast pump shall suffice on board pushed barges without their own means of propulsion.

9.1.0.40.2 In addition, the engine rooms shall be provided with a permanently fixed fire-extinguishing system meeting the following requirements:

9.1.0.40.2.1 *Extinguishing agents*

For the protection of spaces in engine rooms, boiler rooms and pump rooms, only permanently fixed fire-extinguishing systems using the following extinguishing agents are permitted:

(a) CO_2 (carbon dioxide);

(b) HFC 227 ea (heptafluoropropane);

(c) IG-541 (52% nitrogen, 40% argon, 8% carbon dioxide);

(d) FK-5-1-12 (dodecafluoro 2–methylpentane–3–one);

(e) (*Reserved*)

(f) K_2CO_3 (potassium carbonate).

Other extinguishing agents are permitted only on the basis of recommendations by the Administrative Committee.

9.1.0.40.2.2 *Ventilation, air extraction*

(a) The combustion air required by the combustion engines which ensure propulsion should not come from spaces protected by permanently fixed fire-extinguishing systems. This requirement is not mandatory if the vessel has two independent main engine rooms with a gastight separation or if, in addition to the main engine room, there is a separate engine room installed with a bow thruster that can independently ensure propulsion in the event of a fire in the main engine room.

(b) All forced ventilation systems in the space to be protected shall be shut down automatically as soon as the fire-extinguishing system is activated.

(c) All openings in the space to be protected which permit air to enter or gas to escape shall be fitted with devices enabling them to be closed rapidly. It shall be clear whether they are open or closed.

(d) Air escaping from the pressure–relief valves of the pressurised air tanks installed in the engine rooms shall be evacuated to the open air.

(e) Overpressure or negative pressure caused by the diffusion of the extinguishing agent shall not destroy the constituent elements of the space to be protected. It shall be possible to ensure the safe equalisation of pressure.

(f) Protected spaces shall have a facility for extracting the extinguishing agent and the combustion gases. Such facilities shall be capable of being operated from positions outside the protected rooms and which must not be made inaccessible by a fire within such spaces. If there are permanently installed extractors, it shall not be possible for these to be switched on while the fire is being extinguished.

9.1.0.40.2.3 *Fire alarm system*

The space to be protected shall be monitored by an appropriate fire alarm system. The alarm signal shall be audible in the wheelhouse, the accommodation and the space to be protected.

9.1.0.40.2.4 *Piping system*

(a) The extinguishing agent shall be routed to and distributed in the space to be protected by means of a permanent piping system. Piping installed in the space to be protected and their fittings shall be made of steel. This shall not apply to the connecting nozzles of tanks and compensators provided that the materials used have equivalent fire–retardant properties. Piping shall be protected against corrosion both internally and externally.

(b) The discharge nozzles shall be so arranged as to ensure the regular diffusion of the extinguishing agent. In particular, the extinguishing agent must also be effective beneath the floor.

9.1.0.40.2.5 *Triggering device*

(a) Automatically activated fire-extinguishing systems are not permitted.

(b) It shall be possible to activate the fire-extinguishing system from a suitable point located outside the space to be protected.

(c) Triggering devices shall be so installed that they can be activated also in the event of a fire, and that the required quantity of extinguishing agent can still be provided in the space to be protected in the event of a fire or of damage caused by a fire or an explosion.

Systems which are not mechanically activated shall be supplied from two energy sources independent of each other. These energy sources shall be located outside the space to be protected. The control lines located in the space to be protected shall be so designed as to remain capable of operating in the event of a fire for a minimum of 30 minutes. The electrical installations are deemed to meet this requirement if they conform to the IEC 60331–21:1999 standard.

When the triggering devices are so placed as not to be visible, the component concealing them shall carry the "Fire-fighting system" symbol, each side being not less than 10 cm in length, with the following text in red letters on a white ground:

Fire-extinguishing system

(d) If the fire-extinguishing system is intended to protect several spaces, it shall comprise a separate and clearly–marked triggering device for each space;

(e) The instructions shall be posted alongside all triggering devices and shall be clearly visible and indelible. The instructions shall be in a language the master can read and understand and if this language is not English, French or German, they shall be in English, French or German. They shall include information concerning:

(i) the activation of the fire-extinguishing system;

(ii) the need to ensure that all persons have left the space to be protected;

(iii) The correct behaviour of the crew in the event of activation and when accessing the space to be protected following activation or diffusion, in particular in respect of the possible presence of dangerous substances;

(iv) the correct behaviour of the crew in the event of the failure of the fire-extinguishing system to function properly.

(f) The instructions shall mention that prior to the activation of the fire-extinguishing system, combustion engines installed in the space and aspirating air from the space to be protected, shall be shut down.

9.1.0.40.2.6 *Alarm device*

(a) Permanently fixed fire-extinguishing systems shall be fitted with an audible and visual alarm device;

(b) The alarm device shall be set off automatically as soon as the fire-extinguishing system is first activated. The alarm device shall function for an appropriate period of time before the extinguishing agent is released; it shall not be possible to turn it off;

(c) Alarm signals shall be clearly visible in the spaces to be protected and their access points and be clearly audible under operating conditions corresponding to the highest possible sound level. It shall be possible to distinguish them clearly from all other sound and visual signals in the space to be protected;

(d) Sound alarms shall also be clearly audible in adjoining spaces, with the communicating doors shut, and under operating conditions corresponding to the highest possible sound level;

(e) If the alarm device is not intrinsically protected against short circuits, broken wires and drops in voltage, it shall be possible to monitor its operation;

(f) A sign with the following text in red letters on a white ground shall be clearly posted at the entrance to any space the extinguishing agent may reach:

Warning, fire-extinguishing system!
Leave this space immediately when the ... (description) alarm is activated!

9.1.0.40.2.7 *Pressurised tanks, fittings and piping*

(a) Pressurised tanks, fittings and piping shall conform to the requirements of the competent authority or, if there are no such requirements, to those of a recognized classification society.

(b) Pressurised tanks shall be installed in accordance with the manufacturer's instructions.

(c) Pressurised tanks, fittings and piping shall not be installed in the accommodation.

(d) The temperature of cabinets and storage spaces for pressurised tanks shall not exceed 50 °C.

(e) Cabinets or storage spaces on deck shall be securely stowed and shall have vents so placed that in the event of a pressurised tank not being gastight, the escaping gas cannot penetrate into the vessel. Direct connections with other spaces are not permitted.

9.1.0.40.2.8 *Quantity of extinguishing agent*

If the quantity of extinguishing agent is intended for more than one space, the quantity of extinguishing agent available does not need to be greater than the quantity required for the largest of the spaces thus protected.

9.1.0.40.2.9 *Installation, maintenance, monitoring and documents*

(a) The mounting or modification of the system shall only be performed by a company specialised in fire-extinguishing systems. The instructions (product data sheet, safety data sheet) provided by the manufacturer of the extinguishing agent or the system shall be followed.

(b) The system shall be inspected by an expert:

(i) before being brought into service;

(ii) each time it is put back into service after activation;

(iii) after every modification or repair;

(iv) regularly, not less than every two years.

(c) During the inspection, the expert is required to check that the system conforms to the requirements of 9.1.0.40.2.

(d) The inspection shall include, as a minimum:

(i) an external inspection of the entire system;

(ii) an inspection to ensure that the piping is leakproof;

(iii) an inspection to ensure that the control and activation systems are in good working order;

(iv) an inspection of the pressure and contents of tanks;

(v) an inspection to ensure that the means of closing the space to be protected are leakproof;

(vi) an inspection of the fire alarm system;

(vii) an inspection of the alarm device.

(e) The person performing the inspection shall establish, sign and date a certificate of inspection.

(f) The number of permanently fixed fire-extinguishing systems shall be mentioned in the vessel certificate.

9.1.0.40.2.10 *Fire-extinguishing system operating with CO_2*

In addition to the requirements contained in 9.1.0.40.2.1 to 9.1.0.40.2.9, fire-extinguishing systems using CO_2 as an extinguishing agent shall conform to the following provisions:

(a) Tanks of CO_2 shall be placed in a gastight space or cabinet separated from other spaces. The doors of such storage spaces and cabinets shall open outwards; they shall be capable of being locked and shall carry on the outside the symbol "Warning: general danger," not less than 5 cm high and "CO_2" in the same colours and the same size;

(b) Storage cabinets or spaces for CO_2 tanks located below deck shall only be accessible from the outside. These spaces shall have an artificial ventilation system with extractor hoods and shall be completely independent of the other ventilation systems on board;

(c) The degree of filling* of CO_2 tanks shall not exceed 0.75 kg/l. The volume of depressurised CO_2 shall be taken to be 0.56 m^3/kg;

(d) The concentration of CO_2 in the space to be protected shall be not less than 40% of the gross volume of the space. This quantity shall be released within 120 seconds. It shall be possible to monitor whether diffusion is proceeding correctly;

(e) The opening of the tank valves and the control of the diffusing valve shall correspond to two different operations;

(f) The appropriate period of time mentioned in 9.1.0.40.2.6 (b) shall be not less than 20 seconds. A reliable installation shall ensure the timing of the diffusion of CO_2.

9.1.0.40.2.11 *Fire-extinguishing system operating with HFC-227 ea (heptafluoropropane)*

In addition to the requirements of 9.1.0.40.2.1 to 9.1.0.40.2.9, fire-extinguishing systems using HFC-227 ea as an extinguishing agent shall conform to the following provisions:

(a) Where there are several spaces with different gross volumes, each space shall be equipped with its own fire-extinguishing system;

---

* *As this text has been taken from ES-TRIN, the definition of 'Degree of filling' provided in 1.2.1 of these Regulations is not applicable.*

(b) Every tank containing HFC-227 ea placed in the space to be protected shall be fitted with a device to prevent overpressure. This device shall ensure that the contents of the tank are safely diffused in the space to be protected if the tank is subjected to fire, when the fire-extinguishing system has not been brought into service;

(c) Every tank shall be fitted with a device permitting control of the gas pressure;

(d) The degree of filling* of tanks shall not exceed 1.15 kg/l. The specific volume of depressurised HFC-227 ea shall be taken to be 0.1374 m^3/kg;

(e) The concentration of HFC-227 ea in the space to be protected shall be not less than 8% of the gross volume of the space. This quantity shall be released within 10 seconds;

(f) Tanks of HFC-227 ea shall be fitted with a pressure monitoring device which triggers an audible and visual alarm in the wheelhouse in the event of an unscheduled loss of propellant gas. Where there is no wheelhouse, the alarm shall be triggered outside the space to be protected;

(g) After discharge, the concentration in the space to be protected shall not exceed 10.5% (volume);

(h) The fire-extinguishing system shall not comprise aluminium parts.

9.1.0.40.2.12 *Fire-extinguishing system operating with IG-541*

In addition to the requirements of 9.1.0.40.2.1 to 9.1.0.40.2.9, fire-extinguishing systems using IG-541 as an extinguishing agent shall conform to the following provisions:

(a) Where there are several spaces with different gross volumes, every space shall be equipped with its own fire-extinguishing system;

(b) Every tank containing IG-541 placed in the space to be protected shall be fitted with a device to prevent overpressure. This device shall ensure that the contents of the tank are safely diffused in the space to be protected if the tank is subjected to fire, when the fire-extinguishing system has not been brought into service;

(c) Each tank shall be fitted with a device for checking the contents;

(d) The filling pressure of the tanks shall not exceed 200 bar at a temperature of +15 °C;

(e) The concentration of IG-541 in the space to be protected shall be not less than 44% and not more than 50% of the gross volume of the space. This quantity shall be released within 120 seconds.

9.1.0.40.2.13 *Fire-extinguishing system operating with FK-5-1-12*

In addition to the requirements of 9.1.0.40.2.1 to 9.1.0.40.2.9, fire-extinguishing systems using FK-5-1-12 as an extinguishing agent shall comply with the following provisions:

(a) Where there are several spaces with different gross volumes, every space shall be equipped with its own fire-extinguishing system;

* *As this text has been taken from ES-TRIN, the definition of 'Degree of filling' provided in 1.2.1 of these Regulations is not applicable.*

(b) Every tank containing FK-5-1-12 placed in the space to be protected shall be fitted with a device to prevent overpressure. This device shall ensure that the contents of the tank are safely diffused in the space to be protected if the tank is subjected to fire, when the fire-extinguishing system has not been brought into service;

(c) Every tank shall be fitted with a device permitting control of the gas pressure;

(d) The degree of filling* of tanks shall not exceed 1.00 kg/l. The specific volume of depressurized FK-5-1-12 shall be taken to be 0.0719 m^3/kg;

(e) The volume of FK-5-1-12 in the space to be protected shall be not less than 5.5% of the gross volume of the space. This quantity shall be released within 10 seconds;

(f) Tanks of FK-5-1-12 shall be fitted with a pressure monitoring device which triggers an audible and visual alarm in the wheelhouse in the event of an unscheduled loss of extinguishing agent. Where there is no wheelhouse, the alarm shall be triggered outside the space to be protected;

(g) After discharge, the concentration in the space to be protected shall not exceed 10.0%.

9.1.0.40.2.14 *(Reserved)*

9.1.0.40.2.15 *Fire-fighting systems using K_2CO_3 as the extinguishing agent*

In addition to the requirements laid down in 9.1.0.40.2.1 to 9.1.0.40.2.3, 9.1.0.40.2.5, 9.1.0.40.2.6, and 9.1.0.40.2.9, fire-fighting systems using K_2CO_3 as the extinguishing agent shall comply with the following provisions:

(a) The fire-fighting system shall have a type-approval pursuant to Directive 2014/90/EU[2] or to MSC/Circ. 1270[3];

(b) Each room shall be provided with its own firefighting system;

(c) The extinguishing agent must be stored in specially provided unpressurised tanks in the room to be protected. These tanks shall be fitted in such a way that the extinguishing agent is dispensed evenly in the room. In particular the extinguishing agent shall also work underneath the deck plates;

(d) Each tank is separately connected with the triggering device;

(e) The quantity of dry aerosol-forming extinguishing agent relative to the room to be protected shall be at least 120 g per m^3 of the net volume of this room. This net volume is calculated according to Directive 2014/90/EU[2] or to MSC/Circ. 1270[3]. It shall be possible to supply the extinguishing agent within 120 seconds.

---

* *As this text has been taken from ES-TRIN, the definition of 'Degree of filling' provided in 1.2.1 of these Regulations is not applicable.*

2 *Official Journal of the European Union, L 257 of 28 August 2014, p.146.*

3 *International Maritime Organization Circular MSC/Circ. 1270 and corrigenda — Revised Guidelines for the approval of fixed aerosol fire-extinguishing systems equivalent to fixed gas extinguishing systems, as referred to in SOLAS 1974, for machinery spaces — adopted on 4 June 2008.*

9.1.0.40.2.16 *Permanently installed fire-extinguishing systems for protecting objects*

(a) Permanently installed fire-extinguishing systems for protecting objects are permitted for the protection of installations and equipment.

The action of the fire-extinguishing systems must be aimed directly at the objects to be protected. The range of action of fire-extinguishing systems may be limited in space by means of structural measures.

Permanently installed fire-extinguishing systems for protecting objects may already be structurally integrated into the objects concerned.

Permanently installed fire-extinguishing systems for protecting objects must be independent of the systems referred to in 9.1.0.40.2.2 to 9.1.0.40.2.16 in respect of their supply of extinguishing agent.

(b) The following requirements apply to permanently installed fire-extinguishing systems for protecting objects:

(i) 9.1.0.40.2.2, if the extinguishing agent used requires the range of action to be limited by structural measures;

(ii) 9.1.0.40.2.3 and 9.1.0.40.2.4;

(iii) 9.1.0.40.2.5 (b) and (c), in addition to the provisions of (c) of the present section;

(iv) 9.1.0.40.2.6, (a) to (e), and at each entrance to a room or in the immediate vicinity of an encapsulated object, a suitable sign for the fire-extinguishing system for physical protection must be prominently displayed;

(v) 9.1.0.40.2.7 to 9.1.0.40.2.13;

(vi) *(Reserved)*;

(vii) 9.1.0.40.2.15, (b) to (e).

Only extinguishing agents suitable for extinguishing a fire on or in the object to be protected and which are mentioned in 9.1.0.40.2.1 may be used in permanently installed fire-extinguishing systems for protecting objects.

The competent authority may authorize exemptions concerning the extinguishing agent for permanently installed fire-extinguishing systems for protecting objects which are based on a fire protection concept.

(c) Permanently installed fire-extinguishing systems for protecting objects must be capable of being triggered manually. Manual triggering must be possible in the immediate vicinity of the protected object. They may be triggered automatically if the triggering signal is emitted by two fire detectors with different means of detection. The triggering must occur without delay. If the fire-extinguishing system is intended to protect several spaces, it shall comprise a separate and clearly-marked triggering device for each space.

The activation of the fire-extinguishing system shall be displayed in the wheelhouse and at the entrance to the room in which the object to be protected is located. In the case of encapsulated objects, the display at the room entrance can be omitted if another display is attached to the object itself.

For manual activation, operating instructions in accordance with 9.1.0.40.2.5 (e) shall be displayed next to each triggering device, taking into account the location and nature of the object.

(d) The type and place of installation of permanently installed fire-extinguishing systems for protecting objects shall be entered in the ship's certificate.

(e) The provisions of this section do not apply to water spray systems in accordance with 9.3.1.28, 9.3.2.28 and 9.3.3.28.

9.1.0.40.3 The two hand fire-extinguishers referred to in 8.1.4 shall be located in the protected area or in proximity to it.

9.1.0.40.4 The fire-extinguishing agent in the permanently fixed fire-extinguishing system shall be suitable and sufficient for fighting fires.

9.1.0.41 ***Fire and naked light***

9.1.0.41.1 The outlets of funnels shall be located not less than 2 m from the hatchway openings. Arrangements shall be provided to prevent the escape of sparks and the entry of water.

9.1.0.41.2 Heating, cooking and refrigerating appliances shall not be fuelled with liquid fuels, liquid gas or solid fuels. The installation in the engine room or other separate space of heating appliances fuelled with liquid fuel having a flashpoint above 55 °C is, however, permitted.

Cooking and refrigerating appliances are permitted only in wheelhouses with metal floor and in the accommodation.

9.1.0.41.3 Only electric lighting appliances are permitted outside the accommodation and the wheelhouse.

9.1.0.42 to 9.1.0.50 *(Reserved)*

9.1.0.51 ***Surface temperatures of electrical and non-electrical installations and equipment***

(a) The surface temperatures of electrical and non-electrical installations and equipment as well as the outer parts of engines and their inlets and exhaust ducts shall not exceed 200 °C;

(b) The following are exempt from the above provision:

- Accommodation, wheelhouse and service spaces where surface temperatures higher than 200 °C occur that are equipped with a ventilation system according to 9.1.0.12.3; or

- Installations and equipment which generate surface temperatures higher than 200 °C and that can be switched off. Such installations and equipment shall be marked in red;

(c) Within the protected area, 9.1.0.53.1 applies;

(d) The requirements of 9.1.0.51 (a) and (b) must be met only if the vessel is located within or in the immediate vicinity of a shoreside assigned zone.

9.1.0.52 ***Type and location of electrical installations and equipment***

9.1.0.52.1 Electrical installations and equipment outside the protected area shall be at least of the 'limited explosion risk' type. This provision does not apply to:

(a) Lighting installations in the accommodation and in the wheelhouse, except for switches located near to the entrances;

(b) Mobile phones, fixed telephone installations as well as stationary and portable computers in the accommodation or the wheelhouse;

(c) Electrical installations and equipment which, during a stay in the immediate vicinity of or within a shoreside assigned zone, are:

– Not live; or

– Installed in spaces which are equipped with a ventilation system according to 9.1.0.12.3;

(d) Radiotelephone installations and inland AIS (automatic identification systems) stations in the accommodation and in the wheelhouse if no part of an aerial for radiotelephone installations or AIS stations is situated above or within 2.00 m from the protected area.

9.1.0.52.2 Fixed electrical installations and equipment which do not meet the requirements set out in 9.1.0.52.1 and their switches shall be marked in red. The disconnection of such equipment shall be controlled from a centralized location on board.

9.1.0.52.3 Sockets for the connection of signal lights and gangway lighting shall be solidly fitted to the vessel close to the signal mast or the gangway. Sockets intended to supply the submerged pumps, hold ventilators and containers shall be permanently fitted to the vessel in the vicinity of the hatches. The sockets shall be designed to ensure that it is only possible to connect or disconnect them when they are not live.

9.1.0.52.4 Accumulators shall be located outside the protected area.

9.1.0.52.5 Failure of the power supply for the safety and control equipment shall be immediately indicated by visual and audible signals in the wheelhouse and on the deck. The alarm must be relayed to the accommodation automatically if it has not been switched off.

9.1.0.52.6 Electrical switches, sockets and cables on deck shall be protected against mechanical damage.

9.1.0.52.7 The requirements of 9.1.0.52.1 and 9.1.0.52.2 shall be met only if the vessel is located within or in the immediate vicinity of an onshore assigned zone.

9.1.0.53 ***Type and location of electrical and non-electrical installations and equipment intended for use in the protected area***

9.1.0.53.1 It shall be possible to switch off the electrical installations and equipment in the protected area by means of centrally located isolation switches except where:

– In the holds, they are appropriate at least for use in zone 1, for temperature class T4 and explosion group II B; and

– In the protected area on the deck, they are of the limited explosion risk type.

The corresponding electrical circuits shall have control lamps to indicate whether or not the circuits are live.

The isolation switches shall be protected against unintended operation. Submerged pumps installed or used in the holds shall be appropriate at least for use in zone 1, temperature class T4 and explosion group II B.

9.1.0.53.2 The sockets used in the protected area shall be designed so as to prevent connection or disconnection except when they are not live.

9.1.0.53.3 Except in the case of optical fibres, electrical cables within the protected area shall be armoured or placed in a metallic sheath or in protective tubes.

9.1.0.53.4 Movable electric cables are prohibited in the protected area, except electric cables for intrinsically safe electric circuits or for connecting:

(a) Signal lights and lighting for gangways, provided the connection point (for example, the socket) is permanently fitted to the vessel close to the signal mast or gangway;

(b) Containers;

(c) Electrically operated hatch cover gantries;

(d) Submerged pumps;

(e) Hold ventilators;

(f) The power network on a vessel to a land-based power network; provided that:

– The electric cables and the power supply unit conform to a valid standard (for example, EN 15869-1:2019);

– The power supply unit and connectors are located outside of the protected area.

Connecting and disconnecting sockets/connectors shall only be possible when they are not live.

9.1.0.53.5 For movable electrical cables permitted in accordance with 9.1.0.53.4, only rubber-sheathed electrical cables of type H07 RN-F in accordance with IEC-60245-4:2011[4] or electrical cables of at least equivalent design having conductors with a cross-section of not less than 1.5 mm^2, shall be used.

9.1.0.53.6 Non-electrical installations and equipment in the protected area which are intended for use during loading and unloading or stay in the immediate vicinity of or within a shoreside assigned zone shall meet at least the requirements for use in the area concerned. They shall meet at least the requirements for temperature class T4 and explosion group II B.

9.1.0.54 and 9.1.0.55 *(Reserved)*

9.1.0.56 *(Deleted)*

9.1.0.57 to 9.1.0.69 *(Reserved)*

[4] *Identical to EN 50525-2-21: 2011*

9.1.0.70 ***Metal wires, masts***

All metal wires passing over the holds and all masts shall be earthed, unless they are electrically bonded to the metal hull of the vessel through their installation.

9.1.0.71 ***Admittance on board***

The notice boards displaying the prohibition of admittance in accordance with 8.3.3 shall be clearly legible from either side of the vessel.

9.1.0.72 and 9.1.0.73 *(Reserved)*

9.1.0.74 ***Prohibition of smoking, fire and naked light***

9.1.0.74.1 The notice boards displaying the prohibition of smoking in accordance with 8.3.4 shall be clearly legible from either side of the vessel.

9.1.0.74.2 Notice boards indicating the circumstances under which the prohibition applies shall be fitted near the entrances to the spaces where smoking or the use of fire or naked light is not always prohibited.

9.1.0.74.3 Ashtrays shall be provided close to each exit of the accommodation and the wheelhouse.

9.1.0.75 to 9.1.0.79 *(Reserved)*

9.1.0.80 ***Additional rules applicable to double-hull vessels***

The rules of 9.1.0.88 to 9.1.0.99 are applicable to double-hull vessels intended to carry dangerous goods of Classes 2, 3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 7, 8 or 9, except those for which label No. 1 is prescribed in column (5) of Table A of Chapter 3.2, in quantities exceeding those of 7.1.4.1.4.

9.1.0.81 to 9.1.0.87 *(Reserved)*

9.1.0.88 ***Classification***

9.1.0.88.1 Double-hull vessels intended to carry dangerous goods of Classes 2, 3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 7, 8 or 9 except those for which label No. 1 is prescribed in column (5) of Table A of Chapter 3.2, in quantities exceeding those referred to in 7.1.4.1.4 shall be built or transformed under survey of a recognised classification society in accordance with the rules established by that classification society to its highest class. This shall be confirmed by the classification society by the issue of an appropriate certificate.

9.1.0.88.2 Continuation of class is not required.

9.1.0.88.3 Future conversions and major repairs to the hull shall be carried out under survey of this classification society.

9.1.0.89 and 9.1.0.90 *(Reserved)*

9.1.0.91 ***Holds***

9.1.0.91.1 The vessel shall be built as a double-hull vessel with double-hull spaces and double bottom within the protected area.

9.1.0.91.2 The distance between the sides of the vessel and the longitudinal bulkheads of the hold shall be not less than 0.80 m. Regardless of the requirements relating to the width of walkways on deck, a reduction of this distance to 0.60 m is permitted, provided that, compared with the scantlings specified in the rules for construction published by a recognised classification society, the following reinforcements have been made:

(a) Where the vessel's sides are constructed according to the longitudinal framing system, the frame spacing shall not exceed 0.60 m.

The longitudinals shall be supported by web frames with lightening holes similar to the floors in the double bottom and spaced not more than 1.80 m apart. These intervals may be increased if the construction is correspondingly reinforced;

(b) Where the vessel's sides are constructed according to the transverse framing system, either:

– two longitudinal side shell stringers shall be fitted. The distance between the two stringers and between the uppermost stringer and the gangboard shall not exceed 0.80 m. The depth of the stringers shall be at least equal to that of the transverse frames and the cross-section of the face plate shall be not less than 15 cm^2.

The longitudinal stringers shall be supported by web frames with lightening holes similar to plate floors in the double bottom and spaced not more than 3.60 m apart. The transverse shell frames and the hold bulkhead vertical stiffeners shall be connected at the bilge by a bracket plate with a height of not less than 0.90 m and thickness equal to the thickness of the floors; or

– web frames with lightening holes similar to the double bottom plate floors shall be arranged on each transverse frame;

(c) The gangboards shall be supported by transverse bulkheads or cross-ties spaced not more than 32 m apart.

As an alternative to compliance with the requirements of (c) above, a proof by calculation, issued by a recognised classification society confirming that additional reinforcements have been fitted in the double-hull spaces and that the vessel's transverse strength may be regarded as satisfactory.

9.1.0.91.3 The depth of the double bottom shall be at least 0.50 m. The depth below the suction wells may, however, be locally reduced, but the space between the bottom of the suction well and the bottom of the vessel floor shall be at least 0.40 m. If spaces are between 0.40 m and 0.49 m, the surface area of the suction well shall not exceed 0.5 m^2.

The capacity of the suction wells must not exceed 0.120 m^3.

9.1.0.92 ***Emergency exit***

Spaces the entrances or exits of which are partly or fully immersed in damaged condition shall be provided with an emergency exit not less than 0.10 m above the waterline. This does not apply to forepeak and afterpeak.

9.1.0.93 ***Stability (general)***

9.1.0.93.1 Proof of sufficient stability shall be furnished including stability in the damaged condition.

9.1.0.93.2 The basic values for the stability calculation – the vessel's lightweight and the location of the centre of gravity – shall be determined either by means of an inclining experiment or by detailed mass and moment calculation. In the latter case the lightweight shall be checked by means of a lightweight test with a resulting difference of not more than ± 5% between the mass determined by the calculation and the displacement determined by the draught readings.

9.1.0.93.3 Proof of sufficient intact stability shall be furnished for all stages of loading and unloading and for the final loading condition.

Floatability after damage shall be proved for the most unfavourable loading condition. For this purpose calculated proof of sufficient stability shall be established for critical intermediate stages of flooding and for the final stage of flooding. Negative values of stability in intermediate stages of flooding may be accepted only if the continued range of curve of righting lever in damaged condition indicates adequate positive values of stability.

9.1.0.94 ***Stability (intact)***

9.1.0.94.1 The requirements for intact stability resulting from the damaged stability calculation shall be fully complied with.

9.1.0.94.2 For the carriage of containers, proof of sufficient stability shall also be furnished in accordance with the provisions of the Regulations referred to in 1.1.4.6.

9.1.0.94.3 The most stringent of the requirements of 9.1.0.94.1 and 9.1.0.94.2 above shall prevail for the vessel.

9.1.0.95 ***Stability (damaged condition)***

9.1.0.95.1 The following assumptions shall be taken into consideration for the damaged condition:

(a) The extent of side damage is as follows:

longitudinal extent:	at least 0.10 L, but not less than 5.00 m;
transverse extent:	0.59 m inboard from the vessel's side at right angles to the centreline at the level corresponding to the maximum draught;
vertical extent:	from the baseline upwards without limit;

(b) The extent of bottom damage is as follows:

longitudinal extent:	at least 0.10 L, but not less than 5.00 m;
transverse extent:	3.00 m;
vertical extent:	from the base 0.49 m upwards, the sump excepted;

(c) Any bulkheads within the damaged area shall be assumed damaged, which means that the location of bulkheads shall be chosen so as to ensure that the vessel remains afloat after the flooding of two or more adjacent compartments in the longitudinal direction.

The following provisions are applicable:

- For bottom damage also two adjacent athwartships compartments shall be assumed as flooded;
- The lower edge of any openings that cannot be closed watertight (e.g. doors, windows, access hatchways) shall, at the final stage of flooding, be not less than 0.10 m above the damage waterline;
- In general, permeability shall be assumed to be 95%. Where an average permeability of less than 95% is calculated for any compartment, this calculated value may be used.

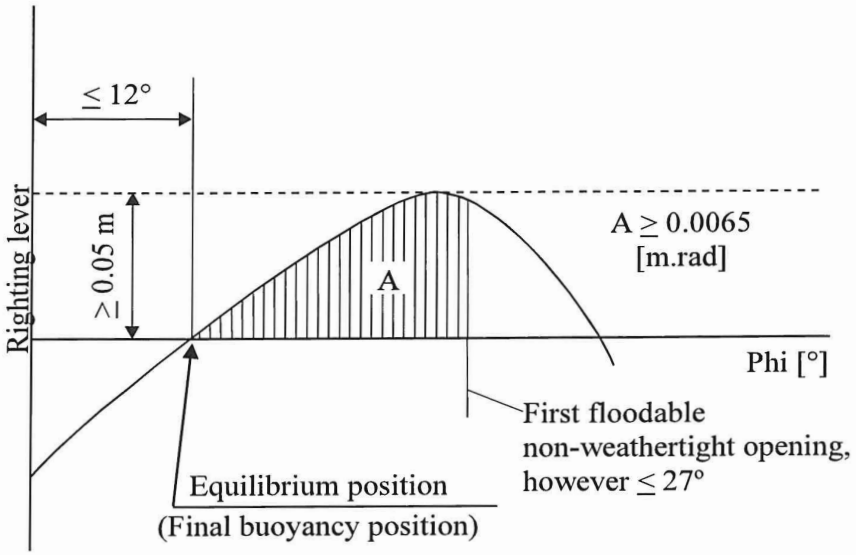
However, the following minimum values shall be used:

– engine rooms:	85%
– accommodation:	95%
– double bottoms, oil fuel tanks, ballast tanks, etc., depending on whether, according to their function, they have to be assumed as full or empty for the vessel floating at the maximum permissible draught:	0% or 95%

For the main engine room only the one–compartment standard needs to be taken into account, i.e. the end bulkheads of the engine room shall be assumed as not damaged.

9.1.0.95.2 At the stage of equilibrium (final stage of flooding) the angle of heel shall not exceed 12°. Non-watertight openings shall not be immersed before reaching the stage of equilibrium. If such openings are immersed before that stage, the corresponding spaces shall be considered as flooded for the purpose of stability calculation.

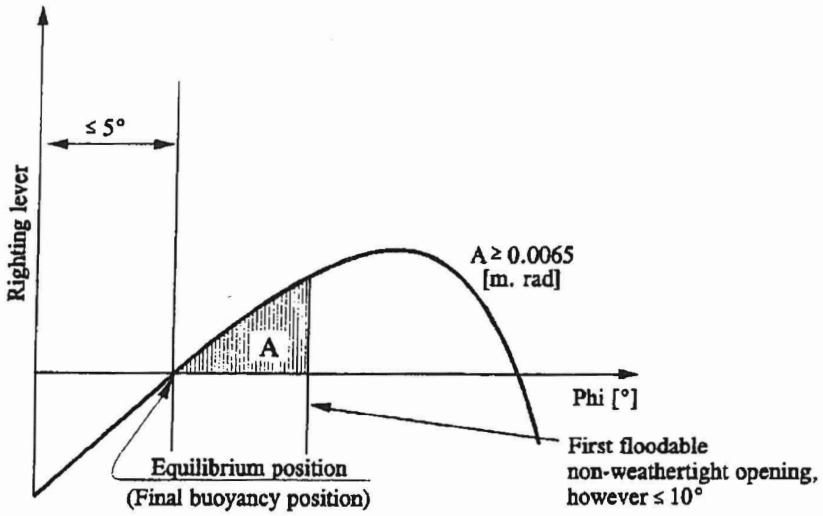
The positive range of the righting lever curve beyond the position of equilibrium shall have a righting lever of ≥ 0.05 m in association with an area under the curve of ≥ 0.0065 m·rad. The minimum values of stability shall be satisfied up to immersion of the first non-weathertight opening and in any event up to an angle of heel $\leq 27°$. If non-weathertight openings are immersed before that stage, the corresponding spaces shall be considered as flooded for the purposes of stability calculation.



9.1.0.95.3 Inland navigation vessels carrying containers which have not been secured shall satisfy the following damage stability criteria:

At the stage of equilibrium (final stage of flooding) the angle of heel shall not exceed 5°. Non-watertight openings shall not be immersed before reaching the stage of equilibrium. If such openings are immersed before that stage, the corresponding spaces shall be considered as flooded for the purpose of stability calculation;

The positive range of the righting lever curve beyond the position of equilibrium shall have an area under the curve of ≥ 0.0065 m.rad. The minimum values of stability shall be satisfied up to immersion of the first non-weathertight opening and in any event up to an angle of heel ≤ 10°. If non-weathertight openings are immersed before that stage, the corresponding spaces shall be considered as flooded for the purposes of stability calculation.



9.1.0.95.4 If openings through which undamaged compartments may become additionally flooded are capable of being closed watertight, the closing devices shall be appropriately marked.

9.1.0.95.5 Where cross- or down-flooding openings are provided for reduction of unsymmetrical flooding, the time for equalisation shall not exceed 15 minutes if during the intermediate stages of flooding sufficient stability has been proved.

9.1.0.96 to 9.1.0.99 *(Reserved)*

CHAPTER 9.2

RULES FOR CONSTRUCTION APPLICABLE TO SEAGOING VESSELS WHICH COMPLY WITH THE REQUIREMENTS OF THE SOLAS 74 CONVENTION, CHAPTER II-2, REGULATION 19 OR SOLAS 74, CHAPTER II-2, REGULATION 54

9.2.0 The requirements of 9.2.0.0 to 9.2.0.79 are applicable to seagoing vessels which comply with the following requirements:

- SOLAS 74, Chapter II-2, Regulation 19 in its amended version; or
- SOLAS 74, Chapter II-2, Regulation 54 in its amended version in accordance with the resolutions mentioned in Chapter II-2, Regulation 1, paragraph 2.1, provided that the vessel was constructed before 1 July 2002.

Seagoing vessels which do not comply with the above–mentioned requirements of the SOLAS 74 Convention shall meet the requirements of 9.1.0.0 to 9.1.0.79.

9.2.0.0 ***Materials of construction***

The vessel's hull shall be constructed of shipbuilding steel or other metal, provided that this metal has at least equivalent mechanical properties and resistance to the effects of temperature and fire.

9.2.0.1 to 9.2.0.19 *(Reserved)*

9.2.0.20 ***Water ballast***

The double-hull spaces and double bottoms may be arranged for being filled with water ballast.

9.2.0.21 to 9.2.0.30 *(Reserved)*

9.2.0.31 ***Engines***

9.2.0.31.1 Only internal combustion engines running on a fuel having a flashpoint above 60 °C, are allowed.

9.2.0.31.2 Ventilation inlets of the engine rooms and the air intakes of the engines which do not take air in directly from the engine room shall be located not less than 2 m from the protected area.

9.2.0.31.3 Sparking shall not be possible in the protected area.

9.2.0.32 and 9.2.0.33 *(Reserved)*

9.2.0.34 ***Exhaust pipes***

9.2.0.34.1 Exhausts shall be evacuated from the vessel into the open–air either upwards through an exhaust pipe or through the shell plating. The exhaust outlet shall be located not less than 2.00 m from the hatchway openings. The exhaust pipes of engines shall be arranged so that the exhausts are led away from the vessel. The exhaust pipes shall not be located within the protected area.

9.2.0.34.2 Exhaust pipes shall be provided with a device preventing the escape of sparks, e.g. spark arresters.

9.2.0.35 to 9.2.0.40 *(Reserved)*

9.2.0.41 ***Fire and naked light***

9.2.0.41.1 The outlets of funnels shall be located not less than 2.00 m from the hatchway openings. Arrangements shall be provided to prevent the escape of sparks and the entry of water.

9.2.0.41.2 Heating, cooking and refrigerating appliances shall not be fuelled with liquid fuels, liquid gas or solid fuels. The installation in the engine room or other separate space of heating appliances fuelled with liquid fuel having a flashpoint above 55 °C shall, however, be permitted.

Cooking and refrigerating appliances are permitted only in wheelhouses with metal floor and in the accommodation.

9.2.0.41.3 Only electric lighting appliances are permitted outside the accommodation and the wheelhouse.

9.2.0.42 to 9.2.0.70 *(Reserved)*

9.2.0.71 ***Admittance on board***

The notice boards displaying the prohibition of admittance in accordance with 8.3.3 shall be clearly legible from either side of the vessel.

9.2.0.72 and 9.2.0.73 *(Reserved)*

9.2.0.74 ***Prohibition of smoking, fire and naked light***

9.2.0.74.1 The notice boards displaying the prohibition of smoking in accordance with 8.3.4 shall be clearly legible from either side of the vessel.

9.2.0.74.2 Notice boards indicating the circumstances under which the prohibition applies shall be fitted near the entrances to the spaces where smoking or the use of fire or naked light is not always prohibited.

9.2.0.74.3 Ashtrays shall be provided close to each exit of the wheelhouse.

9.2.0.75 to 9.2.0.79 *(Reserved)*

9.2.0.80 ***Additional rules applicable to double-hull seagoing vessels***

The rules of 9.2.0.88 to 9.2.0.99 are applicable to double-hull seagoing vessels intended to carry dangerous goods of Classes 2, 3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 7, 8 or 9, except those for which label No. 1 is prescribed in column (5) of Table A of Chapter 3.2, in quantities exceeding those of 7.1.4.1.4.

9.2.0.81 to 9.2.0.87 *(Reserved)*

9.2.0.88 ***Classification***

9.2.0.88.1 Double-hull seagoing vessels intended to carry dangerous goods of Classes 2, 3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 7, 8 or 9 except those for which label No. 1 is prescribed in column (5) of Table A of Chapter 3.2, in quantities exceeding those referred to in 7.1.4.1.4, shall be built under survey of a recognised classification society in accordance with the rules established by that classification society to its highest class. This shall be confirmed by the classification society by the issue of an appropriate certificate.

9.2.0.88.2 The vessel's highest class shall be continued.

9.2.0.89 and 9.2.0.90 *(Reserved)*

9.2.0.91 ***Holds***

9.2.0.91.1 The vessel shall be built as a double-hull vessel with double–wall spaces and double bottom within the protected area.

9.2.0.91.2 The distance between the sides of the vessel and the longitudinal bulkheads of the hold shall be not less than 0.80 m. A locally reduced distance at the vessel's ends shall be permitted, provided the smallest distance between vessel's side and the longitudinal bulkhead (measured perpendicular to the side) is not less than 0.60 m. The sufficient structural strength of the vessel (longitudinal, transverse and local strength) shall be confirmed by the certificate of class.

9.2.0.91.3 The depth of the double bottom shall be not less than 0.50 m.

The depth below the suction wells may however be locally reduced to 0.40 m, provided the suction well has a capacity of not more than 0.03 m^3.

9.2.0.92 *(Reserved)*

9.2.0.93 ***Stability (general)***

9.2.0.93.1 Proof of sufficient stability shall be furnished including stability in the damaged condition.

9.2.0.93.2 The basic values for the stability calculation – the vessel's lightweight and the location of the centre of gravity – shall be determined either by means of an inclining experiment or by detailed mass and moment calculation. In the latter case the lightweight shall be checked by means of a lightweight test with a resulting difference of not more than ± 5% between the mass determined by the calculation and the displacement determined by the draught readings.

9.2.0.93.3 Proof of sufficient intact stability shall be furnished for all stages of loading and unloading and for the final loading condition.

Floatability after damage shall be proved for the most unfavourable loading condition. For this purpose calculated proof of sufficient stability shall be established for critical intermediate stages of flooding and for the final stage of flooding. Negative values of stability in intermediate stages of flooding may be accepted only if the continued range of curve of righting lever in damaged condition indicates adequate positive values of stability.

9.2.0.94 ***Stability (intact)***

9.2.0.94.1 The requirements for intact stability resulting from the damaged stability calculation shall be fully complied with.

9.2.0.94.2 For the carriage of containers, additional proof of sufficient stability shall be furnished in accordance with the requirements of the Regulations referred to in 1.1.4.6.

9.2.0.94.3 The most stringent of the requirements of 9.2.0.94.1 and 9.2.0.94.2 shall prevail for the vessel.

9.2.0.94.4 For seagoing vessels the provisions of 9.2.0.94.2 above may be regarded as having been complied with if the stability conforms to Resolution A.749 (18) of the International Maritime Organization and the stability documents have been checked by the competent authority. This applies only when all containers are secured as usual on seagoing vessels and a relevant stability document has been approved by the competent authority.

9.2.0.95 ***Stability (damaged condition)***

9.2.0.95.1 The following assumptions shall be taken into consideration for the damaged condition:

(a) The extent of side damage is as follows:

longitudinal extent:	at least 0.10 L, but not less than 5.00 m;
transverse extent:	0.59 m inboard from the vessel's side at right angles to the centreline at the level corresponding to the maximum draught;
vertical extent:	from the baseline upwards without limit;

(b) The extent of bottom damage is as follows:

longitudinal extent:	at least 0.10 L, but not less than 5.00 m;
transverse extent:	3.00 m;
vertical extent:	from the base 0.49 m upwards, the sump excepted;

(c) Any bulkheads within the damaged area shall be assumed damaged, which means that the location of bulkheads shall be chosen so that the vessel will remain afloat after flooding of two or more adjacent compartments in the longitudinal direction.

The following provisions are applicable:

- For bottom damage, adjacent athwartship compartments shall also be assumed as flooded;
- The lower edge of any openings that cannot be closed watertight (e.g. doors, windows, access hatchways) shall, at the final stage of flooding, be not less than 0.10 m above the damage waterline;
- In general, permeability shall be assumed to be 95%. Where an average permeability of less than 95% is calculated for any compartment, this calculated value may be used.

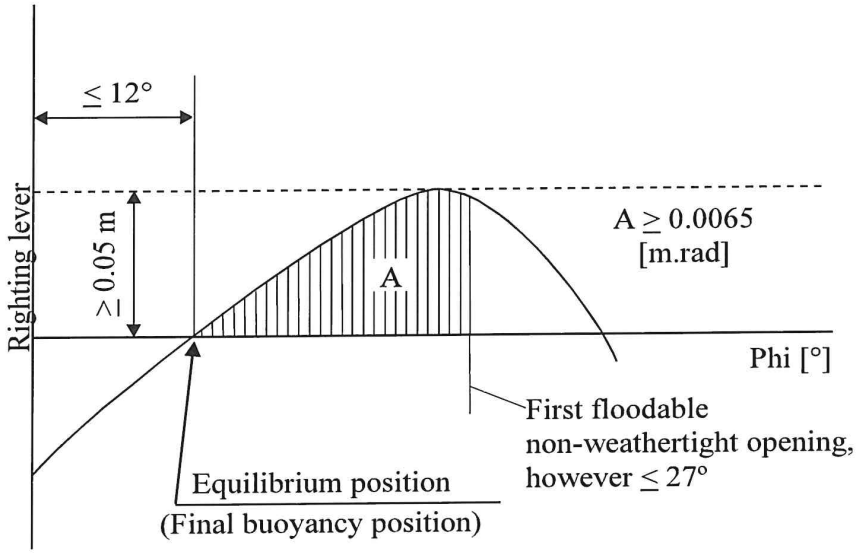
However, the following minimum values shall be used:

– engine rooms	85%
– accommodation	95%
– double bottoms, oil fuel tanks, ballast tanks, etc., depending on whether according to their function, they have to be assumed as full or empty for the vessel floating at the maximum permissible draught	0% or 95%

For the main engine room only the one–compartment standard needs to be taken into account. (Consequently, the end bulkheads of the engine room shall be assumed as not damaged.)

9.2.0.95.2 At the stage of equilibrium (final stage of flooding) the angle of heel shall not exceed 12°. Non-watertight openings shall not be immersed before reaching the stage of equilibrium. If such openings are immersed before that stage, the corresponding spaces shall be considered as flooded for the purpose of stability calculation.

The positive range of the righting lever curve beyond the position of equilibrium shall have a righting lever of ≥ 0.05 m in association with an area under the curve of ≥ 0.0065 m.rad. The minimum values of stability shall be satisfied up to immersion of the first non-weathertight opening and in any event up to an angle of heel ≤ 27°. If non-weathertight openings are immersed before that stage, the corresponding spaces shall be considered as flooded for the purposes of stability calculation.



9.2.0.95.3 If openings through which undamaged compartments may become additionally flooded are capable of being closed watertight, the closing devices shall be appropriately marked.

9.2.0.95.4 Where cross- or down-flooding openings are provided for reduction of unsymmetrical flooding, the time for equalisation shall not exceed 15 minutes if during the intermediate stages of flooding sufficient stability has been proved.

9.2.0.96 to 9.2.0.99 *(Reserved)*

CHAPTER 9.3

RULES FOR CONSTRUCTION OF TANK VESSELS

9.3.1 Rules for construction of type G tank vessels

The rules for construction of 9.3.1.0 to 9.3.1.99 apply to type G tank vessels.

9.3.1.0 *Materials of construction*

9.3.1.0.1.1 The vessel's hull and cargo tanks shall be constructed of shipbuilding steel or other at least equivalent metal, special provisions of the additional requirements/remarks of column (20) of Table C of Chapter 3.2 excepted.

9.3.1.0.1.2 Independent cargo tanks and membrane tanks may also be constructed of other materials, provided these have at least equivalent mechanical strength and resistance against the effects of temperature and fire.

For membrane tanks the equivalence for resistance against the effect of temperature and fire is deemed to be proven where the materials of the membrane tanks fulfil the following requirements:

– They withstand the range between the maximum temperature in service and 5 °C below the minimum design temperature, but not lower than -196 °C; and

– They are fire-resistant or protected by a suitable system such as a permanent inert gas environment or provided with a fire-retardant barrier.

9.3.1.0.2 Every part of the vessel including any installation and equipment which may come into contact with the cargo shall consist of materials which can neither be dangerously affected by the cargo nor cause decomposition of the cargo or react with it so as to form harmful or hazardous products. In case it has not been possible to examine this during classification and inspection of the vessel a relevant reservation shall be entered in the vessel substance list according to 1.16.1.2.5.

9.3.1.0.3 Except where explicitly permitted in 9.3.1.0.4 below or in the certificate of approval, the use of wood, aluminium alloys, plastic materials, rubber, glass or composite within the cargo area is prohibited.

9.3.1.0.4 The use of wood, aluminium alloys, plastic materials, rubber, glass or composite in the cargo area is permitted as shown in the following table:

(X means "allowed")	***Wood***	***Aluminium alloys***	***Plastic material / Composite***	***Rubber***	***Glass***
Permanently installed materials					
Chocking of cargo tanks which are independent of the vessel's hull and chocking of installations and equipment	X		X		
Masts and similar round timber	X	X	X		
Engine parts		X	X		
Protective covers of engines and pumps			X		
Notice boards (Prohibition of admittance and smoking)		X	X		
Parts of the electrical installation		X	X		
	According to the applicable technical norms				
Parts of the loading and unloading installation, e.g., gaskets		X	X	X	
Supports and stops of any kind	X		X		
Ventilators, including hose assemblies for ventilation		X	X		
Parts of the water spray system, the shower and the eye and face bath		X	X		
Insulation of cargo tanks and of piping for loading and unloading, gas discharge pipes and heating pipes		X	X	X	
Coating of cargo tanks and of piping for loading and unloading		X	X	X	
Insulation of cargo tanks (Table C, Column (20), Remark 32)		X	X	X	
All kinds of gaskets		X	X	X	
	Subject to Table C, Column (20), Remark 39 a)				
Cables for electrical equipment			X	X	
	According to the applicable technical norms				
Boxes, cabinets or other receptacles placed on the deck for storage of disposal and recovery equipment, for capstans, extinguishers, fire hoses, etc.		X	X		
Boxes, cabinets or other receptacles placed on the deck for storage of disposal of waste		X	X		
	For oily and greasy wastes fire-resistant receptacles only (7.2.1.21.6)				

(X means "allowed")	***Wood***	***Aluminium alloys***	***Plastic material / Composite***	***Rubber***	***Glass***
Portable equipment					
Gangways	X	X	X	X	
External ladders and passageways (gangways)		X	X	X	
Outboard ladders		X	X	X	
Ladders		X	X	X	
Cleaning equipment, e.g. brooms	X	X	X	X	
Fire extinguishers, portable gas detectors,		X	X	X	
Rescue winches		X			
Personal protective and safety equipment, rescue equipment conforming to ES-TRIN		X	X	X	
Driptrays			X		
Fenders	X		X	X	
Mooring lines, ropes for tenders, etc.			X		
	Respecting 7.2.4.76				
Mat under hose assemblies for loading and unloading piping system			X	X	
Fire hoses, air hoses, hoses for cleaning the deck, etc.			X	X	
Other kinds of hoses	*In line with 8.1.6.2 and norms mentioned*				
Aluminium gauging rods		X			
	If fitted with brass feet or protected in another way to avoid sparking.				
Sampling equipment			X		
Receptables for oily and greasy wastes (7.2.4.1)		X	X		
		Fire-resistant receptables, (7.2.1.21.6)			
Receptables for residual products and receptables for slops		X	X		
	Respecting ADR, RID or IMDG-Code regarding the admission requirements of materials.				
Sampling bottles			X		X
	Respecting ADR, regarding the admission requirements of materials.				
Photo-optical copies of the certificate of approval according to 8.1.2.6 or 8.1.2.7, and of the vessel's certificate, the measurement certificate and the Rhine navigation membership certificate		X	X		
Aluminum basket for storing of mooring wires/lines		X			
Boot's hook	X	X	X		
Ship's boat (In case of 7.2.3.29.1 and 7.2.3.31.1 allowed in the cargo area)		X	X		
	Only when the material shall not readily ignite				

9.3.1.0.5 The paint used in the cargo area shall not be liable to produce sparks in case of impact.

9.3.1.0.6 All permanently fitted materials in the accommodation or wheelhouse, with the exception of furniture, shall not readily ignite. They shall not evolve fumes or toxic gases in dangerous quantities, if involved in a fire.

9.3.1.1 ***Vessel record***

NOTE: *For the purpose of this paragraph, the term "owner" has the same meaning as in 1.16.0.*

The vessel record shall be retained by the owner who shall be able to provide this documentation at the request of the competent authority and the recognized classification society.

The vessel record shall be maintained and updated throughout the life of the vessel and shall be retained for 6 months after the vessel is taken out of service.

Should a change of owner occur during the life of the vessel the vessel record shall be transferred to the new owner.

Copies of the vessel record or all necessary documents shall be made available on request to the competent authority for the issuance of the certificate of approval and for the recognized classification society or inspection body for first inspection, periodic inspection, special inspection or exceptional checks.

9.3.1.2 to 9.3.1.7 *(Reserved)*

9.3.1.8 ***Classification***

9.3.1.8.1 The tank vessel shall be built under the survey of a recognised classification society and be classed in its highest class.

The vessel's highest class shall be continued. This shall be confirmed by an appropriate certificate issued by the recognized classification society (certificate of class).

The certificate of class shall confirm that the vessel is in conformity with its own additionally applicable rules and regulations that are relevant for the intended use of the vessel.

The design pressure and the test pressure of cargo tanks shall be entered in the certificate.

If a vessel has cargo tanks with different valve opening pressures, the design and test pressures of each tank shall be entered in the certificate.

The recognized classification society shall draw up a vessel substance list mentioning all the dangerous goods accepted for carriage by the tank vessel (see also 1.16.1.2.5).

9.3.1.8.2 to 9.3.1.8.4 *(Deleted)*

9.3.1.9 *(Reserved)*

9.3.1.10 ***Protection against the penetration of dangerous gases and the spreading of dangerous liquids***

9.3.1.10.1 The vessel shall be designed so as to prevent dangerous gases and liquids from penetrating into the accommodation, wheelhouse and service spaces. None of the windows in these spaces shall be capable of being opened unless its intended use is as an emergency exit and it is marked as such.

9.3.1.10.2 Liquid-tight protective coamings shall be fitted on deck at the height of the external bulkheads of the cargo tanks, at a maximum distance of 0.60 m from the outer cofferdam bulkheads or the hold end bulkheads. The protective coamings shall either extend over the entire width of the vessel or be fixed between the longitudinal spill coamings so as to prevent liquids from entering the forepeak and afterpeak. The height of the protective coamings and the spill coamings shall be at least 0.075 m. The protective coaming may correspond to the protection wall prescribed in 9.3.1.10.3 if the protection wall extends across the entire width of the vessel.

9.3.1.10.3 If the list of substances on the vessel according to 1.16.1.2.5 is going to include substances that require explosion protection in accordance with column (17) of Table C of Chapter 3.2, then the use of installations and equipment that are not of at least the 'limited explosion risk' type is not permitted during loading and unloading operations in parts of the deck outside the cargo area, unless those parts are protected against the entry of gases and liquids by a gas- and liquid-tight protection wall. The wall must either extend from one side of the vessel to the other or surround the areas to protect in an U-shaped form. The wall must cover the whole width of the area to protect and at least 1.00 m in the direction opposite to the cargo area (see Classification of zones diagram). The height of the wall shall be at least 1.00 m above the adjacent cargo deck area in the cargo area. The outer wall and side walls of the accommodation can be considered as a protection wall if they do not include openings and if the dimensions are complied with.

A protection wall is not required where the distance between the areas to be protected and the safety valve, the shore connections of the piping for loading and unloading, and venting piping, the compressor on deck and the opening of the closest pressure tanks is at least 12.00 m.

9.3.1.10.4 On deck, the lower edges of door-openings in the sidewalls of superstructures and the sills of hatches and ventilation openings of premises located under the deck shall have a height of not less than 0.50 m above the deck.

This requirement does not apply to access openings to double-hull spaces and double bottoms.

9.3.1.10.5 The bulwarks, foot-rails, etc., shall be provided with sufficiently large openings which are located directly above the deck.

9.3.1.11 ***Hold spaces and cargo tanks***

9.3.1.11.1 (a) The maximum permissible capacity of a cargo tank shall be determined in accordance with the following table:

$L \times B \times H$ (m^3)	Maximum permissible capacity of a cargo tank (m^3)
up to 600	$L \times B \times H \times 0.3$
600 to 3 750	$180 + (L \times B \times H - 600) \times 0.0635$
> 3 750	380

Alternative constructions in accordance with 9.3.4 are permitted.

In the table above $L \times B \times H$ is the product of the main dimensions of the tank vessel in metres (according to the measurement certificate), where:

L = overall length of the hull in m;

B = extreme breadth of the hull in m;

H = shortest vertical distance between the top of the keel and the lowest point of the deck at the side of the vessel (moulded depth) within the cargo area in m;

where:

For trunk vessels, H shall be replaced by H', where H' shall be obtained from the following formula:

$$H' = H + \left(ht \times \frac{bt}{B} \times \frac{lt}{L} \right)$$

where:

ht = trunk height (distance between trunk deck and main deck measured on trunk side at L/2) in m;

bt = trunk breadth in m;

lt = trunk length in m;

(b) Pressure tanks whose ratio of length to diameter exceeds 7 are prohibited.

(c) The pressure tanks shall be designed for a cargo temperature of + 40 °C.

9.3.1.11.2 (a) In the cargo area, the hull shall be designed as follows:[1]

– as a double-hull and double bottom vessel. The internal distance between the sideplatings of the vessel and the longitudinal bulkheads shall not be less than 0.80 m, the height of the double bottom shall be not less than 0.60 m, the cargo tanks shall be supported by saddles extending between the tanks to not less than 20° below the horizontal centreline of the cargo tanks.

Refrigerated cargo tanks and cargo tanks used for the transport of refrigerated liquefied gases shall be installed only in hold spaces bounded by double-hull spaces and double–bottom. Cargo tank fastenings shall meet the requirements of a recognised classification society; or

– as a single–hull vessel with the sideplatings of the vessel between gangboard and top of floor plates provided with side stringers at regular intervals of not more than 0.60 m which are supported by web frames spaced at intervals of not more than 2.00 m. The side stringers and the web frames shall have a height of not less than 10% of the depth, however, not less than 0.30 m. The side stringers and web frames shall be fitted with a face plate made of flat steel and having a cross-section of not less that 7.5 cm^2 and 15 cm^2, respectively.

The distance between the sideplating of the vessel and the cargo tanks shall be not less than 0.80 m and between the bottom and the cargo tanks not less than 0.60 m. The depth below the suction wells may be reduced to 0.50 m.

The lateral distance between the suction well of the cargo tanks and the bottom structure shall be not less than 0.10 m.

The cargo tank supports and fastenings should extend to not less than 10° below the horizontal centreline of the cargo tanks.

---

1 *For a different design of the hull in the cargo area, proof shall be furnished by way of calculation that in the event of a lateral collision with another vessel having a straight bow, an energy of 22 MJ can be absorbed without any rupture of the cargo tanks and the piping leading to the cargo tanks. Alternative constructions in accordance with 9.3.4 are permitted.*

(b) The cargo tanks shall be fixed so that they cannot float.

(c) The capacity of a suction well shall be limited to not more than 0.10 m^3. For pressure cargo tanks, however, the capacity of a suction well may be of 0.20 m^3.

(d) Side–struts linking or supporting the load-bearing components of the sides of the vessel with the load-bearing components of the longitudinal walls of cargo tanks and side–struts linking the load-bearing components of the vessel's bottom with the tank-bottom are prohibited.

(e) Cargo tanks intended to contain products at a temperature below -10°C shall be suitably insulated to ensure that the temperature of the vessel's structure does not fall below the minimum allowable material design temperature. The insulation material shall be resistant to flame spread.

9.3.1.11.3 (a) The hold spaces shall be separated from the accommodation, engine rooms and service spaces outside the cargo area below deck by bulkheads of Class "A-60" as defined in SOLAS 74, Chapter II-2, Regulation 3. A space of not less than 0.20 m shall be provided between the cargo tanks and the end bulkheads of the hold spaces. Where the cargo tanks have plane end bulkheads this space shall be not less than 0.50 m.

(b) The hold spaces and cargo tanks shall be capable of being inspected.

(c) All spaces in the cargo area shall be capable of being ventilated. Means for checking their gas-free condition shall be provided.

9.3.1.11.4 The bulkheads bounding the hold spaces shall be watertight. The cargo tanks and the bulkheads bounding the cargo area shall have no openings or penetrations below deck.

The bulkhead between the engine room and the service spaces within the cargo area or between the engine room and a hold space may be fitted with penetrations provided that they conform to the requirements of 9.3.1.17.5.

9.3.1.11.5 Double-hull spaces and double bottoms in the cargo area shall be arranged for being filled with ballast water only. Double bottoms may, however, be used as oil fuel tanks, provided they comply with the requirements of 9.3.1.32.

9.3.1.11.6 (a) A space in the cargo area below deck may be arranged as a service space, provided that the bulkhead bounding the service space extends vertically to the bottom and the bulkhead not facing the cargo area extends from one side of the vessel to the other in one frame plane. This service space shall only be accessible from the deck.

(b) The service space shall be watertight with the exception of its access hatches and ventilation inlets.

(c) No piping for loading or unloading shall be fitted within the service space referred to under (a) above.

Piping for loading and unloading may be fitted in the cargo pump rooms below deck only when they conform to the provisions of 9.3.1.17.6.

9.3.1.11.7 Where service spaces are located in the cargo area under deck, they shall be arranged so as to be easily accessible and to permit persons wearing personal protective equipment and breathing apparatus to safely operate the service equipment contained therein. They shall be designed so as to allow injured or unconscious personnel to be removed from such spaces without difficulty, if necessary by means of fixed equipment.

9.3.1.11.8 Hold spaces and other accessible spaces within the cargo area shall be arranged so as to ensure that they may be completely inspected and cleaned in an appropriate manner. The dimensions of openings, except for those of double-hull spaces and double bottoms which do not have a wall adjoining the cargo tanks, shall be sufficient to allow a person wearing breathing apparatus to enter or leave the space without difficulty. These openings shall have a minimum cross-sectional area of 0.36 m^2 and a minimum side length of 0.50 m. They shall be designed so as to allow injured or unconscious persons to be removed from the bottom of such spaces without difficulties, if necessary by means of fixed equipment. In these spaces the distance between the reinforcements shall not be less than 0.50 m. In double bottoms this distance may be reduced to 0.45 m.

Cargo tanks may have circular openings with a diameter of not less than 0.68 m.

9.3.1.11.9 In case the vessel has insulated cargo tanks, the hold spaces shall only contain dry air to protect the insulation of the cargo tanks against moisture.

9.3.1.12 ***Ventilation***

9.3.1.12.1 Each hold space shall have two openings the dimensions and location of which shall be such as to permit effective ventilation of any part of the hold space. If there are no such openings, it shall be possible to fill the hold spaces with inert gas or dry air.

9.3.1.12.2 Double-hull spaces and double bottoms within the cargo area which are not arranged for being filled with ballast water and cofferdams between engine rooms and pump rooms, if they exist, shall be provided with ventilation systems.

9.3.1.12.3 (a) A service space located within the cargo area below deck shall be provided with a ventilation system. The capacity of the fans shall be sufficient to ensure 20 complete changes of air per hour based on the volume of the service space.

The ventilation exhaust ducts shall extend down to 50 mm above the bottom of the service space. The air shall be supplied through a duct at the top of the service space.

(b) If the list of substances on the vessel according to 1.16.1.2.5 is going to include substances that require explosion protection in accordance with column (17) of Table C of Chapter 3.2, then the air inlets shall be located not less than 2.00 m above the deck, at a distance of not less than 2.00 m from tank openings and 6.00 m from the outlets of safety valves.

The extension pipes which may be necessary may be of the hinged type.

9.3.1.12.4 (a) Ventilation shall be provided for the accommodation, wheelhouse and service spaces.

(b) The ventilation system in such spaces shall meet the following requirements:

(i) The air intakes shall be located as far away as possible, and not less than 6.00 m from the cargo area and not less than 2.00 m above the deck;

(ii) Pressure of at least 0.1 kPa (0.001 bar) may be maintained in the premises;

(iii) A breakdown alarm is integrated;

(iv) The ventilation system, including the breakdown alarm, shall be at least of the 'limited explosion risk' type;

(v) A gas detection system conforming to conditions 1. to 4. below is connected to the ventilation system:

1. It is appropriate at least for use in zone 1, explosion group IIC and temperature class T4;
2. It is equipped with sensors;
   - On the suction inlets of the ventilation systems; and
   - Directly below the top edge of the sill of the entrance doors;
3. Its t90 response time is lower than or equal to 4 s;
4. Measurement shall be continuous;

(vi) In the service spaces, the ventilation system is linked to the emergency lighting, which shall be at least of the 'limited explosion risk' type;

This emergency lighting is not necessary if the lighting installations in the service spaces are of at least the 'limited explosion risk' type;

(vii) The suction of the ventilation system and installations and equipment that do not meet the requirements set out in 9.3.1.51 (a) and (b) and 9.3.1.52.1 must be shut down when a concentration of 20% of LEL of n-Hexane is reached;

The switching-off shall be indicated in the accommodation and wheelhouse by visual and audible signals;

(viii) In the event of failure of the ventilation system or the gas detection installations in the accommodation, installations and equipment in the accommodation that do not meet the requirements set out in 9.3.1.51 (a) and (b) and 9.3.1.52.1 must be stopped;

The failure shall be indicated in the accommodation, the wheelhouse and on the deck by visual and audible signals;

(ix) In the event of failure of the ventilation system or the gas detection installations in the wheelhouse or service spaces, installations and equipment in those spaces that do not meet the requirements set out in 9.3.1.51 (a) and (b) and 9.3.1.52.1 must be shut down;

The failure shall be indicated in the wheelhouse and on the deck by visual and audible signals. The alarm must be relayed to the accommodation automatically if it has not been switched off;

(x) Any switching-off shall take place immediately and automatically and, if necessary, shall activate the emergency lighting;

The automatic switch-off device is set so that no automatic switching-off may occur while the vessel is under way;

(c) If there is no ventilation system or the ventilation system of a space does not comply with all the requirements set out in (b) above, any installations or equipment present in that space that may, if switched on, give rise to surface temperatures higher than those mentioned in 9.3.1.51 (a) and (b) or that do not meet the requirements set out in 9.3.1.52.1 must be capable of being switched off.

9.3.1.12.5 *(Deleted)*

9.3.1.12.6 Notice boards shall be fitted at the ventilation inlets indicating the conditions under which they shall be closed. All ventilation inlets of accommodation, wheelhouse and service spaces leading to the open air outside the cargo area shall be fitted with devices permanently fixed according to 9.3.1.40.2.2 (c), enabling them to be closed rapidly. It shall be clear whether they are open or closed.

Such ventilation inlets shall be located not less than 2.00 m from the cargo area.

Ventilation inlets of service spaces in the cargo area may be located within that area.

Ventilation inlets of service spaces in the cargo area may be located within such area.

9.3.1.13 ***Stability (general)***

9.3.1.13.1 Proof of sufficient stability shall be furnished including for stability in damaged condition.

9.3.1.13.2 The basic values for the stability calculation – the vessel's lightweight and location of the centre of gravity – shall be determined either by means of an inclining experiment or by detailed mass and moment calculation. In the latter case the lightweight of the vessel shall be checked by means of a lightweight test with a tolerance limit of ± 5% between the mass determined by calculation and the displacement determined by the draught readings.

9.3.1.13.3 Proof of sufficient intact stability shall be furnished for all stages of loading and unloading and for the final loading condition for all the relative densities of the substances transported contained in the vessel substance list according to 1.16.1.2.5.

For every loading case, taking account of the actual fillings and floating position of cargo tanks, ballast tanks and compartments, drinking water and sewage tanks and tanks containing products for the operation of the vessel, the vessel shall comply with the intact and damage stability requirements.

Intermediate stages during operations shall also be taken into consideration.

The proof of sufficient stability shall be shown for every operating, loading and ballast condition in the stability booklet, to be approved by the recognized classification society, which classes the vessel. If it is unpractical to pre-calculate the operating, loading and ballast conditions, a loading instrument approved by the recognised classification society which classes the vessel shall be installed and used which contains the contents of the stability booklet.

NOTE: *A stability booklet shall be worded in a form comprehensible for the responsible master and containing the following details:*

General description of the vessel:

- *General arrangement and capacity plans indicating the assigned use of compartments and spaces (cargo tanks, stores, accommodation, etc.);*
- *A sketch indicating the position of the draught marks referring to the vessel's perpendiculars;*
- *A scheme for ballast/bilge pumping and overflow prevention systems;*
- *Hydrostatic curves or tables corresponding to the design trim, and, if significant trim angles are foreseen during the normal operation of the vessel, curves or tables corresponding to such range of trim are to be introduced;*

- *Cross curves or tables of stability calculated on a free trimming basis, for the ranges of displacement and trim anticipated in normal operating conditions, with an indication of the volumes which have been considered buoyant;*

- *Tank sounding tables or curves showing capacities, centres of gravity, and free surface data for all cargo tanks, ballast tanks and compartments, drinking water and sewage water tanks and tanks containing products for the operation of the vessel;*

- *Lightship data (weight and centre of gravity) resulting from an inclining test or deadweight measurement in combination with a detailed mass balance or other acceptable measures. Where the above–mentioned information is derived from a sister vessel, the reference to this sister vessel shall be clearly indicated, and a copy of the approved inclining test report relevant to this sister vessel shall be included;*

- *A copy of the approved test report shall be included in the stability booklet;*

- *Operating loading conditions with all relevant details, such as:*

  - *Lightship data, tank fillings, stores, crew and other relevant items on board (mass and centre of gravity for each item, free surface moments for liquid loads);*

  - *Draughts amidships and at perpendiculars;*

  - *Metacentric height corrected for free surfaces effect;*

  - *Righting lever values and curve;*

  - *Longitudinal bending moments and shear forces at read–out points;*

  - *Information about openings (location, type of tightness, means of closure); and*

  - *Information for the master.*

- *Calculation of the influence of ballast water on stability with information on whether fixed level gauges for ballast tanks and compartments have to be installed or the ballast tanks, or compartments shall only be completely full or completely empty when underway.*

9.3.1.13.4 Floatability after damage shall be proved for the most unfavourable loading condition. For this purpose, calculated proof of sufficient stability shall be established for critical intermediate stages of flooding and for the final stage of flooding.

9.3.1.14 ***Stability (intact)***

9.3.1.14.1 The requirements for intact stability resulting from the damaged stability calculation shall be fully complied with.

9.3.1.14.2 For vessels with cargo tanks of more than 0.70 B in width, proof shall be furnished that the following stability requirements have been complied with:

(a) In the positive area of the righting lever curve up to immersion of the first non-weathertight opening there shall be a righting lever (GZ) of not less than 0.10 m;

(b) The surface of the positive area of the righting lever curve up to immersion of the first non-weathertight opening and in any event up to an angle of heel < 27° shall not be less than 0.024 m.rad;

(c) The metacentric height (GM) shall be not less than 0.10 m.

These conditions shall be met bearing in mind the influence of all free surfaces in tanks for all stages of loading and unloading.

9.3.1.14.3 The most stringent requirement of 9.3.1.14.1 and 9.3.1.14.2 is applicable to the vessel.

9.3.1.15 ***Stability (damaged condition)***

9.3.1.15.1 The following assumptions shall be taken into consideration for the damaged condition:

(a) The extent of side damage is as follows:

longitudinal extent:	at least 0.10 L, but not less than 5.00 m;
transverse extent:	0.79 m inboard from the vessel's side at right angles to the centreline at the level corresponding to the maximum draught, or when applicable, the distance allowed by section 9.3.4, reduced by 0.01 m;
vertical extent:	from the base line upwards without limit;

(b) The extent of bottom damage is as follows:

longitudinal extent:	at least 0.10 L, but not less than 5.00 m;
transverse extent:	3.00 m;
vertical extent:	from the base 0.59 m upwards, the well excepted;

(c) Any bulkheads within the damaged area shall be assumed damaged, which means that the location of bulkheads shall be chosen so as to ensure that the vessel remains afloat after the flooding of two or more adjacent compartments in the longitudinal direction.

The following provisions are applicable:

– For bottom damage, adjacent athwartship compartments shall also be assumed as flooded;

– The lower edge of any non-watertight openings (e.g. doors, windows, access hatchways) shall, at the final stage of flooding, be not less than 0.10 m above the damage waterline;

– In general, permeability shall be assumed to be 95%. Where an average permeability of less than 95% is calculated for any compartment, this calculated value obtained may be used.

However, the following minimum values shall be used:

- engine rooms: 85%;
- accommodation: 95%;
- double bottoms, oil fuel tanks, ballast tanks, etc., depending on whether, according to their function, they have to be assumed as full or empty for the vessel floating at the maximum permissible draught: 0% or 95%.

For the main engine room only the one–compartment standard need be taken into account, i.e. the end bulkheads of the engine room shall be assumed as not damaged.

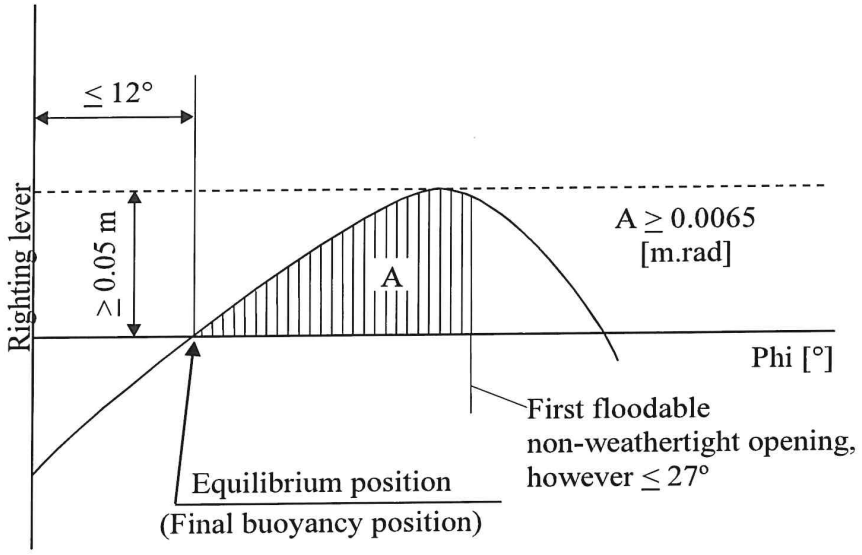
9.3.1.15.2 For the intermediate stage of flooding the following criteria have to be fulfilled:

$GZ \geq 0.03m$

Range of positive GZ: 5°.

At the stage of equilibrium (final stage of flooding), the angle of heel shall not exceed 12°. Non-watertight openings shall not be flooded before reaching the stage of equilibrium. If such openings are immersed before that stage, the corresponding spaces shall be considered as flooded for the purpose of stability calculation.

The positive range of the righting lever curve beyond the stage of equilibrium shall have a righting level of ≥ 0.05 m in association with an area under the curve of ≥ 0.0065 m.rad. The minimum values of stability shall be satisfied up to immersion of the first non-weathertight opening and in any event up to an angle of heel $\leq 27°$. If non-weathertight openings are immersed before that stage, the corresponding spaces shall be considered as flooded for the purpose of stability calculation.



9.3.1.15.3 If openings through which undamaged compartments may additionally become flooded are capable of being closed watertight, the closing appliances shall be marked accordingly.

9.3.1.15.4 When cross- or down-flooding openings are provided for reduction of unsymmetrical flooding, the time for equalisation shall not exceed 15 minutes, if during the intermediate stages of flooding sufficient stability has been proved.

9.3.1.16 ***Engine rooms***

9.3.1.16.1 Internal combustion engines for the vessel's propulsion as well as internal combustion engines for auxiliary machinery shall be located outside the cargo area. Entrances and other openings of engine rooms shall be at a distance of not less than 2.00 m from the cargo area.

9.3.1.16.2 The engine room shall be accessible from the deck; the entrances shall not face the cargo area. When the doors are not located in a recess whose depth is at least equal to the door width, the hinges shall face the cargo area.

9.3.1.17 ***Accommodation and service spaces***

9.3.1.17.1 Accommodation spaces and the wheelhouse shall be located outside the cargo area forward of the fore vertical plane or abaft the aft vertical plane bounding the part of the cargo area below deck. Windows of the wheelhouse which are located not less than 1.00 m above the bottom of the wheelhouse may tilt forward.

9.3.1.17.2 Entrances to spaces and openings of superstructures shall not face the cargo area. Doors opening outward and not located in a recess the depth of which is at least equal to the width of the doors shall have their hinges facing the cargo area.

9.3.1.17.3 Entrances from the deck and openings of spaces facing the weather shall be capable of being closed. The following instruction shall be displayed at the entrance of such spaces:

Do not open during loading, unloading and degassing
without the permission of the master.
Close immediately.

9.3.1.17.4 Entrances and windows of superstructures and accommodation spaces which can be opened as well as other openings of these spaces shall be located not less than 2.00 m from the cargo area. No wheelhouse doors and windows shall be located within 2.00 m from the cargo area, except where there is no direct connection between the wheelhouse and the accommodation.

9.3.1.17.5 (a) Driving shafts of the bilge or ballast pumps may penetrate through the bulkhead between the service space and the engine room, provided the arrangement of the service space is in compliance with 9.3.1.11.6.

(b) The penetration of the shaft through the bulkhead shall be gastight and shall have been approved by a recognised classification society.

(c) The necessary operating instructions shall be displayed.

(d) Penetrations through the bulkhead between the engine room and the service space in the cargo area, and the bulkhead between the engine room and the hold spaces may be provided for electrical cables, hydraulic lines and piping for measuring, control and alarm systems, provided that the penetrations have been approved by a recognised classification society. The penetrations shall be gastight. Penetrations through a bulkhead with an "A-60" fire protection insulation according to SOLAS 74, Chapter II-2, Regulation 3, shall have an equivalent fire protection.

(e) Pipes may pass through the bulkhead between the engine room and the service space in the cargo area provided that these are pipes between the mechanical equipment in the engine room and the service space which do not have any openings within the service space and which are provided with shut-off devices at the bulkhead in the engine room.

(f) Notwithstanding 9.3.1.11.4, pipes from the engine room may pass through the service space in the cargo area or a cofferdam or a hold space or a double-hull space to the outside provided that within the service space or cofferdam or hold space or double-hull space they are of the thick-walled type and have no flanges or openings.

(g) Where a driving shaft of auxiliary machinery penetrates through a wall located above the deck the penetration shall be gastight.

9.3.1.17.6 A service space located within the cargo area below deck shall not be used as a cargo pump room for the vessel's own gas discharging system, e.g. compressors or the compressor/heat exchanger/pump combination, except where:

- the cargo pump room is separated from the engine room or from service spaces outside the cargo area by a cofferdam or a bulkhead with an insulation of Class "A-60" as defined in SOLAS 74, Chapter II-2, Regulation 3, or by a service space or a hold space;
- the "A-60" bulkhead required above does not include penetrations referred to in 9.3.1.17.5 (a);
- ventilation exhaust outlets are located not less than 6.00 m from entrances and openings of the accommodation, wheelhouse and service spaces outside the cargo area;
- the access hatches and ventilation inlets can be closed from the outside;
- all piping for loading and unloading (at the suction side and the delivery side) are led through the deck above the pump room. The necessary operation of the control devices in the pump room, starting of pumps or compressors and control of the liquid flow rate shall be effected from the deck;
- the system is fully integrated in the gas and liquid piping system;
- the cargo pump room is provided with a permanent oxygen detection system which automatically indicates the amount of oxygen and which actuates a visual and audible alarm when the oxygen concentration has reached 19.5% by volume. The sensors of this system shall be placed at suitable positions at the bottom and at a height of 2.00 m. Measurement shall be continuous and displayed near to the entrance. Audible and visual alarms shall be installed in the wheelhouse and in the cargo pump room and, when the alarm is actuated, the loading and unloading system shall be shut down;
- failure of the oxygen measuring system shall actuate a visual and audible alarm in the wheelhouse and on deck. The alarm must be relayed to the accommodation automatically if it has not been switched off;
- the ventilation system prescribed in 9.3.1.12.3 has a capacity sufficient to ensure not less than 30 changes of air per hour based on the total volume of the service space.

If the list of substances on the vessel according to 1.16.1.2.5 is going to include substances that require explosion protection in accordance with column (17) of Table C of Chapter 3.2, then the cargo pump room shall also be provided with a permanent gas detection system which automatically indicates the presence of flammable gases and actuates a visual and audible alarm when the gas concentration has reached 20% of the LEL of n-Hexane or of the calibration gas prescribed by the system's manufacturer.

The sensors of this gas detection system shall be placed at suitable positions at the bottom and directly below the deck.

Measurement shall be continuous and displayed near to the entrance.

Audible and visual alarms shall be installed in the wheelhouse and in the cargo pump room and, when the alarm is actuated, the loading and unloading system shall be shut down.

Any failure of the gas detection system shall be immediately signalled in the wheelhouse and on deck by a visual and audible warning. The alarm must be relayed to the accommodation automatically if it has not been switched off.

9.3.1.17.7 The following instruction shall be displayed at the entrance of the cargo pump room:

Before entering the cargo pump room check whether it is free from gases and contains sufficient oxygen. Do not open doors and entrance openings without the permission of the master. Leave immediately in the event of alarm.

9.3.1.18 ***Inerting facilities***

9.3.1.18.1 In cases in which inerting or blanketing of the cargo is prescribed, the vessel shall be equipped with an inerting system.

The system shall be capable of keeping permanently a minimum pressure of 7 kPa (0.07 bar) in the spaces to be inerted. In addition, the inerting system shall not increase the pressure in the cargo tank to a pressure greater than that at which the pressure valve is regulated. The set pressure of the vacuum-relief valve shall be 3.5 kPa (0.035 bar).

A sufficient quantity of inert gas for loading or unloading shall be carried or produced on board if it is not possible to obtain it on shore. In addition, a sufficient quantity of inert gas to offset normal losses occurring during carriage shall be on board.

The premises to be inerted shall be equipped with connections for introducing the inert gas and monitoring systems so as to ensure the correct atmosphere on a permanent basis.

When the pressure or the concentration of inert gas in the gaseous phase falls below a given value, this monitoring system shall activate an audible and visible alarm in the wheelhouse. When the wheelhouse is unoccupied, the alarm shall also be perceptible in a location occupied by a crew member.

9.3.1.18.2 Vessels equipped with membrane tanks shall have an inerting system capable of inerting all insulation spaces of the tanks.

The system shall be capable of keeping permanently a minimum pressure above atmospheric pressure in the spaces to be inerted.

The inert gas shall be produced on board or carried in a quantity that is sufficient for the entire holding time as determined in accordance with 7.2.4.16.16 and 7.2.4.16.17. The circulation of inert gas throughout the spaces to be inerted shall be sufficient to allow for effective means of gas detection.

The spaces to be inerted shall be equipped with connections for introducing the inert gas and monitoring systems so as to ensure the required atmosphere on a permanent basis.

When the pressure, the temperature or the concentration of the inert gas falls below a given value, this monitoring system shall activate an audible and visible alarm in the wheelhouse. When the wheelhouse is unoccupied, the alarm shall also be perceptible in a location occupied by a crew member.

9.3.1.19 and 9.3.1.20 (*Reserved*)

9.3.1.21 ***Safety and control installations***

9.3.1.21.1 Cargo tanks shall be provided with the following equipment:

(a) (*Reserved*)

(b) a level gauge;

(c) a level alarm device which is activated at the latest when a degree of filling of the cargo tank of 86% is reached;

(d) a high level sensor for actuating the facility against overflowing at the latest when a degree of filling of the cargo tank of 97.5% is reached;

(e) an instrument for measuring the pressure of the gas phase in the cargo tank;

(f) an instrument for measuring the temperature of the cargo;

(g) a connection for a closed-type sampling device. The connection shall be fitted with a shut-off device resistant to the internal pressure at the connection.

9.3.1.21.2 When the degree of filling of the cargo tank in per cent is determined, an error of not more than 0.5% is permitted. It shall be calculated on the basis of the total cargo tank capacity including the expansion trunk.

9.3.1.21.3 The level gauge shall allow readings from the control position of the shut-off devices of the particular cargo tank. The permissible maximum filling levels of 91%, 95% and 97%, as given in the list of substances, shall be marked on each level gauge.

Permanent reading of the overpressure and vacuum shall be possible from a location from which loading or unloading operations may be interrupted. The permissible maximum overpressure and vacuum shall be marked on each level gauge.

Readings shall be possible in all weather conditions.

9.3.1.21.4 The level alarm device shall give a visual and audible warning on board when actuated. The level alarm device shall be independent of the level gauge.

9.3.1.21.5 (a) The high level sensor referred to in 9.3.1.21.1 (d) shall give a visual and audible alarm on board and at the same time actuate an electrical contact which in the form of a binary signal interrupts the electric current loop provided and fed by the shore facility, thus initiating measures at the shore facility against overflowing during loading operations.

The signal shall be transmitted to the shore facility via a watertight two–pin plug of a connector device in accordance with standard EN 60309–2:1999 + A1:2007 + A2:2012 for direct current of 40 to 50 volts, identification colour white, position of the nose 10 h.

The plug shall be permanently fitted to the vessel close to the shore connections of the loading and unloading piping.

The high level sensor shall also be capable of switching off the vessel's own discharging pump.

The high level sensor shall be independent of the level alarm device, but it may be connected to the level gauge.

(b) During discharging by means of the on-board pump, it shall be possible for the shore facility to switch it off. For this purpose, an independent intrinsically safe power line, fed by the vessel, shall be switched off by the shore facility by means of an electrical contact.

It shall be possible for the binary signal of the shore facility to be transmitted via a watertight two–pole socket or a connector device in accordance with standard EN 60309-2:1999 + A1:2007 + A2:2012, for direct current of 40 to 50 volts, identification colour white, position of the nose 10 h.

This socket shall be permanently fitted to the vessel close to the shore connections of the unloading piping.

9.3.1.21.6 The visual and audible signals given by the level alarm device shall be clearly distinguishable from those of the high level sensor.

The visual alarm shall be visible at each control position on deck of the cargo tank stop valves. It shall be possible to easily check the functioning of the sensors and electric circuits or these shall be of the "failsafe" design.

9.3.1.21.7 When the pressure or the temperature exceeds a set value, the instruments for measuring the pressure and the temperature of the cargo shall activate a visual and an audible alarm in the wheelhouse. When the wheelhouse is unoccupied the alarm shall also be perceptible in a location occupied by a crew member.

When the pressure exceeds a set value during loading or unloading, the instrument for measuring the pressure shall simultaneously initiate an electrical contact which, by means of the plug referred to in 9.3.1.21.5 above, enables measures to be taken to interrupt the loading and unloading operation. When the vessel's own discharge pump is used, it shall be switched off automatically. The sensor for the alarms referred to above may be connected to the alarm installation.

9.3.1.21.8 Where the control elements of the shut-off devices of the cargo tanks are located in a control room, it shall be possible to stop the loading pumps and read the level gauges in the control room, and the visual and audible warning given by the level alarm device, the high level sensor referred to in 9.3.1.21.1 (d) and the instruments for measuring the pressure and temperature of the cargo shall be noticeable in the control room and on deck.

Satisfactory monitoring of the cargo area shall be ensured from the control room.

9.3.1.21.9 The vessel shall be so equipped that loading or unloading operations can be interrupted by means of switches, i.e. the quick closing valve located on the flexible vessel–to–shore connecting line must be capable of being closed. The switches shall be placed at two points on the vessel (fore and aft).

The interruption systems shall be designed according to the quiescent current principle.

9.3.1.21.10 When refrigerated substances are carried the opening pressure of the safety system shall be determined by the design of the cargo tanks. In the event of the transport of substances that must be carried in a refrigerated state the opening pressure of the safety system shall be not less than 25 kPa (0.25 bar) greater than the maximum pressure calculated according to 9.3.1.27.

9.3.1.21.11 On vessels certified to carry refrigerated liquefied gases the following protective measures shall be provided in the cargo area:

– Drips trays shall be installed under the shore connections of the piping for loading and unloading through which the loading and unloading operation is carried out. They must be made of materials which are able to resist the temperature of the cargo and be insulated from the deck. The drip trays shall have a sufficient volume and an overboard drain;

– A water spray system to cover:

1. exposed cargo tank domes and exposed parts of cargo tanks;

2. exposed on–deck storage vessels for flammable or toxic products;

3. parts of the cargo deck area where a leakage may occur.

The capacity of the water spray system shall be such that when all spray nozzles are in operation, the outflow is of 300 litres per square meter of cargo deck area per hour. The system shall be capable of being put into operation from the wheelhouse and from the deck;

– A water film around the shore connection of the piping for loading and unloading in use to protect the deck and the shipside in the way of the shore connection of the piping for loading and unloading in use during connecting and disconnecting the loading arm or hose. The water film shall have sufficient capacity. The system shall be capable of being put into operation from the wheelhouse and from the deck.

9.3.1.21.12 Vessels carrying refrigerated liquefied gases shall have on board, for the purpose of preventing damage to the cargo tanks during loading and the piping for loading and unloading during loading and unloading, a written instruction for pre–cooling. This instruction shall be applied before the vessel is put into operation and after long–term maintenance.

9.3.1.22 ***Cargo tank openings***

9.3.1.22.1 (a) Cargo tank openings shall be located on deck in the cargo area.

(b) Cargo tank openings with a cross-section greater than 0.10 m^2 shall be located not less than 0.50 m above the deck.

9.3.1.22.2 Cargo tank openings shall be fitted with gastight closures which comply with the provisions of 9.3.1.23.1.

9.3.1.22.3 The exhaust outlets of the pressure relief valves shall be located not less than 2.00 m above the deck at a distance of not less than 6.00 m from the accommodation and from the service spaces located outside the cargo area. This height may be reduced when within a radius of 1.00 m round the pressure relief valve outlet there is no equipment, no work is being carried out and signs indicate the area.

9.3.1.22.4 The closing devices normally used in loading and unloading operations shall not be capable of producing sparks when operated.

9.3.1.22.5 Each tank in which refrigerated substances are carried shall be equipped with a safety system to prevent unauthorized vacuum or overpressure.

9.3.1.23 ***Pressure test***

9.3.1.23.1 Cargo tanks and piping for loading and unloading shall comply with the provisions concerning pressure vessels which have been established by the competent authority or a recognised classification society for the substances carried.

9.3.1.23.2 Any cofferdams shall be subjected to initial tests before being put into service and thereafter at the prescribed intervals.

The test pressure shall be not less than 10 kPa (0.10 bar) gauge pressure.

9.3.1.23.3 The maximum intervals for the periodic tests referred to in 9.3.1.23.2 above shall be 11 years.

9.3.1.24 ***Regulation of cargo pressure and temperature***

9.3.1.24.1 Unless the entire cargo system is designed to resist the full effective vapour pressure of the cargo at the upper limits of the ambient design temperatures, the pressure of the tanks shall be kept below the permissible maximum set pressure of the safety valves, by one or more of the following means:

(a) a system for the regulation of cargo tank pressure using mechanical refrigeration;

(b) a system ensuring safety in the event of the heating or increase in pressure of the cargo. The insulation or the design pressure of the cargo tank, or the combination of these two elements, shall be such as to leave an adequate margin for the operating period and the temperatures expected; in each case the system shall be deemed acceptable by a recognized classification society and shall ensure safety for a minimum time of three times the operation period;

(c) For UN No. 1972 only, a system for the regulation of cargo tank pressure whereby the boil-off vapours are utilized as fuel;

(d) other systems deemed acceptable by a recognized classification society.

9.3.1.24.2 The systems prescribed in 9.3.1.24.1 shall be constructed, installed and tested to the satisfaction of the recognized classification society. The materials used in their construction shall be compatible with the cargoes to be carried. For normal service, the upper ambient design temperature limits shall be:

air: +30 °C;
water: +20 °C.

9.3.1.24.3 The cargo storage system shall be capable of resisting the full vapour pressure of the cargo at the upper limits of the ambient design temperatures, whatever the system adopted to deal with the boil-off gas. This requirement is indicated by remark 37 in column (20) of Table C of Chapter 3.2.

9.3.1.25 ***Pumps and piping***

9.3.1.25.1 Pumps, compressors and accessory loading and unloading piping shall be placed in the cargo area. Cargo pumps and compressors shall be capable of being shut down from the cargo area and, in addition, from a position outside the cargo area. Cargo pumps and compressors situated on deck shall be located not less than 6.00 m from entrances to, or openings of, the accommodation and service spaces outside the cargo area.

9.3.1.25.2 (a) Piping for loading and unloading shall be independent of any other piping of the vessel. No cargo piping shall be located below deck, except those inside the cargo tanks and in the service spaces intended for the installation of the vessel's own gas discharging system.

(b) *(Reserved)*

(c) Piping for loading and unloading shall be clearly distinguishable from other piping, e.g. by means of colour marking.

(d) The piping for loading and unloading on deck, the venting piping with the exception of the shore connections but including the safety valves, and the valves shall be located within the longitudinal line formed by the outer boundaries of the domes and not less than one quarter of the vessel's breadth from the outer shell. This requirement does not apply to the relief pipes situated behind the safety valves. If there is, however, only one dome athwartships, these pipes and their valves shall be located at a distance not less than 2.70 m from the shell.

Where cargo tanks are placed side by side, all the connections to the domes shall be located on the inner side of the domes. The external connections may be located on the fore and aft centre line of the dome. The shut-off devices shall be located directly at the dome or as close as possible to it. The shut-off devices of the loading and unloading piping shall be duplicated, one of the devices being constituted by a quick closing valve. When the inside diameter of a shut-off device is less than 50 mm this device may be regarded as a safety device against bursts in the piping.

(e) The shore connections shall be located not less than 6.00 m from the entrances to or openings of, the accommodation and service spaces outside the cargo area.

(f) Each shore connection of the venting piping and shore connections of the piping for loading and unloading, through which the loading or unloading operation is carried out, shall be fitted with a shut-off device and a quick closing valve. However, each shore connection shall be fitted with a blind flange when it is not in operation.

(g) Piping for loading and unloading, and venting piping, shall not have flexible connections fitted with sliding seals.

For transport of refrigerated liquefied gases

(h) The piping for loading and unloading and cargo tanks shall be protected from excessive stresses due to thermal movement and from movements of the tank and hull structure.

(i) Where necessary, piping for loading and unloading shall be thermally insulated from the adjacent hull structure to prevent the temperature of the hull falling below the design temperature of the hull material.

(j) All piping for loading and unloading, which may be closed off at each end when containing liquid (residue), shall be provided with safety valves. These safety valves shall discharge into the cargo tanks and shall be protected against inadvertent closing.

9.3.1.25.3 *(Deleted)*

9.3.1.25.4 Every component of the piping for loading and unloading shall be electrically connected to the hull.

9.3.1.25.5 The stop valves or other shut-off devices of the piping for loading and unloading shall indicate whether they are open or shut.

9.3.1.25.6 The piping for loading and unloading shall have, at the test pressure, the required elasticity, leakproofness and resistance to pressure.

9.3.1.25.7 The piping for unloading shall be fitted with pressure gauges at the inlet and outlet of the pump.

Reading of the pressure gauges shall be possible from the control position of the vessel's own gas discharging system. The maximum permissible overpressure or vacuum shall be indicated by a measuring device.

Readings shall be possible in all weather conditions.

9.3.1.25.8 Use of the cargo piping for ballasting purposes shall not be possible.

9.3.1.25.9 *(Reserved)*

9.3.1.25.10 Compressed air generated outside the cargo area can be used in the cargo area subject to the installation of a spring-loaded non-return valve to ensure that no gases can escape from the cargo area through the compressed air system into accommodation, wheelhouse or service spaces outside the cargo area.

9.3.1.26 *(Reserved)*

9.3.1.27 ***Refrigeration system***

9.3.1.27.1 The refrigeration system referred to in 9.3.1.24.1 (a) shall be composed of one or more units capable of keeping the pressure and temperature of the cargo at the upper limits of the ambient design temperatures at the prescribed level. Unless another means of regulating cargo pressure and temperature deemed satisfactory by a recognized classification society is provided, provision shall be made for one or more stand-by units with an output at least equal to that of the largest prescribed unit. A stand-by unit shall include a compressor, its engine, its control system and all necessary accessories to enable it to operate independently of the units normally used. Provision shall be made for a stand-by heat-exchanger unless the system's normal heat-exchanger has a surplus capacity equal to at least 25% of the largest prescribed capacity. It is not necessary to make provision for separate piping.

Cargo tanks, piping and accessories shall be insulated so that, in the event of a failure of all cargo refrigeration systems, the entire cargo remains for at least 52 hours in a condition not causing the safety valves to open.

9.3.1.27.2 The security devices and the connecting lines from the refrigeration system shall be connected to the cargo tanks above the liquid phase of the cargo when the tanks are filled to their maximum permissible degree of filling. They shall remain within the gaseous phase, even if the vessel has a list up to 12 degrees.

9.3.1.27.3 When several refrigerated cargoes with a potentially dangerous chemical reaction are carried simultaneously, particular care shall be given to the refrigeration systems so as to prevent any mixing of the cargoes. For the carriage of such cargoes, separate refrigeration systems, each including the full stand-by unit referred to in 9.3.1.27.1, shall be provided for each cargo. When, however, refrigeration is ensured by an indirect or combined system and no leak in the heat exchangers can under any foreseeable circumstances lead to the mixing of cargoes, no provision need be made for separate refrigeration units for the different cargoes.

9.3.1.27.4 When several refrigerated cargoes are not soluble in each other under conditions of carriage such that their vapour pressures are added together in the event of mixing, particular care shall be given to the refrigeration systems to prevent any mixing of the cargoes.