

TÜRK LOYDU



Chapter 24 - Chemical Recovery Vessels January 2022

This latest edition incorporates all rule changes. The latest revisions are shown with a vertical line. The section title is framed if the section is revised completely. Changes after the publication of the rule are written in red colour.

Unless otherwise specified, these Rules apply to ships for which the date of contract for construction as defined in TL- PR 29 is on or after 1st of January 2022. New rules or amendments entering into force after the date of contract for construction are to be applied if required by those rules. See Rule Change Notices on TL website for details.

"General Terms and Conditions" of the respective latest edition will be applicable (see Rules for Classification and Surveys).

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Chemical Recovery Vessels

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SECTION 1

GENERAL CONDITIONS and REQUIREMENTS

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A. Scope

1. Application

These Rules apply to steel inland-waterway and seagoing vessels with or without their own means of propulsion, which in the event of an accident involving chemicals may be used for service in a hazardous atmosphere. These may be auxiliary vessels for floating equipment as well as independent operating vessels. Vessels complying with these Rules may without restriction be used for service in oil-covered waters.

If the vessel is intended to be used for restricted services, materials other than steel may be used for construction.

These Rules are for application in the case of toxic or corrosive substances, and of substances having a flash point not exceeding 60 °C (closed cup-test).

These Rules can analogously be applied to appliances bearing no resemblance to ships and which do not fall within the scope of ship classification.

2. Other applicable rules

In addition to these rules, TL Rules Chapter 1- Hull, Chapter 4- Machinery, Chapter 5- Electric, Chapter 8- Chemical Tankers, Chapter 28- Ventilation and Chapter 19- Inland Waterway Vessels apply.

B. Definitions

In the context of these Rules the following definitions apply:

1. Hazardous Area

The area of a ship, in which an explosive atmosphere in a dangerous quantity is to be expected.

Hazardous areas are subdivided into Zones 0, 1 and 2 depending on the likelihood of the presence of an explosive atmosphere. For a chemical recovery vessel, the following subdivision applies:

1.1 Zone 0

Zone 0 comprises areas in which an explosive atmosphere is constantly present or for long periods of time.

The following areas correspond to Zone 0:

- cargo tanks for hazardous substances as well as the inside of pipelines and vessels belonging to the cargo tank system
- the area up to 1 m above the water surface/the load waterline.

1.2 Zone 1

Zone 1 comprises areas in which an explosive atmosphere is liable to occur on occasion.

The following areas correspond to Zone 1:

- cofferdams and other spaces adjacent to cargo tanks
- cargo pump rooms
- enclosed or semi-enclosed spaces directly above cargo tanks or with boundaries in line with cargo tank bulkheads
- stowage spaces for cargo hoses and for chemical-recovery equipment
- holds for hazardous substances
- areas on the open deck, including semi-enclosed spaces, spherically within a radius of 3 m from tank openings and openings from pump rooms, holds or cofferdams (e.g. cargo hatches, inspection openings, ventilation openings, accesses)
- the open deck above Zone 0 for the full length and breadth of the ship up to 3 m above the uppermost continuous deck. For ships whose uppermost continuous deck is Zone 0, Zone 1 extends up to 3 m above Zone 0

- spaces not having overpressure ventilation, directly accessible (without an air lock) from a hazardous area in Zone 1 or with an opening to this
- enclosed or semi-enclosed spaces with pipelines belonging to the cargo tank system.

1.3 Zone 2

Zone 2 comprises areas in which an explosive atmosphere is liable to occur rarely and only for short periods.

The following areas correspond to Zone 2:

- areas above the hazardous areas of Zone 1 over the full length and breadth of the ship
- spaces not having overpressure ventilation, directly accessible (without an air lock) from a hazardous area in Zone 2 or with an opening to this

2. Non-hazardous areas

Non-hazardous areas are ones not belonging to one of the Zones 0, 1 or 2 (citadel area).

3. Hazardous substance

Toxic, corrosive or combustible substances transported on board inland waterway or seagoing ships in solid, liquid or gaseous state as bulk cargo or in packaged form.

4. Hazardous atmosphere

A hazardous atmosphere is one of gases or vapours in dangerous concentration and quantity, noxious to humans and/or explosive.

5. Cargo area

Area of the ship comprising all spaces and tanks, including slop tanks, designated for the carriage of liquid or solid packaged goods or cargo transported in bulk. In addition, the cargo area comprises of cargo pump rooms, ballast pump rooms, cofferdams, ballast

tanks or void spaces adjacent to cargo tanks, slop tanks or cargo spaces plus deck areas covering the full length and breadth of the ship, over the above-named spaces.

Any tanks used for the temporary storage of substances such as settling tanks are to be considered as cargo/slop tanks in the sense of this definition.

6. Citadel

Internal area of the ship which is protected against penetration by a hazardous atmosphere. The citadel comprises of any space in the ship which is in continuous use during service or must, for safety reasons, be accessible at all times.

7. Protected air

Air cleaned of hazardous substances in a filtration station and fed into the citadel.

8. List of substances

List of substances for which a ship or parts of its equipment are suitable.

9. Air lock

Space between two gastight doors at the entrances to the citadel.

10. Operation centre

Compartment manned by a responsible person throughout the operation in hazardous atmosphere and in which all monitoring and control functions important to the operation are concentrated.

C. Classification Notations

1. Vessels complying with these Rules and having facilities for the recovery of hazardous substances plus tanks for liquid substances in bulk and/or holds for packaged and solid bulk goods, receive the notation "Chemical Recovery Vessel" after their character of classification.

Vessels equipped with facilities for oil recovery receive the additional notation "Oil Recovery Vessel".

2. Vessels corresponding to 1., but having no tanks or holds for the carriage of the recovered substances, receive in addition to the class designation the entry "Without cargo tanks/holds" in the Certificate.

3. Vessels which have neither the necessary facilities for the recovery of hazardous substances nor tanks or holds for storage but otherwise comply with these Rules and are suitable for service in a hazardous atmosphere, in addition to the appropriate class designation such as Tug, Supply Vessel, etc. receive the entry "Suitable for service in a hazardous atmosphere" in the Certificate.

4. If there are restrictions with regard to the carriage of hazardous substances or restriction to the ship's service in a hazardous atmosphere, the ship receives a list of substances as an Appendix to the Class Certificate.

D. Documents to be Submitted for Approval

1. Apart from the documents listed in the TL Rules, Chapter 1 – Hull, Section 1, G. and Chapter 19 – Inland Waterway Vessels, Section 1, E., the following documents are to be submitted in triplicate:

- general arrangement drawing with information about the position and applications of the equipment used during service in a hazardous atmosphere
- details of accesses and openings which during service in a hazardous atmosphere are in operational use and cannot be closed gastight
- details of accesses and openings which during service in a hazardous atmosphere must be closed gastight
- details of the arrangement and capacities of the cargo tanks/holds
- drawings of the cargo tanks/holds with details of the materials
- details of the supports and securing arrangements of the cargo tanks if

independent tanks are intended to be provided

- drawings showing the design and arrangement of windows, together with information about materials used

2. Apart from the documents listed in the TL Rules Chapter 4 – Machinery, Section 20, A.3 and Chapter 19 – Inland Waterway Vessels, Section 24,B. the following documents are to be submitted in triplicate:

- operations and equipment manual for service in a hazardous atmosphere
- schematic diagrams of the pumping and piping arrangements connected to the ship during service in a hazardous atmosphere
- drawings from which are apparent the disposition and location of the chemical-recovery equipment connected to the ship and carried loose during service in a hazardous atmosphere, with full technical details and material specifications
- drawings from which the arrangement and location of the ventilation system is apparent
- constructional drawings of the most important parts of the ventilation system
- design calculation of the ventilation system according to Section 3, D.2.
- proof of the suitability of fitted air filters
- ventilation plan of the spaces with overpressure ventilation plus arrangement of the air locks
- plan of closing appliances for service in a hazardous atmosphere

3. Apart from the documents listed in the TL Rules, Chapter 5 – Electrical Installations, Section 1, C. and Chapter 19 – Inland Waterway Vessels, Section 39, B., the following documents are to be submitted in triplicate:

- general arrangement drawing with details of the areas of Zones 0, 1 and 2 subject to explosion hazard during service in a hazardous atmosphere and of the areas with overpressure from ventilation
- details of protection/ignition protection of the fitted appliances in the areas listed under B.1.
- details of the non-certified safe-type electrical equipment in the hazardous area which during service in a hazardous atmosphere have to be shut down
- details of the design of the gas detection equipment with proof of suitability for the substances to be measured plus drawings showing the arrangement of the gas measuring points
- electrical power balance for service in a hazardous atmosphere

E. Surveys

1. With regard to surveys, chemical recovery vessels shall be treated like chemical tankers. In addition to the range of inspections laid down in the TL Rules – Classification and Surveys, Section 3, the inspections listed below shall be carried out.

1.1 Initial Survey

The protected air system and the equipment provided for service in a hazardous atmosphere shall, within the framework of the initial inspection undergo a check of whether it meets the safety specifications and serviceability. In particular the working conditions for service in a hazardous atmosphere have to be established exactly as described in the operations and equipment manual.

1.2 Annual survey

The protected air system and the equipment provided for service in a hazardous atmosphere plus the associated safety equipment shall within the framework of the annual inspection undergo a check to confirm that it is in a satisfactory operational condition.

1.3 Class renewal survey

The protected air system and the equipment provided for service in a hazardous atmosphere plus the associated safety equipment shall within the framework of the class renewal inspection undergo a check in order to ascertain that it has been thoroughly maintained. In addition a thorough operational test is to be carried out.

SECTION 2**ARRANGEMENT and SEPARATION of SPACES**

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A. General Requirements**1. General**

Regarding separation of the cargo area from the other areas of the ship, TL Rules, Chapter 1 – Hull, Section 28 and Chapter 8 – Chemical Tankers, Section 3 apply. Drycargo holds for hazardous substances shall be treated like cargo tanks. With regard to the arrangement of the accommodation, machinery and cargo areas, deviation from the Rules may be possible after examination and with approval from the competent authority.

2. Citadel

The citadel area is to be so designed that the protected spaces can, during service in a hazardous atmosphere, be kept at an overpressure relative to the outside atmosphere to preclude entry of hazardous substances from outside. For further details refer to Section 3, D.2.

3. Accesses and openings

Accesses and openings into the citadel which during the service in a hazardous atmosphere are not in operational use shall be capable of being closed gastight. For accesses and openings in operational use suitable measures are to be provided to prevent the entry of hazardous substances/loss of overpressure. Means shall be provided for decontaminating personnel contaminated with harmful substances.

4. Markings

All equipment requiring a change of setting for service in a hazardous atmosphere (e.g. gastight doors, central switches, closures to openings), shall be marked prominently.

B. Ship Arrangements**1. Hull**

1.1 All openings to rooms and tanks, except those which are in operational use, must be so

constructed, that they are capable of being closed gastight when the ship is due to operate in a hazardous atmosphere.

1.2 Windows

1.2.1 Windows are to be produced as non-opening type in accordance with ISO 21005, DIN ISO 1751 or another international comparable standard and are to be tested accordingly in the presence of the Surveyor.

1.2.2 The glass is to be tested in accordance with DIN ISO 614 and shall be marked accordingly.

1.2.3 Windows shall be generally of laminated type. The laminate has to consist of at least two layers of thermally toughened safety glass, bonded by a foil.

1.2.4 The windows have to be designed to withstand a shock wave with a positive pressure of 0,3 bar for at least 200 ms.

1.2.5 The local design loads according to Chapter 1 – Hull have to be applied.

1.2.6 In case of international service the 1966 load line convention in its relevant edition is to be observed regarding arrangement and specification. Deviations must be approved by the relevant Administration.

1.2.7 Heated panes for wheelhouse windows are in addition to be designed and tested according to DIN ISO 3434.

1.2.8 Fire resistant windows, where necessary, have to be considered separately, see DIN ISO 5797.

2. Air locks

2.1 The accesses to the citadel are to be provided with air locks which ensure the maintenance of overpressure inside. An air lock must comprise two doors not less than 1,5 m apart. The doors must be self-closing and may not have any fixing devices. The door sill must be at least 300 mm high. Legal stipulations going beyond this are to be observed.

2.2 An alarm is to be provided which indicates if more than one of the doors is not fully closed.

2.3 Air locks shall be so designed that they are flushed with air from inside outwards in order to carry out any hazardous substances brought in when using the lock. There must be at least 20 air changes per hour, related to the total volume of the air lock. Upon agreement and approval of TL alternative installations are permissible.

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A. Machinery Spaces

1. The combustion air for Diesel engines and boilers shall be supplied either from the machinery space or directly from outside.

When the supply of air is from the machinery space additional demand of air has to be taken into account during the design of the ventilation system.

If the air supply is directly from outside, the following requirements have to be complied with:

- The intake openings are to be located in Zone 2.

In exceptional cases locations of the intake openings in Zone 1 may be permitted by TL.

- The air supplied is to be monitored for flammable gases and vapours near the intakes. Details regarding the specification for the monitoring equipment are to be taken from E.
- Diesel engines must either be of gastight design or totally encased.

If non-encased Diesel engines are fitted, these shall be checked for tightness before use in a hazardous atmosphere. An instruction to this end is to be included in the Operations and Equipment Manual.

- Diesel engines shall be provided with automatic overspeed protection which must also be effective if there are flammable gases or vapours in the combustion air.
- The air ducts are to be provided with flame arrestors which have to be approved by a recognized institution as being flame proof.
- The air duct from the flame arrestors to the engine has to be of an explosion-resistant design. For naturally aspirated engines this requirement is regarded as being complied with

if the duct is designed for an internal pressure of 10 bar. For supercharged engines the duct has to be designed according to the higher pressure which is to be expected.

- The number of dismountable pipe joints in the combustion air ducts shall be kept to a minimum.
- If the charge air temperature after the turbo-charger exceeds 135 °C, a temperature sensor has to be provided with a remote indication and an alarm on the bridge.

2. The exhaust gas lines of diesel engines and boilers have to comply with the following requirements:

2.1 Approved spark arrestors have to be provided.

2.2 The outlet openings into the atmosphere may not be located in Zone 0.

Outlet openings below the water line are acceptable if the following requirements are complied with:

- The maximum outlet temperature is 108 °C. The alarm mentioned in 2.4 has to be set accordingly.
- It is to be guaranteed by means of additional measures or equipment such as a water seal or injection of water, that no sparks will escape.

2.3 The temperature of the exhaust gases during discharge into the atmosphere in Zone 1 or Zone 2 may not exceed 135 °C.

2.4 The exhaust gas temperature has to be monitored at the outlets into the atmosphere. A remote indication has to be provided at the operation centre mentioned in Section 1, B.10. An alarm shall be actuated if the maximum permissible temperature is exceeded.

2.5 Approved flame arrestors have to be provided. Alternative arrangements can be accepted in preventing the introduction of explosive gas-/vapour- air mixtures into the exhaust gas piping if the engines need to be started during an operation in a hazardous atmosphere.

2.6 The number of dismountable pipe joints has to be kept to a minimum.

3. Diesel engine crankcase vents are to be so designed that no toxic or flammable vapours or gases can enter the crankcase.

4. The heat released into the machinery and service spaces by engines and power units shall be removed via an air cooler. If Diesel engines are installed encapsulated, appropriate cooling equipment is to be provided inside the encapsulation.

5. On ships with the class notation according to Section 1, C.1., the supply of cooling water is to be so designed that the machinery can be cooled without direct intake of sea water (e.g. box cooling or skin cooling) during an operation in a hazardous atmosphere.

6. Vent pipes and filling connections of service tanks shall be so designed or arranged that hazardous substances cannot enter the tanks. The drinking-water tank vent pipe outlets shall be located inside the citadel.

B. Cargo Area

1. Cargo tanks and compartments within the cargo area shall be equipped in accordance with Chapter 8 – Chemical Tankers.

2. Following Chapter 4 – Machinery, Section 12, P., holds shall be equipped as follows:

- A ventilation system for 30 changes of air per hour is to be provided. Electric motors shall be located outside the air stream.
- Bilge pumping arrangements are to be provided for in the cargo area.
- A separate, permanently installed system is to be provided for pumping and discharging hazardous substances which might be released into the hold.

- A fire detection and alarm system shall be provided.

– All openings have to be fitted with means for gastight closure.

C. Fire Extinguishing and Alarm Equipment

1. Ships to which these Rules are applicable have to be provided with fire protection and fire extinguishing equipment according to TL Rules Chapter 4 – Machinery, Section 12 and Chapter 19 – Inland Waterway Vessels, Section 34.

2. Machinery spaces which are not permanently manned during operations in a hazardous atmosphere have to be provided with fire detection and alarm system.

An approved fixed fire extinguishing system has to be provided additionally in machinery spaces which are not accessible during service in a hazardous atmosphere.

3. If Diesel engines are encapsulated the encapsulation has to be provided with a fire alarm system and a fire extinguishing system. The design has to be in accordance with the TL Rules Chapter 4 – Machinery, Section 12.

4. Ships with the Class Notation Chemical Recovery Vessel according to Section 1, C.1. must have a deck foam system for the cargo area. Design and construction according to the TL Rules Chapter 8 – Chemical Tankers, Section 11.

The quantity of foam/water mixture to be generated is to be calculated on the basis of 20 l/min/m² for the deck area above the largest cargo tank or the largest hold.

The foam system must be capable of protecting the deck area above the cargo tanks and/or the deck area above the holds.

5. For ships with the Class Notation Chemical Recovery Vessel and the entry "Without cargo tanks/holds" in the Certificate according to Section 1, C.2. a foam fire extinguishing system may be required if during the operation equipment for the recovery of chemicals or parts thereof

(pumps, pipelines, hoses, etc.) is located on board.

6. A CO₂ fire extinguishing system shall be provided for the holds.

7. Equipment, appliances and systems in hazardous areas

7.1 For recovery equipment for chemicals, the Rules listed in Section 1, A.2., so far as applicable, are to be applied. The equipment and appliances must be suitable for the envisaged service and be electrically bonded to the hull.

7.2 Hoses for hazardous substances must be adequately electrically conducting, see Chapter 4 – Machinery, Section 15, B.9.1.2.

7.3 By the selection of suitable materials and appropriate protective measures, it shall be assured that when equipment and appliances for the recovery of chemicals are put into service there is no possibility of sparks with ignition potential occurring, see also Chapter 4 – Machinery, Section 15, B.9.

7.4 The surface temperature of equipment and appliances may not exceed the following values:

- 108 °C in Zone 0
- 135 °C in Zones 1 and 2

D. Ventilation and Air Conditioning

1. General

1.1 Accommodation and machinery spaces

The ventilation systems for the accommodation and machinery spaces of seagoing ships are to be in accordance with TL Rules and in accordance with Chapter 28 – Ventilation. Any deviation from the above-mentioned Rules requires TL approval.

For the ventilation and air conditioning of the citadel during service in a hazardous atmosphere, additionally suitable technical appliances such as a protected air plant, drawing-in air from outside via a filter, or a

circulating-air regeneration plant, shall be provided.

1.2 Cargo area

With regard to the design, type and construction of mechanical ventilation systems TL Rules Chapter 4 – Machinery, Section 15 and Chapter 8 - Chemical Tankers, Section 12 are to be complied with.

2. Citadel

2.1 Design of the ventilation

The ventilation of the citadel is to be so designed that during service in a hazardous atmosphere the overpressure never drops below 0,5 mbar relative to the outside atmosphere in any of the spaces.

The following CO₂ concentrations of the air inside the citadel may not be exceeded:

- | | |
|---------------------------------|--------|
| – service spaces and rest rooms | 0,15 % |
| – mess rooms | 0,25 % |
| – workshops | 0,50 % |

The room temperatures shall comply with Chapter 28 – Ventilation.

2.2 Layout of the ventilation system

During service in a hazardous atmosphere, machinery spaces may be ventilated using exhaust from the accommodation and engine enclosure using exhaust from the machinery space.

The direction of flow from the accommodation to the machinery spaces and from the machinery space into the engine enclosure is to be ensured by an appropriate gradation of overpressure.

Following values for overpressures relative to the outside atmosphere may be used for guidance:

- | | |
|--|--------|
| - accommodation, work and service spaces | 4 mbar |
| - engine room | 3 mbar |
| - engine enclosures | 2 mbar |

Openings connecting the accommodation to the ma-

chinery spaces shall be kept to a minimum. They are to be provided with adjustable non-return valves as well as closures. The closures must close automatically if the engine room CO₂ fire extinguishing system is activated. Manual closure from the accommodation must also be possible.

2.3 Filtration plant

Protected air plants which draw in outside air via filters must comply with the following requirements:

- Intake of the plant from the outside atmosphere is to be arranged in zone 2.
- The filters must be suitable for separating hazardous substances from the air being drawn in. Proof of suitability of the filter material is to be provided by certification from a recognised testing institution.
- A safety filter is to be fitted after the main filter. In the case of ships with a classification character according to Section 1, C.3., the safety filter may be omitted if the supply of breathing air for a period of 30 minutes for the personnel on board is guaranteed by other suitable arrangements.
- The filtered air is to be monitored between main and safety filter and after the latter. In each case any penetration by hazardous substances shall cause an alarm to be activated. For details see E.
- The protected-air plant must be designed for a flow rate which ensures an adequate supply of breathing air for the ship's crew and the personnel involved in the clean-up operation after an accident.

The protected air quantity may not drop below the following value:

$$KHM = SHM \cdot n \cdot (a / (b_2 - b_1)) \quad [m^3/h],$$

KHM = Protected-air quantity

SHM = Breathing-air quantity

- resting 0,50 m³/h/person
- on light work 0,75 m³/h/person
- on heavy work 1,25 m³/h/person

- n = number of people on board
- a = CO₂ content of air breathed out (4 vol.%)
- b₁ = CO₂ content of outside air (0,03 vol.%)
- b₂ = permissible CO₂ content of the air in the area under design
 - 0,15 % in service spaces and rest rooms
 - 0,25 % in mess rooms
 - 0,50 % in workshops

2.4 Regeneration plant

Regeneration plants must comply with the following requirements:

- The overpressure in the citadel shall be maintained from a reserve of compressed air carried on board. This reserve must be sufficient for the duration of service envisaged. The envisaged duration of service is to be stated in the Operations and Equipment Manual.
- All openings from the citadel to the outside atmosphere shall be equipped with means for gastight closure.
- Maintenance of the values stated in 2.1 (overpressure and CO₂ content) must be possible.

2.5 Monitoring

The overpressures in the spaces within the citadel are to be monitored. Pressure indicators for each area are to be provided at the operation centre. Should the pressure in any one of the areas fall below 0,5 mbar, an audible and visual alarm shall be activated.

In the case of regeneration plant the following items are to be monitored in addition:

- The O₂ content of the air on leaving the regeneration plant. Should this drop below the lowest permissible value an alarm shall be activated.

- The pressure in the compressed air reservoir.

Should this drop below a value to be determined in dependence on the system, an alarm shall be activated.

E. Gas Detection and Alarm System

1. General

1.1 A permanently installed gas detection and alarm system for the detection of flammable as well as toxic gases and vapours in the outside atmosphere shall be provided. The equipment must be capable of detecting all gases and vapours that occur and are toxic and/or explosive and/or damaging to human health. If limiting values are exceeded, audible and visual alarms are to be activated. A clearly recognisable collective alarm is to be provided on deck; individual alarms on the ship's bridge or at the operation centre. The equipment must be type-tested by TL.

1.2 If the air supply to the citadel is effected via filters, for monitoring of the protected air a detection and alarm system which indicates any deviation from the normal composition of clean air may be accepted.

1.3 If the gas detection equipment after the filter is not suitable for detecting all hazardous substances that occur, the ship is to be supplied with a list of those substances for which the equipment is suitable.

2. Measuring points

2.1 Measuring points of the gas detection and alarm system shall be located as follows:

2.1.1 For toxic substances and substances which are damaging to human health:

- on the main deck, low down

- near the air inlets to the citadel (where air is supplied to the citadel via filters)

2.1.2 For flammable gases and vapours:

- on the main deck, low down

- near the combustion air inlets to diesel engines and boilers

- near the air inlets to the citadel (where air is supplied to the citadel via filters)

2.1.3 For gases and vapours which are damaging to human health or toxic or flammable (where air is supplied to the citadel via filters):

- after the main filter
- after the safety filter

If there is no safety filter provided on ships with a character of classification according to Section 1, C.3., a second measuring point has to be arranged after the main filter.

2.2 The measuring point after the safety filter which is the second measuring point after the main filter has to be independent of the general gas detection and alarm system. The audible and visual alarm activated by the measuring point has to be different from all other alarms and must be clearly audible on the bridge and in the accommodation.

2.3 Further measuring points may be required by TL on account of special constructional circumstances and service conditions.

3. Set-Points

The settings of the gas detection and alarm system shall be such that alarms are activated if the following limits are exceeded:

3.1 Measuring points according to 2.1.1:

Settings have to be established in co-operation with the

responsible administration. The basis shall be the substance which is the most damaging to human health.

3.2 Measuring points according to 2.1.2:

30 % of the lower explosive limit (LEL), referred to Toluene.

3.3 Measuring points according to 2.1.3:

As per 3.1 and 3.2.

For detection equipment according to 1.2, deviation from the normal composition of clean air.

4. Portable instruments

In addition to the permanently installed equipment, portable measuring instruments for the determination of flammable substances in the atmosphere shall be on board.

Further requirements from the appropriate authorities are to be adhered to.

SECTION 4**ELECTRICAL PLANT**

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3. Temperature class / explosion group	

A. General

1. The electrical plant on board ships with the Class Notation “Chemical Recovery Vessel” must comply with the TL Rules Chapter 5 – Electrical Installations, Section 15, C. and Chapter 8 – Chemical Tankers, Section 10,

2. Ship’s power supply systems

2.1 For ships not having their own cargo tanks in accordance with Section 1, C.2 and for ships according to Section 1, C.3., systems complying with the TL Rules Chapter 5 – Electrical Installations, Section 1,G are permitted.

2.2 For ships with the Class Notation “Chemical Recovery Vessel” in accordance with Section 1, C.1. systems have to comply with the TL Rules Chapter 5 – Electrical Installations, Section 15, C.

B. Electrical Equipment in Hazardous Areas**3. Non-certified safe-type equipment**

For the duration of service in a hazardous atmosphere non-certified safe-type equipment of hazardous areas must be capable of being disconnected and safeguarded against unauthorized reconnection at a central point in the safe area and shall be marked accordingly.

4. Permitted electrical equipment

In hazardous areas electrical appliances are to be restricted to essential operation.

4.1 In areas comparable to Zone 0 the following is permitted:

- intrinsic safety Ex ia or intrinsically safe equipment / circuits certified for Zone 0

- other certified safe-type equipment with special permission from TL in the combination of two types of protection, such as Ex d plus Ex e, if there is a compelling requirement for their use in this area.

4.2 In areas comparable to Zone 1 the following is permitted:

- flameproof enclosure Ex d
- pressurized enclosure Ex p
- increased safety Ex e
- sand-filled apparatus Ex q
- encapsulation Ex m
- intrinsic safety Ex i

4.3 In areas comparable to Zone 2 the following is permitted:

- certified safe-type equipment for Zones 0 and 1
- equipment with explosion protection type Ex n
- equipment whose temperatures cannot rise above 135 °C and in which no sources of ignition occur when in service
- equipment with a casing, conforming to minimum protection class IP 55, whose surface temperature does not exceed 135 °C

3. Temperature class / explosion group

Explosion-proof electrical equipment must meet at least the following requirements:

- explosion group II B
- temperature class T4

SECTION 5**SAFETY EQUIPMENT AND OPERATION**

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A. Safety and Protective Equipment for Personnel

1. For the protection of personnel, safety equipment following TL Rules Chapter 8 – Chemical Tankers, in accordance with Section 14.2 must be carried on board. The extent has to be agreed on in each case.

2. For every person on board during operation in hazardous atmosphere a self-contained breathing set according to 14.2.8 of the Rules quoted under 1. must be carried on board.

3. On ships with the Class Notation “Chemical Recovery Vessel” there shall additionally be provided:

3.1 Protective equipment in accordance with Chapter 8, Section 14.1.1, for each crew member engaged in the service of combating the chemicals.

3.2 At least one shower suitably arranged for washing-off hazardous substances, plus an eyewash. Both the shower and the eyewash must be operable at all ambient temperatures.

B. Operations and Equipment Manual

An approved Operations and Equipment Manual is to be carried on board. It must contain documentation and descriptions of the fitted technical installations as well as the necessary safety measures required in preparation for and the execution of a service in a hazardous atmosphere. This includes:

- a plan showing all closing appliances including the measures for the achievement of the closed-down condition with respect to personnel and explosion protection
- a plan of the spaces with overpressure (citadel) showing the arrangement of the air locks
- measures for building-up the overpressure in the citadel

- activating the gas detection equipment
- a list of all electricity-consumers requiring to be switched-off for operation in hazardous atmosphere
- switching-off arrangements of all non-explosion-proof consumers in the hazardous area
- a list of the equipment and appliances provided for operation in hazardous atmosphere or recovery operation with installation and operating instructions
- plans from which the arrangement of the equipment and appliances for operation in hazardous atmosphere or recovery operation are apparent
- lists of substances, insofar as applicable
- a check-list of the measures to be carried out in preparation for operation in hazardous atmosphere or recovery operation
- appropriate measures in case of alarms:
 - general gas alarm
 - 30 % of the lower explosive limit in the combustion air of the diesel engines or boilers
 - overpressure in the citadel below 0,5 mbar
 - exhaust gas temperature exceeding the permitted value
 - charge air temperature after turbocharger exceeding 135 °C
 - fire in the engine room
 - gas after main filter (where air is supplied to the citadel via filters)

- gas alarm after safety filter or alarm activated by the second independent measuring point after main filter (where air is supplied to the citadel via filters)
- pressure in the compressed air vessel low (where an air regeneration plant is installed)
- O2 content of the air from the regeneration plant