(Note: The following essential content-related changes have been included in the Technical Rule 512:

- *The Technical Rule 512 also applies to sulphuryl difluoride. Corresponding rules are now included.*
- *The rules for pharmaceuticals and for first aid in the case of exposure to gas (enclosure 3) have been revised.*
- *The proposals for the disposal of fumigated carrier material have been extended.*

In addition, a number of editorial adaptations have been undertaken.)

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Technical Rules for Hazardous Substances	Fumigations	Technical Rule 512

The Technical Rules for Hazardous Substances (TRGS) convey the status of the safety, occupational-medicine, hygiene and industrial-science demands on hazardous substances associated with placing them on the market and handling them. The

Committee on Hazardous Substances (AGS)

establishes the rules and adapts them to the current status of technical development accordingly.

The Technical Rules are announced by the Federal Ministry of Labour and Social Affairs in the Federal Labour Gazette (BArbBl.)

This document includes special protective measures for fumigation with bromomethane, hydrogen cyanide, phosphorus hydride and sulphuryl difluoride.

With regard to the scope of the rules on handling contained in the Hazardous Substances Ordinance (GefStoffV) as well as the generally applicable definitions of terms, attention is drawn to §§ 2 and 3 of the Hazardous Substances Ordinance.

Rules from the Hazardous Substances Ordinance (GefStoffV), including Number 5 of Annex V of the Hazardous Substances Ordinance, have been incorporated and are indicated by vertical lines in the margin.

Contents

1 Scope

(1) This Technical Rule applies to the use of the following substances and their preparations as fumigants:

1. Bromomethane (methyl bromide),
2. Hydrogen cyanide (prussic acid) as well as substances and preparations which serve in the formation or vaporization of hydrogen cyanide or highly volatile hydrogen cyanide compounds.
3. Phosphorus hydride and substances and preparations that form phosphorus hydride,
4. Sulphuryldifluoride (sulphuryl fluoride).

(2) This Technical Rule does not apply to

- fumigations with ethylene oxide and formaldehyde in sterilization and disinfection plants (Technical Rule 513 applies here)
- room disinfection using formaldehyde (Technical Rule 522 applies here).

(3) The rules of Annex V of the Hazardous Substances Ordinance also apply when the competent authority according to § 43 Section 8 of the Hazardous Substances Ordinance has authorized other fumigants.

(4) In the case of authorizing fumigants other than those named in Section 1, the competent authority must determine the extent to which the Technical Rule applies to these fumigants.

(5) Fumigations with gases are also covered by this Technical Rule if they are used as auxiliaries together with the substances and preparations named under Section 1 (e.g. carbon dioxide, nitrogen).

(6) According to Technical Rule 905, bromomethane is assessed as carcinogenic, category 3 and classified as toxic and dangerous for the environment.

(7) Hydrogen cyanide is classified as very toxic and extremely flammable. The risk of skin absorption additionally exists when handling hydrogen cyanide.

(8) Preparations which form phosphorus hydride such as, for example, aluminium, magnesium and calcium phosphide are classified as very toxic and highly flammable. Phosphorus hydride/nitrogen mixtures with phosphorus hydride percentages lower than 1.8 per cent by volume are classified as very toxic.

(9) Sulphuryl difluoride is classified as toxic.

2 Definition of terms and explanations

(1) According to the meaning of this Technical Rule, fumigations are pest control measures (disinfestation, decontamination) using the very toxic and toxic substances and preparations listed in Number 1, Section 1 including all the work that is required in connection with the safe use of a fumigant, in particular the monitoring of the preparatory work, the inserting of the fumigant, the monitoring of the fumigation as well as the ventilation and the release of fumigated rooms or goods as well as the removal and disposal of utilized carrier materials.

(2) A fumigation plant is a plant that is set up and operated specifically for the purpose of the fumigation of goods and products.

(3) According to the meaning of this Technical Rule, rooms are buildings or parts of buildings including silos as well as ships and cargo holds. Fumigations of transport containers or of goods under covering sheets in buildings or on ships are to be treated like room fumigations (taking into consideration the additional demands on ship fumigations in the case of fumigations on ships). Rooms that serve in the storage and processing of goods which are only fumigated as required (e.g. in the case of attack by pests) are not to be regarded as fumigation plant according to the meaning of number 9.1.

(4) According to the meaning of this Technical Rule, transport containers are road and rail vehicles, freight containers and mobile tanks which can be made sufficiently gas-proof for the purpose of fumigation.

(5) If a transport container is permanently installed in a fenced-off parking space and provided with exhaust ventilation equipment for the purpose of fumigation it is to be considered as a fumigation plant.

(6) Ships are all types of water vessels.

(7) A technical expert or specialised professional is someone who, due to his specialist training and experience, possesses sufficient knowledge in the area of fumigation and is familiar with the relevant governmental occupational safety and health rules, accident prevention rules, guidelines and generally recognized technical rules (e.g. DIN/EN standards, VDE regulations, Technical Rules of other Member States of the European Union or of other states party to the convention on the European Economic Area) to such an extent that he can assess the safe handling of fumigants. Proof of technical expert knowledge is furnished by successful participation in a recognized training course relating to the handling of fumigants.

(8) According to the meaning of this Technical Rule, the head of fumigation is the holder of a certificate of competence according to Number 4.2 who is responsible for the procedure of the fumigation.

(9) The maximum workplace concentration (MAK) is the concentration of a substance in the air at the workplace at which the health of workers in general is not impaired.

(10) The trigger threshold is the concentration of a substance in the air at the workplace or, according to the meaning of Section 6 of the Hazardous Substances Ordinance, in the body which, if exceeded, requires additional health protection measures. With regard to exceeding the trigger threshold it is the same whether procedures are applied in which measures according to Clause 1 are required or whether there is direct dermal contact.

3 Restrictions on use and exceptions

(1) Fumigations with very toxic and toxic substances and preparations (fumigants) may only be performed using the substances and preparations named in Number 1, Section 1. These fumigants may only be used under the preconditions contained in Sections 3 to 5 and Number 4. Exempted here are substances and preparations packaged in portions which, when used as intended, do not form more than 15 grams of phosphorus hydride and are used for pest control in the open air. Clause 2 also applies when the competent authority has authorized other fumigants according to § 43 Section 8 of the Hazardous Substances Ordinance. Bromomethane may only be used as a fumigant according to Clause 1 for the protection of wood in buildings as well as for products to be exported to states for whom fumigation with bromomethane as a fumigant according to the meaning of Clause 1 is mandatory.

(2) In accordance with § 2, Section 3 of the Chemicals Act, the restrictions on use of bromomethane mentioned in Section 1 do not apply to plant protection products that are subject to an authorization procedure according to the Plant Protection Act. According to § 2, Section 1, the use of plant protection products containing bromomethane is subject to the restrictions on use stated in Annex 2, Number 5 of the Plant Protection Product Use Ordinance.

(3) Only those substances and their preparations which are authorized by the Federal Biological Research Centre for Agriculture and Forestry (BVL) may be used as fumigants according to Number 1, Section 1. In all other cases the competent authority can demand testing by the Federal Institute for Health Protection of Consumers and Veterinary Medicine (BfR) or the Federal Institute for Materials Research and Testing (BAM).

(4) Notwithstanding Section 3, on written application by the employer the competent authority can authorize, on a case-by-case basis, the use of fumigants other than those named under Number 1, Section 1 if they are authorized by the Biological Research Centre for Agriculture and Forestry. In other cases the competent authority can demand testing by the Federal Institute for Health Protection of Consumers and Veterinary Medicine or the Federal Institute for Materials Research and Testing. Clause 1 also applies to fumigations required for testing and approval of fumigation procedures with new fumigants.

(5) During transportation ships may only be fumigated using phosphorus hydride and transport containers only fumigated using phosphorus hydride or bromomethane.

4 Permission, certificate of competence, technical expert knowledge

4.1 Permission

(1) Whoever wishes to undertake fumigations using the fumigants listed under Number 1, Section 1 requires the permission of the competent authority. This does not apply to the exemption for phosphorus hydride which is laid down in Number 3, Section 1.

(2) The permission according to Section 1 is granted to whoever

- as an applicant possesses the required reliability and, in so far as he heads the handling of the fumigants named in Number 1, Section 1, a certificate of competence according to Number 4.2 and
- has available to him holders of a certificate of competence in sufficient quantity

Each change in the holders of the certificate of competence must be announced to the competent authority immediately.

(3) The permission according to Section 1 and the certificate of competence according to Section 2 can be granted for a limited period, under certain conditions and, in particular, limited to particular types of plants. Conditions can also be imposed subsequently.

(4) The necessary reliability must be demonstrated by means of an official certificate of good conduct.

(5) An applicant has available to him a sufficient number of holders of a certificate of competence if he employs

- at least four holders of a certificate of competence in the case of fumigations with bromomethane, sulphuryl difluoride or hydrogen cyanide or preparations forming hydrogen cyanide
- at least two holders of a certificate of competence in the case of fumigations with phosphorus hydride or preparations forming phosphorus hydride.

4.2 Certificate of competence

(1) The competent authority grants a certificate of competence to whoever

1. possesses the necessary reliability for handling the fumigants named in Number 1, Section 1,
2. proves by means of a certificate issued by an authorized physician according to the meaning of § 30 of the Hazardous Substances Ordinance that no reason exist to make him appear unsuited, either physically or mentally, to handling the fumigants named in Number 1.1,
3. proves that he possesses the necessary expert knowledge and sufficient experience in fumigations and
4. is at least 18 years old.

(2) The necessary reliability must be demonstrated by an official certificate of good conduct.

(3) The medical examination to check the demands according to Section 1, No. 2 shall include the following tests:

- Assessment of the sense of smell and the ability to distinguish colours according to the recommendation of the Federal Ministry of Labour and Social Affairs for the performance of suitability tests for holders of a certificate of competence (Federal Labour Gazette, issue 12/95, p. 41).
- Suitability for respiratory protection for a full-face mask with gas filter (BGV A4/ GUV - G 26/group 2) [3] if no valid examination certificate is available.

The test for suitability for respiratory protection can be dispensed with in the case of the restriction of the certificate of competence to pest control in the open air. See Annex 6 for a “specimen certificate for the suitability test”.

(4) Workers who must participate in fumigations with hydrogen cyanide, sulphuryl difluoride or bromomethane in order to be granted a certificate of competence can, in accordance with § 44 of the Hazardous Substances Ordinance, apply for an exemption from the provisions contained in Number 7, Section 7 of this Technical Rule.

(5) The certificate of competence is to be limited to a maximum of 5 years.

(6) Certificates of competence for the handling of bromomethane, sulphuryl difluoride and/or hydrogen cyanide must have the condition attached to them that they lose their validity if the holder has not performed any fumigation with these fumigants for more than one year. A two-year period must be laid down for certificates of competence for fumigations with phosphorus hydride and/or pest control in the open air.

(7) The certificate of competence lapses if, according to Section 1, No. 2, a new certificate is not presented to the competent authority at the latest 5 years since the issuance of the certificate.

(8) In addition to the certificate according to Section 1, No. 2, a precondition for each extension of the certificate of competence is proof of successful participation in a further training course according to Annex 4 that is recognized by the competent authority. Section 7 applies accordingly. Attention is drawn to Annex 4, Clause 1.

4.3 Technical expert knowledge

(1) Proof of technical expert knowledge according to Number 4.2, Section 1, No. 3 is provided by whoever presents a certificate relating to participation in a course recognized by the competent authority for the intended activity in which an examination is passed. The certificate of competence is to be limited according to the proof of expert knowledge that is furnished.

(2) The course (basic course, see Annex 1) must conclude with a theoretical and a practical examination. The examination can also be taken, either entirely or in part, at a subsequent date. The theoretical examination must be taken in writing according to the requirements of Annex 8. Oral examination questions can be asked in addition.

(3) The examination must be taken before a representative of the competent authority in whose area the course is held, in the presence of a representative of the institution that holds the course. The representative of the institution holding the course is entitled to ask questions on the examination subject.

(4) A record is to be taken of the examination result and the essential content of the examination. It must be signed by the representative of the competent authority.

(5) A certificate showing the type of knowledge that has been conveyed is to be issued to the applicant for successful participation in the course. The certificate must be signed by the representative from the competent authority. It shall also be signed by the representative of the body running the course.

(6) In cases of restriction to individual areas of use the duration of the course according to Annex 1 can be shortened accordingly. This course also requires recognition by the competent authority.

(7) The following is to be regarded as sufficient experience:

- 18-months' practice under the instruction of a head of fumigation. A period less than that required according to Clause 1 may be sufficient in the case of limitation of the certificate of competence to phosphorus hydride and preparations forming hydrogen cyanide and particular areas of use (e.g. head of silos in his own work area) and
- the participation in at least 4 fumigations with each of the fumigants and in each case in the areas of use (e.g. fumigations of silo cells, rooms, stacks of sacks, low-

height stores, ships) to which the certificate of competence that is applied for relates and

- proof of training as a first-aider according to the rule “First Aid” produced by the German Statutory Accident Insurance Institution (BGV A5 / GUV) [3]

One-off participation in a relevant fumigation and training as a first-aider according to the rule “First Aid” produced by the German Statutory Accident Insurance Institution (BGV A5 / GUV) [3] are regarded as sufficient experience for pest control in the open air.

5 Announcement

(1) Whoever wishes to perform fumigations outside a permanent fumigation plant using fumigants according to Number 1, Section 1 must announce this in writing to the competent authority at least one week in advance, in the case of ship fumigations 24 hours in advance. The competent authority shall permit exceptions in justified cases.
(For a printed form for an announcement see Annex 2 of this Technical Rule).

(2) Justified cases for exceptions to the announcement periods are, for example, the immediate fumigation of foodstuffs, tobacco and feedstuffs due to the threat of their rapid ruin or of pests to prevent their further spread and carry-over.

(3) The announcement must include:

1. the head of the fumigation,
2. the day of the fumigation,
3. in a current, official ground plan on the scale 1:1000 the location of the fumigation and the object that is to be fumigated together with information on the goods that are to be fumigated
4. the fumigant that is to be used as well as the intended quantities,
5. the expected start of the fumigation,
6. the expected end of the fumigation,
7. the expected date of degassing declaration and release,
8. the time of the testing of leakproofness, if this is required,
9. in a measurement plan the intended measurement points and the intervals at which measurement shall take place
10. In the case of fumigations with hydrogen cyanide, phosphorus hydride and sulphuryl difluoride the authorization number for the fumigant assigned by the Federal Office of Consumer Protection and Food Safety or by the earlier Federal Biological Research Centre for Agriculture and Forestry.

6 Head of fumigation

(1) A responsible head of fumigation must be appointed for each fumigation. The head of fumigation must possess a certificate of competence that is sufficient for the intended fumigation.

(2) In the case of permanent fumigation plant, heads of fumigation can be appointed on a permanent basis.

7 Organizational measures

(1) Fumigations must be performed without risk to people.

(2) Before a fumigation the permit holder or the head of the fumigation must examine whether

1. substances or preparations with a lower health risk than the fumigants he has considered for use are available or whether
2. by employing other authorized fumigation procedures the use of the fumigants named in Number 1, Section 1 can be reduced, e.g. by means of a reduction in the volume that is to be fumigated or whether,
3. by changing the procedure, the use of very toxic and toxic fumigants can be dispensed with.

(3) In the case of fumigations with fumigants according to Number 1, Section 1, at least the head of fumigation as well as one further person who fulfils the conditions contained in Number 4.3 must be present during the essential stages of the work.

(4) Essential stages of the work involved in fumigations (with the exception of fumigations in plants) are:

- examination of the rooms, transport containers and similar that are to be fumigated prior to the introduction of the fumigant
- introduction of the fumigant
- ventilation
- removal of the carrier material
- release and degassing declaration
- disposal of the carrier material

(5) Essential stages of the work involved in plants are:

- supplying the fumigation plant with the fumigant,
- if necessary, changing the compressed gas cylinder,
- testing the leakproofness of the plant if no testing of leakproofness according to the current state of technology is included in the plant programme
- starting fumigation,
- testing the degassing which has taken place,
- releasing the good,

- removing and disposing of the carrier material.

(6) With the exception of assistants according to Section 8, only persons that are experts according to the meaning of Number 4.3 may be employed in fumigation.

(7) In the case of fumigations with hydrogen cyanide, sulphuryl fluoride or bromomethane, only holders of a certificate of competence may be employed. In the case of pest control in the open air, one holder of a certificate of competence is sufficient if first aid is assured. The corresponding situation also applies to measurements for the release of containers and vehicles in the open air.

(8) In so far as ready-to-use, portioned preparations that form phosphorus hydride are used, previously instructed persons of suitable health may also be employed as assistants during the preparations, the introduction of the fumigant and the release work as long as they are under the direct supervision of a sufficient number of persons according to Number 4.3 (experts).

(9) The required supervision is sufficient if one supervisor according to Section 6 is used for every 10 assistants.

(10) One head of fumigation must be available as required after the introduction of the fumigant up to the release of the rooms.

(11) As a rule, a head of fumigation is available as required if he is at least

- contactable by phone within a 1/4 of an hour and
- can arrive at the fumigation location within two hours.

(12) The extent to which a head of fumigation must be available as required over and beyond this must be determined prior to the start of fumigation in dependence on the type and location of the object that is to be fumigated. Whether monitoring of fumigated rooms above and beyond that laid down in Section 3 is required must be determined by the head of fumigation according to the facts of the individual case.

(13) A record must be kept of fumigations with fumigants according to Number 1, Section 1. On request, a copy is to be sent to the competent authority. The record shall indicate in particular the type and quantity of the fumigants, the place of use, the personnel involved, the start and end of use and the time of release.

(14) During the work the participating persons must not be under the influence of alcohol or other drugs.

(15) Prior to the start of fumigation it must be ensured that

1. the head of fumigation possesses a mobile phone or, in the case of fumigations on ships, a VHF radio telephone that operates on the channels of the harbour authority
2. the telephone number of the emergency service and the emergency medical service and the register of poison information centres are available
3. emergency escape routes are established and kept clear
4. injured persons can be rescued quickly, in particular from lower-lying rooms, e.g. by cranes, lifts, authorized rescue stretchers with sufficiently long rescue lines and similar.

(16) Accidents during fumigations and harm to persons as a result of fumigants must be reported to the competent authority and the responsible accident insurance body immediately.

8 Safety measures when fumigating rooms

8.1 Information provided to third parties

(1) The users of adjacent objects such as rooms, buildings and plots of land must be warned in writing by the head of fumigation with reference to the risks of the fumigants at least 24 hours before the start of the application of fumigants. The warning sign must be attached in a visible manner to the access points of these objects if they lie within the possible area of effect of the fumigation. The warning sign shall include at least the following information:

The object that is to be fumigated, the time and the duration of the fumigation	Prohibition of access to and staying in the danger area
Emergency telephone, information telephone	Advice on how to behave near the danger area
Description of the properties of the fumigant and the signs of poisoning	Description of the visual and, if appropriate, acoustic warnings and all-clear signals

(2) Whoever as a contractor wishes to perform fumigations outside fumigation plants must write to the contract-placing party in good time to inform him about the risks associated with the fumigation and the start of the fumigation.

8.2 Sealing, gastightness

(1) The fumigation must be performed so as not to cause adverse environmental effects such as risks, considerable disadvantages or considerable annoyances to the general public or the neighbourhood. The rooms or the good that are to be fumigated must therefore be sufficiently sealed.

(2) Whether sufficient sealing is present must be determined according to the location and nature of the object

- on the basis of information sheet number 66 from the Federal Biological Research Centre for Agriculture and Forestry (BBA)
- by means of a leakproofness test undertaken by the head of fumigation or other expert person on the basis of information sheet number 71 from the BBA or
- if there is the risk of considerable annoyances (e.g. smells) in the case of insufficient sealing, by a specialist.

If required, the gastightness must be tested using physical methods of determination. Buildings to be fumigated which are

- structurally connected to other buildings or

- which have a room content of less than 500 m^3

are to be subjected to a leakproofness test using a tracer gas.

(3) Prior to the introduction of the fumigant the head of fumigation must ensure that the rooms that are to be fumigated are sufficiently sealed.

8.3 Clearing structurally connected buildings

(1) Before introducing the fumigant the head of fumigation must convince himself that structurally connected buildings or building complexes are cleared and that no one is present in them, in adjacent rooms or in any other rooms into which fumigants can penetrate. The same applies to buildings with which the object that is to be fumigated is structurally connected via shafts, channels, cable ducts, empty pipes and similar.

(2) Access to the rooms named in Section 1 during the fumigation is to be prevented with certainty by changing locks and safeguards or installing additional ones.

8.4 Danger area and measurements

(1) A danger area must be established around the object that is to be fumigated and secured by means of a barrier. Beyond the danger area that has been established the fumigant must not be detectable during the effect period using the gas measurement methods that usually apply to fumigations (PH_3 0.01 ppm, HCN 2 ppm, CH_3Br 0.5 ppm, SO_2F_2 1 ppm). If necessary, the danger area must be extended accordingly. Areas used by the public such as, for example, playgrounds, residential streets etc. must not be located within the danger area. It may be necessary to close off or clear areas.

(2) The head of fumigation must regularly perform measurements to check the established danger area as well as neighbouring publicly used areas for any fumigant concentrations. The measurement points and the frequency of the measurements must be geared to the local conditions relating to the buildings and use, the meteorological situation as well as to the stage of fumigation. The measurement results must be recorded and kept together with the record of the fumigation.

(3) The measurements required according to Section 2 may also be performed by other persons who are experts in this field.

(4) After the introduction of the fumigant, up to the point of release, all rooms must be closed so that they cannot be entered.

8.5 Work in structurally connected rooms

If structurally connected rooms such as, for example, warehouses, workshops, electrical operations rooms, corridors or similar have to be entered for operational reasons or work performed in them during the fumigation, measurements of any fumigant concentrations in the ambient air of these areas must be undertaken continuously. Persons may only stay there or workers may only be employed in these areas if each individual measurement does not exceed the particular air limit value for the fumigant (as a limit value).

8.6 Labelling of fumigated rooms

(1) Prior to the start of fumigation, warning signs which draw attention to the fumigation and include an inscription according to Section 2 must be fixed to access points to rooms

– which are to be fumigated

– which are adjacent and which fumigants can penetrate.

(2) The sign with the minimum format 250 x 300 mm must include:

- the danger symbol for "toxic"
- the inscription "Very toxic gases! Danger! No entry!",
- the name of the fumigant,
- the date and the time of the fumigation,
- the name, address and telephone number of the fumigation company.
- the name and telephone number of the head of the fumigation.
- in case of emergency, call the emergency control centre tel. *****

(3) In the areas of shipping and aviation, the labelling required according to Section 2 must be additionally undertaken in English.

8.7 Ventilation of fumigated rooms

(1) Observing the requirements for fumigation plants under Number 9.1, the exhaust air from fumigated buildings is to be brought to the open air via the roof.

(2) In the case of a weather situation in which a low exchange of air persists the ventilation of the fumigated rooms shall be postponed or reduced accordingly. In the case of doubt, an enquiry at the nearest meteorological office is required.

9 Supplementary safety measures

9.1 Fumigation in plants

9.1.1 General demands

(1) Fumigations in plants are only permitted if the plants are

1. gastight,
2. can be ventilated without risk to man and the environment,

3. are set up in rooms in which people do not stay permanently.

(2) Fumigation plants may only be operated at normal pressure or under-pressure.

(3) The head of fumigation must test the plants for leakproofness prior to every fumigation. Records must be kept of the fumigation which is performed.

(4) The examination of the leakproofness of the fumigation plants demanded according to Section 3 can take place, for example, as follows:

- in the case of plants which operate at under-pressure, by creating the usual under-pressure and manometric checking of the variation in pressure during a representative period and
- in the case of plants which operate at normal pressure, by applying excess pressure of max. 0.1 bar and manometric checking of the variation in pressure during a representative period.

(5) Fumigation plants can be described as sufficiently gastight if

- in the case of plants which operate at under-pressure, the under-pressure set during the fumigation is maintained during the entire fumigation or if sufficient under-pressure is present in the plant up to the end of the fumigation.
- in the case of plants which operate at normal pressure, traces of the fumigant are not detectable outside the fumigation plant – particularly near to the inlet – during the fumigation (see Number 11).

(6) If highly flammable fumigants are to be used, sufficient explosion protection measures must be taken. The heating, ventilation and air-handling systems within the plant must be of explosion-proof design.

(7) The exhaust gases from fumigation plants must

- be brought to the outside air via the roof, and indeed
  - in the case of ridge roofs 1 m above the ridge,
  - in the case of flat and shed roofs 5 m above the upper edge of the roof,

  however at least 10 m above the ground.
- be discharged far enough away from the air-intake openings of neighbouring air-conditioning and air-handling systems that the maximum immission concentration values or the immission values according to the Technical Instructions on Air Quality Control in front of the air-intake openings are not exceeded.

(8) The assembly of permanent fumigation plants possibly requires approval from the building regulations authorities. The competent authority according to the Hazardous Substances Ordinance must be informed about it.

(9) Fumigation plants require approval according to § 4 of the Federal Immission Control Act if the content of the fumigation chamber amounts to 1 m^3 or more and if very toxic or toxic substances or preparations are used for the purpose of fumigation.

9.1.2 Ventilation of the setting-up and removal rooms

(1) Setting-up and removal rooms must have at least an eight-fold hourly exchange of air with the air being carried diagonally across the room.

(2) The ventilation plant must be assembled and operated so that the air extracted from the setting-up and removal room cannot enter other rooms.

9.1.3 Degassing of fumigated goods

(1) After fumigation, the good treated with the fumigant must be degassed. Degassing in rooms is not permitted.

(2) Degasification must always be performed in a fumigation plant equipped with a degasification programme. It must be performed to such an extent that on opening the plant the limit value for the fumigant is not exceeded (cf. Number 2, Section 3).

9.1.4 Maintenance, repair and testing

(1) Maintenance work, repairs and essential changes to fumigation plants may only be undertaken by the manufacturer of the plant or by persons authorized by the manufacturer.

(2) Fumigation plants (including the gas supply and waste gas pipes) must be examined for safety by an expert in at least yearly intervals. A record must be kept of the test result.

(3) Pressurized fumigant vessels of fumigation plants are subject to the Ordinance on Pressurized Vessels and a duty to test them possibly exists.

(4) Any faults detected on fumigation plants must be rectified immediately.

9.2 Fumigation of transport containers in the open air

(1) Transport containers may be fumigated in the open air only if there is a safety distance to buildings of at least 10 m on all sides. The containers must be sealed by the head of fumigation and examined for gastightness. The head of fumigation must label the containers visibly on all sides, keep them closed and provide them with a seal for the duration of the fumigation.

(2) Labelling must be performed according to Number 8.5.

(3) Transport containers standing under gas must be secured against transportation by suitable means up to the point of release/degassing declaration. The safety distance according to Section 1 of at least 10 m must also be adhered to in relation to vehicles and other objects in which people may stay.

9.3 Transportation of fumigated transport containers

(1) Transport containers standing under gas may only be transported when the head of fumigation has established that there is no longer a risk due to the fumigant. Number 9.2, Section 1, Clause 3 applies. The demand according to Clause 1 includes that the fumigant may not be introduced into the transport containers on ships.

(2) In the case of transport containers which are to be transported abroad while under gas, the labelling required according to Number 8.5 must be additionally performed in the English language.

(3) Transport containers standing under gas may only be transported if written confirmation from the head of fumigation is available to the haulier that the containers are gas-tight, suitable for transportation and that at least 24 hours have passed since the introduction of the fumigant.

(4) Transport containers standing under gas may only be brought aboard ships if

- the skipper of the ship is informed about the intention to bring them aboard and
- if the ship's freight documents identify the transport containers standing under gas as such and include information on the time of fumigation and the fumigants that were used.

(5) Transport containers standing under gas must, as far as possible, be transported on the deck of the ship.

(6) Transport containers standing under gas must be stored on deck with a minimum distance of 6 m to ventilation inlets, crew accommodation and other rooms on the ship through which persons pass.

(7) Transport containers standing under gas may only be transported below deck if the cargo holds are equipped with a mechanical ventilation system which prevents the development of gas concentrations above the limit values. Suitable gas-measurement devices and instructions for their use as well as first-aid equipment must be available on the ship.

(8) During the under-deck transportation of containers standing under gas, in these cargo holds

- the ventilation units must be kept in constant operation and at least a two-fold exchange of air per hour must be ensured
- monitoring measures according to Number 12 must be performed, these being measurements of the concentration of the hazardous substance in the ambient air
  - prior to the departure of the ship
  - after particular occurrences (in the case of the ventilation ceasing to function, sea damage)
  - in the port of arrival.

(9) If transport containers standing under gas are to be transported on ships with cargo holds without mechanical ventilation according to Section 7, the cargo holds are to be treated as if standing under gas and the rules contained in Number 9.5 are to be applied.

(10) The port authorities must be informed about the type and the time of fumigation of the transport containers at least 24 hours before the arrival of the ship. The information must include the details according to Number 8.5.2.

(11) On arrival in the unloading port, information from the manufacturer of the fumigant regarding methods for measuring the gas in the air, its properties and risks, its signs of poisoning, suitable first-aid and emergency measures as well as medical equipment and instructions on the removal of the residues of the fumigant, e.g. carrier material, must be kept available on the ship.

(12) On conclusion of the transportation of fumigated transport containers, release/degassing declaration according to 11.3 must take place. Risk-free exhaust ventilation only exists in the case of a safety distance of at least 10 m.

(13) If on opening a transport container residues of the fumigant are determined or if there is any other suspicion that the transport container is not gas-free, it is necessary to proceed as follows:

- leave the transport containers, close them and, if necessary, secure them,
- seek advice from the holder of a certificate of competence.

9.4 Fumigation of ships at berths

(1) The fumigation, including the ventilation of ships' rooms, may only be performed at a berth in the port or in the roads that is determined by the port authorities. Number 8.1, Section 2 has to be applied. The ship may not leave the port until the release certificate has been issued by the head of fumigation.

(2) All persons must leave the ship prior to the fumigation of the ship's rooms. By inspecting all rooms, lifeboats etc, it must be guaranteed whether all unauthorized persons have left the ship. During fumigation persons must be prevented from boarding the ship without permission by means of a guard. In addition to the warning signs at the rooms that are to be fumigated which are required according to Number 8.5.2, corresponding warning signs must be attached in a clearly visible manner to the gangway and the entry points to the crew accommodation and must be illuminated in the dark. No non-fumigated ships may lie alongside and no ladders may hang out.

(3) If, due to other regulations, persons have to be on board while fumigants are taking effect on ships at berths, it is necessary to proceed according to Number 9.5.

(4) The head of fumigation must be present during the essential stages of a fumigation and up to the issuance of the release certificate.

(5) To end the fumigation the head of fumigation must take the necessary measures to ensure that the fumigant volatilizes. Residues of the fumigant such as, e.g. carrier material, must be removed from the fumigated rooms under the supervision of the head of fumigation and destroyed according to the instructions of the manufacturer. If crew members are called upon to help perform such measures they

- must be able to wear respiratory protection
- must wear suitable respirators and protective clothing
- must be instructed about the risks and protective measures, if necessary in the language of the crew members
- must follow the requests of the head of fumigation

(6) The head of fumigation must provide the skipper with a written list of the rooms which may be entered by crew members after the introduction of the fumigant for the purpose of performing work prior to the release of the ship. Living and recreation rooms may not be released as places to remain on a permanent basis. If required, it is necessary to proceed according to Number 9.5.

(7) During the fumigation and ventilation periods in the rooms named in Section 5 the head of fumigation must monitor the concentration of the hazardous substance in the air to ensure that the gas concentration does not exceed the respective limit value. Should the gas concentration in one of these areas exceed the limit value, the crew members must wear suitable respirators or the area must be cleared until measurements have shown that it can be entered without risk.

(8) Persons not belonging to the fumigation or auxiliary personnel may only enter the fumigated rooms once the head of fumigation has established that the ship is gas-free, the warning signs have been removed and the head of fumigation has issued the release certificate.

(9) The release certificate according to Section 8 may only be issued when measurements have shown that the fumigant has volatilized from all of the ship's rooms and all of the residues of the fumigant such as, for example, carrier material have been removed in accordance with Section 5. During these checks particular account must be taken of the fact that the residues of the fumigant are only released very slowly from fine-grain and dense material, particularly when the load is at temperatures at or below 10 °C.

(10) With the exception of cases according to Section 5, rooms standing under gas may only be entered in an emergency. In this emergency the head of fumigation must enter with at least one other person. Each must be equipped with a suitable respirator and at all times be in contact with a reliable safety guard placed outside the room. The safety guard must at all times be able to call for help. As a rule, the permanent contact is visual contact. If visual contact is not possible, permanent contact can be maintained, for example, by voice contact or signal lines.

9.5 Fumigation of ship cargoes during transportation at sea

(1) The fumigation may only be performed on ships which have been authorized for this purpose by the competent authority and if during the transportation at least two persons are present who are experts according to the meaning of Number 4.3.

(2) The introduction of the fumigant into the ship's rooms may only be performed in the port at a berth determined by the port authority.

(3) In each case a report from the classification society is to be submitted to the competent authority together with the application for authorization. The report shall include

- the cargo holds suitable for fumigation
- the condition of the structural elements delimiting the holds, including all openings with their covers and the seals of all hatch covers and flaps
- measures considered necessary for the additional sealing of openings and seals
- the confirmation that no living and recreation rooms are adjacent to the cargo holds that are suitable for fumigation.

For this purpose, the cargo holds must be in a cleaned state and the adjacent rooms made available for inspection. At the order of the inspector, covers and flap seals must be tested for leak-proofness, valves and other means of closing off connected pipelines must be checked. Pipelines that are to be taken into consideration include: bilge systems, electrical systems, cargo line systems, smoke detection systems and CO_2 pipeline systems.

(4) The rules contained in Number 8 must be applied accordingly. Before the start of loading the cargo holds must be inspected by the head of fumigation and the expert ship's officer. It must be established here whether the rooms are arranged according to the authorization notice. The head of fumigation must issue the skipper with a certificate of the result. Expert according to the meaning of Number 4.3 are, for example, ship's officers who, as a result of their training and further training, have been familiarized with the risks of very toxic gases and the necessary protective measures and gas measurement procedures and who have been specially instructed by the head of fumigation before and during the ship fumigation.

(5) The experts on the ship must be informed about the instructions for use on the packaging of the fumigants and the information provided by the manufacturer concerning methods for measuring the gas in the air, its properties and risks, its signs of poisoning, suitable first-aid and emergency measures and special medical equipment required for these measures.

(6) The following must be available for use on the ship:

1. gas measurement devices suitable for the utilized fumigants and instructions for their use as well as information on the limit values that must be adhered to,
2. instructions on the handling of the residues of the fumigant and, in particular, on their destruction,

3. in addition to the prescribed ship's equipment at least 4 sets of respirators and 12 filters suitable for phosphorus hydride or 10 reserve bottles for self-contained respirators,
4. the necessary medical and pharmaceutical equipment (see also Annex 3 to this Technical Rule),
5. MFAG: Medical First Aid Guide (for Ships) - RM 003 – Guidance for medical measures in the case of accidents with hazardous substances

(7) The expert officer must inform the crew and any other persons on board before a fumigation takes place and must confirm this to the head of fumigation as well as confirm to him the presence of the equipment listed under Section 6 and the pharmaceutical equipment according to the MFAG.

(8) After a suitable fumigation period and before leaving the port, the head of fumigation must inform the skipper

1. which rooms are fumigated and which further rooms must not be entered during transportation,
2. which technical changes were effected to the ship for the purpose of performing the fumigation,
3. that the fumigated rooms are sufficiently gastight,
4. that the rooms adjacent to the fumigated rooms are free of fumigants.

(9) After the introduction of the fumigant the ship shall remain in the port at a berth assigned by the port authority until the gas in the fumigated rooms has reached such a high concentration that any leakages can be determined by measurements. The necessary measurements must be performed by the expert ship personnel under the supervision of the head of fumigation. Particular attention is required because the fumigant is introduced in solid form and requires a relatively long time in order to reach a high concentration in the cargo holds. If leakages are determined the ship cannot leave the port until these leakages have been removed.

(10) After it has been established that the ship is safe to leave the port, i.e. that gas leakages have no longer been determined, the head of fumigation must inform the skipper in writing about the fulfilment of the demands according to Section 8, No. 3 and 4.

(11) With the written notice according to Section 8 and 10 the head of fumigation transfers his responsibility for the fumigation to the skipper of the ship. Only then may he leave the ship.

(12) If the ship leaves the port immediately after the start of fumigation the head of fumigation must remain on board until

1. the fumigated cargo has been unloaded or
2. sections 8 or 10 are fulfilled.

(13) Number 8.5 Sections 1 and 2 (warning signs) has to be applied.

(14) The gastightness of the fumigated rooms must be examined at least every 8 hours during the entire duration of the transportation. The results must be entered into the ship's log.

(15) Gas concentration measurements must be performed in all rooms which can be entered by the crew such as living and recreation rooms, machine rooms, areas required for navigation as well as in occasionally sought out working rooms and stores such as e.g. the forecastle. It is necessary to observe with particular attention the gas concentration in rooms which are connected to the cargo holds by bilge pipelines, cargo pipelines or other pipelines.

(16) Work may only be performed in the rooms named in Section 15 if the conditions according to Number 11.1, Section 1 are fulfilled.

(17) People may only stay in living and recreation rooms if the conditions according to Number 11.1, Section 2 are fulfilled.

(18) Fumigated ship's rooms must not be entered or opened for the duration of the transportation. In an emergency it is necessary to proceed according to Number 9.4, Section 10.

(19) If for any reason it is unavoidable that fumigated cargo holds have to be ventilated during the transportation, the gas must be prevented from collecting in living and recreation rooms or in workrooms. The gas concentration must be measured continuously in these rooms during ventilation. If the concentration of the hazardous substance in the air in workrooms exceeds the air limit values or if hazardous substances are detectable in living or recreation rooms (see Number 12), persons must leave these rooms and the ventilated cargo holds must be closed. If a cargo hold was closed again after ventilation, it cannot be assumed that this room is absolutely free of gas. Corresponding gas measurements must therefore be performed before it is entered.

(20) The port authorities must be informed about the type and the time of fumigation as well as about the fumigated rooms and transport containers at the latest 24 hours prior to the arrival of a fumigated ship.

(21) The ventilation of fumigated ships' rooms may only be performed in the port or in the roads at a berth determined by the port authority.

(22) During ventilation and during the opening of the hatches the persons occupied with the work must wear respirators. Measurements of hazardous substances must be performed in the room atmosphere before entering ventilated cargo holds. Attention is drawn to Number 9.4, Section 9, Clause 2. The measurement results must be entered into the ship's log.

(23) As far as possible, the cargo from fumigated cargo holds must be unloaded using conveying devices which do not require persons to enter the cargo holds. If the presence of persons in the cargo holds is required in order to unload the cargo, hazardous-substance measurements must be performed continuously in the fumigated cargo hold. If necessary, these persons must be equipped with respirators and protective clothing.

(24) If the unloading is completed and the ship is free of fumigants and their residues, such as e.g. carrier material, and this has been confirmed by the holder of a certificate of competence, all of the warning signs must be removed. All actions taken in connection with the fumigation must be entered into the ship's log.

(25) Residues of the fumigant, such as e.g. carrier material, may only be disposed of in the port according to the instructions of the manufacturer or removed for proper disposal.

10 Additional rules for particular fumigants

10.1 Bromomethane

(1) If rooms to be fumigated have to be entered in order to open bottle valves, so many holders of certificates of competence must be employed that the rooms can be left within 10 minutes after the opening of the first bottle valve.

(2) A closed room with a bromomethane concentration above 2 g/m^3 must not be entered. At concentrations above 0.4 g/m^3 it is only permitted to stay for 10 minutes at the most using respiratory protection.

(3) The following must be observed in the case of the ventilation of rooms which have been fumigated using bromomethane:

1. Wearing respiratory protection, the doors, windows etc. that have been prepared for this previously must first be opened from the outside. The room must not be entered.
2. At the earliest after one hour or after measurements near to the opened room access points have resulted in values below 2 g/m^3 the room may be entered for a short time wearing respiratory protection in order to create further draught openings.
3. Clearing-up work, checks etc. may only be performed after complete aeration of the room. The progress of the ventilation must be continuously monitored by taking measurements in the room atmosphere.

(4) When entering rooms in accordance with Section 1 or 2 the workers must wear suitable protective clothing and respirators with gas filters suitable for bromomethane.

(5) In the greenhouse and in the open air fumigation may only take place under gastight sheeting. Warning signs with an inscription according to Number 8.5, Section 2 must be put up at the fumigation site.

10.2 Hydrogen cyanide

(1) In the fumigation of rooms the applied quantity of gas must not exceed 30 g/m^3 (2.7 parts per hundred by volume in air). Subsequent dosing is only permitted after two hours.

(2) More than 100 kg hydrogen cyanide must not be used by one holder of a certificate of competence on one working day.

(3) Persons with external injuries must not perform any work with hydrogen cyanide.

(4) Workers that perform fumigations with hydrogen cyanide must wear protective clothing as well as respirators with gas filters suitable for hydrogen cyanide.

10.3 Phosphorus hydride

(1) If phosphorus hydride is used for the purpose of pest control in the open air, Number 5 and Number 7, Section 13 do not apply.

(2) In the fumigation of rooms the quantity of gas used must be selected so that no explosive gas-air mixture can be formed.

(3) Holders of certificates of competence and experts that perform fumigations with phosphorus hydride must carry with them respirators with suitable gas filters for phosphorus hydride during the fumigation. In so far as assistants according to number 7 are used, one holder of a certificate of competence or one expert must be assigned per 10 assistants and must keep ready the respirators with gas filter.

(4) Sheeting (covering sheets) is regarded as gastight for phosphorus hydride if in testing according to DIN 53536 A it does not allow through more than 1 mg PH_3 pro m^2 and day.

(5) Before using phosphorus hydride (PH_3) from compressed gas containers the head of fumigation must be instructed by the person placing the product on the market with regard to the risks and protective measures. This can take place within the framework of the instruction according to § 3, Section 1, No. 5 of the Prohibition of Chemicals Ordinance.

(6) In the case of the use of phosphorus hydride (PH_3) from compressed gas containers

a) according to Number 7.6, only holders of certificates of competence but no assistants may be employed. An exemption must be obtained for training purposes,

b) after introduction of the fumigant the utilized hoses must be rinsed with nitrogen,

c) a self-contained respirator must be kept ready at the fumigation site for emergencies.

(7) The compressed gas containers used in the fumigation must be set up outside the room (building, object) that is to be fumigated.

10.4 Sulphuryl difluoride

(1) The compressed gas containers used in the fumigation must be set up outside the room (building, object) that is to be fumigated.

(2) If rooms (building, objects) standing under fumigants have to be entered, e.g. in order to initiate ventilation, this may only occur wearing a self-contained respirator. Filter devices must not be used because no suitable filters currently exist.

(3) The following personal protective equipment must be worn during use of the compressed gas containers filled with sulphuryl difluoride for the purpose of fumigation:

- protective clothing (e.g. protective jacket or apron are suitable here)
- protective goggles, face protection against splashes
- safety shoes.

11 Release

The head of fumigation may only release rooms, fitments and fumigated goods when it has been ensured by means of suitable detection techniques that there is no longer a risk due to fumigants.

11.1 Rooms

(1) A precondition for the provisional release of the rooms for the performance of remaining work is that the gas concentration in the room atmosphere does not exceed the respective limit value.

(2) A precondition for the final release of the rooms so that persons can stay in them permanently is

- sufficient ventilation,
- removal of the carrier material,
- ascertainment of the fact that the utilized substances and preparations are no longer detectable in the room atmosphere (see Number 12).

(3) A room fumigated with bromomethane may only be released if, after at least 12-hours' ventilation, the fumigant is also no longer detectable in the gaps of, for example, stacks of sacks or in other hardly accessible cavities.

(4) In the case of the final release the labelling must be removed.

(5) A certificate must be issued concerning the release of the rooms and handed to the contractor.

11.2 Fumigated goods

(1) A precondition for the release of fumigated fitments and goods for further use is that in the fumigation room or in their temporary or intended set-up room, with the ventilation turned off, they no longer release any fumigant above the following limit values:

- in the case of phosphorus hydride 0.01 ppm PH_3,
- in the case of bromomethane 0.5 ppm CH_3Br,

- in the case of hydrogen cyanide 2 ppm HCN and
- in the case of sulphuryl difluoride 1 ppm SO_2F_2

(2) The gas concentration must be tested using a suitable measurement method.

11.3 Release of transport containers (container, vehicle)

(1) Transport containers may only be released by a holder of a certificate of competence and only then when the transport containers have been sufficiently ventilated and measurements have revealed that the gas concentration in the container is below the respective detection limit. All the residues of the fumigant, e.g. carrier material, and the labelling according to Number 8.5 must be removed prior to release.

(2) Gas test tubes or other suitable measurement devices whose measurement range include the detection limit must be used for the release measurements. The following apply as detection limits according to the meaning of this Technical Rule.

- in the case of phosphorus hydride 0.01 ppm PH_3,
- in the case of bromomethane 0.5 ppm CH_3Br and
- in the case of sulphuryl difluoride 1 ppm SO_2F_2

(3) If no reliable information on the utilized fumigant is available for the release of a container or vehicle standing under gas, testing must be performed for all fumigants that can be expected.

(4) The measurement of the gas concentration in containers according to Section 1 must be performed, after sufficient ventilation of the container or vehicle, with shut doors e.g. through a measurement opening or the rubber seal of the door. The gas concentration shall be determined for individually packed goods, also in blister-packed goods or in other packaging, e.g. cardboard boxes, by means of random sampling.

(5) The release according to Section 1 includes the test to ensure that no dangerous concentration of the fumigant can occur in the cargo hold as a result of desorption of the fumigant (subsequent release of gas).

(6) A certificate regarding the release of the transport containers must be issued and handed to the contractor.

(7) The release certificate must be enclosed with the freight papers so that it also reaches the recipient / unloader of the container or vehicle. A copy of the release certificate must be attached to the container or vehicle in a clearly visible manner.

12 Monitoring duty

(1) If the occurrence of one or various hazardous substances in the workplace atmosphere cannot be excluded with certainty it is necessary to determine whether levels are below the maximum concentration values in the workplace (MAK), the technical exposure limits (TRK) or the biological tolerance values in the workplace (BAT) or exceed the trigger threshold. The total effect of various hazardous substances in the workplace atmosphere must be assessed.

(2) The §§ 15a to 15e and the Fifth Section of the Hazardous Substances Ordinance apply to the handling of hazardous substances including activities in their danger zone.

(3) Whoever performs measurements according to Number 12.1 must

- possess the necessary expert knowledge and the necessary equipment and
- employ measurement techniques which with regard to the detection limit, sensitivity and precision are adapted to the limit value. Using the technique it should be possible to measure concentrations of the component requiring measurement at least in the range between the tenth and the threefold of the limit value.
- Measurement devices must be checked at least once a year or according to information provided by the manufacturer and, if necessary, calibrated. A written record must be kept of the performance of the check and must be submitted to the competent monitoring authority on request.

In the case of the fumigation of rooms or their ventilation it is necessary to determine whether the fumigant can be detected outside the danger zone (Number 8.3).

(5) Direct-displaying measurement systems must be used in the determination of the concentration of fumigants in the air. Inter alia, these can be:

- gas test tubes,
- measurement systems on an electrochemical basis,
- photoionization detectors (PID).

The lower detection limit is 0.01 ppm for PH_3, 0.5 ppm for CH_3Br, 2 ppm for HCN and 1 ppm for SO_2F_2.

(6) The gas concentration in the fumigation room must be monitored during fumigation if it is to be feared that an explosive atmosphere may form in a danger-threatening quantity.

(7) If the permitted air limit value is exceeded during fumigation, protective measures must be taken such as, for example,

- additional sealing measures,
- extension of the danger zone beyond the extent required according to Number 8.3,
- ventilation measures,
- personal protective equipment according to Number 14

(8) The results of the determinations and measurements must be recorded and kept for at least 30 years. In the case of company closure the measurement results must be handed over to the competent accident insurance body.

(9) During the performance of the fumigation a copy of the measurement results must be available to the supervisory authority at the fumigation site for inspection at all times.

13 Medical surveillance

The employer may

1. only employ,
2. only continue to employ

a worker who uses fumigants

if he has been examined for the wearing of respirators by an authorized physician within the periods for the first and subsequent preventive health checks as laid down in the rule from the German Statutory Accident Insurance Institution “Medical surveillance” (BGV A 4 / GUV) [3]. This does not apply to assistants according to Number 7, Section 8.

14 Personal protective equipment

(1) If the organizational and technical safety measures that are to be taken do not result in concentrations that are below the maximum concentration in the workplace (MAK) or the biological tolerance value in the workplace (BAT) the employer must

1. make available effective and, with regard to its wearability, suitable personal protective equipment and keep it ready for use in a perfect hygienic condition
2. ensure that the workers are only employed for as long as is absolutely required by the work process and is compatible with health protection.

This also applies when allergic reactions must be expected.

(2) The workers must use the personal protective equipment that has been made available.

(3) The use of the personal protective equipment must be monitored during the work by the head of fumigation.

(4) The wearing of respiratory protection and full protective suits must not be a permanent measure.

(5) The filters of respirators that are used during fumigation must be disposed of properly after single use.

(6) The personal protective equipment must be made available for the utilized fumigant according to the information provided in

- the information sheets produced by the German Statutory Accident Insurance Institution for the Chemical Industry [3]
- the guidelines of the Federal Institute for Health Protection of Consumers and Veterinary Medicine (now the Federal Institute for Risk Assessment)
- the rules for the use of respirators (BGR 190) [3].

15 Protective hygiene measures

(1) When handling the fumigants named under Number 1, Section 1

- in work rooms
- in the rooms to be fumigated or at workplaces in the open air

workers must not eat, drink or smoke. Areas must be established for these workers in which they can eat, drink or smoke without impairment of their health as a result of hazardous substances.

(2) Washrooms as well as rooms with the possibility of storing separately outdoor clothing and working clothes must be made available to workers who are employed in the handling of substances that are very toxic, toxic, carcinogenic, toxic to the embryo/fetus or mutagenic. If necessary for health reasons, changing rooms for outdoor clothing and working clothes that are separated from each other by a washroom with showers must be made available. Working clothes and protective clothing must be cleaned by the employer. If necessary, the clothing is to be disposed of properly and replaced by the employer.

(3) Running water for rinsing wetted parts of the body must be available in the vicinity of the fumigation site.

16 First aid

(1) Suitable equipment and pharmaceuticals for first aid in the case of poisoning must be kept ready for use at the fumigation site or in the vicinity of the fumigation plant (see Annex 3 to this Technical Rule).

(2) The first-aid equipment must be checked annually for completeness and usability. A record must be kept of the check.

(3) In the case of poisoning and damage to the skin the affected workers must be presented to a physician immediately.

(4) Holders of certificates of competence and technical experts must be additionally trained and provided with further training in first aid by an occupational physician, in particular in resuscitation measures with regard to the utilized fumigants. Repetition and further training must be undertaken at least in two-yearly intervals. A record must be kept of the trainings that are performed.

17 Employment restrictions

Attention is drawn to the restrictions on employment in the Act on the Protection of Minors at Work and the Ordinance on the Protection of Nursing and Expectant Mothers.

18 Keeping and storing

(1) Hazardous substances must be kept or stored in such a way that they do not endanger human health and the environment. Suitable and reasonable precautions must be taken to prevent, as far as possible, wrongful or mistaken use. During keeping for the purpose of supply and immediate use the dangers associated with use must be recognizable.

(2) Hazardous substances must not be kept or stored in containers as a result of whose shape or name the content may be confused with foods. Hazardous substances may only be kept or stored in a clearly ordered manner and not in the immediate vicinity of pharmaceuticals, foods or feedstuffs including additives.

(3) Substances and preparations labelled with T+ or T must be kept under lock and key or kept or stored in such a way that only experts have access to them (see also Technical Rule 514) [3].

19 Disposal

(1) The wastes that occur must be disposed of according to waste legislation, in particular in observance of the Ordinance on the Determination of Wastes (AbfBestV), the Waste Avoidance, Recycling and Disposal Act (KrW-/AbfG) and the Waste Register Ordinance (AVV). Accordingly, e.g. bags, tablets, pellets as well as plates and strips that form phosphorus hydride bear the waste code no. 061301 (not yet degassed wastes) or 060316 (degassed wastes). Small quantities that occur, including contaminated packaging materials, shall be collected separately and taken directly to the municipal collection point for problematic substances.

(2) Transport packaging is disposed of according to the rules contained in the Packaging Ordinance (VerpackV). Accordingly, transport packaging can be returned to the producer or the distributor.

(3) Sales packaging that is free of residue such as cans, bottles, canisters and the like (see also § 3, Section 1, Number 2 of the Packaging Ordinance) must be rendered unusable and is disposed of via the household or industrial waste.

(4) Compressed gas cylinders must be returned to the producer/supplier for reutilization.

(5) PH_3 carrier material that is used in fumigation can, after it is sufficiently degassed according to the manufacturer's/importer's instructions for use, be inactivated, for example, as follows and then transported and disposed of without risk. This can occur, for example, as follows: the carrier material (e.g. plates, bags, tablets) is placed in a non-

covered, water-filled container in the open air. It must be stirred in the water to which a household washing-up liquid has been added in order to wet the carrier material better and left for at least 12 hours. The carrier material can then be disposed of via the industrial waste.

(6) Hydrogen cyanide carrier material used in fumigation can be disposed of via the industrial waste without further treatment.

20 company-specific operating Instructions

(1) The employer must produce company-specific operating instructions that are related to the working area and the particular substance. They must refer to the risks to man and the environment associated with the handling of hazardous substances and lay down the necessary protective measures and codes of conduct. Attention must be drawn to the proper disposal of hazardous wastes that occur. The company-specific operating instructions must be written in a comprehensible way in the language of the employees and announced at a suitable location in the place of work. They must also include instructions on behaviour in the case of danger and on first aid.

(2) Workers employed to handle hazardous substances must receive instruction on the dangers that occur as well as on the protective measures on the basis of the company-specific operating instructions . The instruction must take place prior to employment and subsequently at least once a year orally and in relation to the workplace. The content and the time of the instruction must be recorded in writing and confirmed by those instructed by means of their signature. The proof of instruction must be kept for two years.

(3) The employer is obliged to inform as soon as possible expectant or nursing mothers as well as the other female workers employed by him and the works committee or staff council, if the latter exist, about the results of the assessment of the working conditions and the measures that are to be taken to ensure safety and health protection in the workplace (§ 2 Clause 1 of the Ordinance on the Protection of Nursing and Expectant Mothers - MuSchRiV).

21 Associated rules

In addition, attention is drawn in particular to the following rules:

- IMO “Recommendations on the Safe Use of Pesticides in Ships” [1]
- RM 003 "Guideline on first-aid measures – Guidance document for medical measures in the case of accidents with hazardous goods (MFAG) -"Federal Gazette, issue 235a of 14.12.1984
- Information sheet from the Federal Health Office and the Federal Biological Research Centre for Agriculture and Forestry on precautionary measures during the use of methyl bromide in pest control in rooms, fumigation plant or under gastight sheeting. Information sheet number 22.

- Information sheet from the Federal Biological Research Centre for Agriculture and Forestry on combating stored-goods pests using phosphorus hydride. Information sheet number 64.
- Information sheet from the Federal Biological Research Centre for Agriculture and Forestry on the sealing of warehouses and parts of corn in the case of fumigation performed against stored-goods pests. Information sheet number 66.
- Information sheet from the Federal Biological Research Centre for Agriculture and Forestry on the pressure test for the determination of the ability of buildings, chambers or sheeting-covered goods to be fumigated during pest control. Information sheet number 71
- § 36 of the Statutory Accident Insurance Institution's rule "General rules" (BGV A 1 / GUV 3)
- Statutory Accident Insurance Institution's rule "Sea" § 82 [3]
- Statutory Accident Insurance Institution's rule "Medical surveillance" (BGV A 4 / GUV) [3]
- Statutory Accident Insurance Institution's rule "first aid" (BGV A 5 / GUV) [3]
- Information sheet on hydrogen cyanide (prussic acid) (BGI 569 or M 002) [3]
- Plant Protection Product Use Ordinance
- Technical Rule 150 Direct dermal contact with hazardous substances
- Technical Rule 400 "Determination and assessment of the risks due to hazardous substances in the workplace: requirements"
- Technical Rule 402 Determination and assessment of the concentrations of hazardous substances in the atmosphere of working areas
- Technical Rule 403 Assessment of substance mixtures in the workplace atmosphere
- Technical Rule 440 Determination and assessment of the risks due to hazardous substances in the workplace: Procedure (determination duty)
- Technical Rule 500 Protective measures: minimum standards
- Technical Rule 514 Storage of very toxic and toxic substances in packages and mobile containers
- Technical Rule 555 Instructions for use and instruction according to § 20 of the Hazardous Substances Ordinance
- Technical Rule 900 Occupational exposure limits in the workplace atmosphere
- Technical Rule 903 Biological tolerance values for the workplace (BAT values)
- Technical Rule 905 Register of carcinogenic and mutagenic substances or substances toxic to reproduction
- Employment Protection Act
- Ordinance on the Protection of Nursing and Expectant Mothers -MuSchRiV of 15.04.97 (Federal Law Gazette. p. 782)

- Second law to amend the Act on the Protection of Minors at Work of 24.02.97 (Federal Law Gazette. p. 311)

Sources of supply:

[1] K.O. Storck-Verlag, Stahltwiete 7 in 22761 Hamburg

[2] Saphir-Verlag Heike Kramer, Gutsstraße 15, 38551 Ribbesbüttel

[3] Carl Heymanns Verlag KG Luxemburger Str. 449 in 50939 Cologne

[4] Beuth-Verlag GmbH Burggrafenstr. 4-10 in 12623 Berlin

[5] Bundesanzeiger Verlags GmbH, Postfach 13 20 in 53003 Bonn

Annex 1 to Technical Rule 512 "fumigations"

Basic course for fumigations

Precondition: First-aider course and ability to wear respiratory protection

1 Properties and mode of action of the fumigants

1.1 General

- Properties of the fumigant, related to use
- Explanations of basic terms such as ppm (vpm), boiling point, solubility, specific weight and the like
- Detection methods (gas test tubes, colour reaction, flame coloration), effects on materials (e.g. noble metals) as well as plants and products,
- Explosion limits, ignition temperatures

1.2 Mode of action

- Explanation of important basic terms such as LD_{50} (Dosis letalis)
- Inhalation toxicity effect on the target organism (biological effectiveness)
- Effect on humans and pets,
- Limit values (maximum workplace concentrations (MAK), technical exposure limits (TRK) and biological tolerance values for the workplace (BAT) etc.)
- Signs of poisoning, antidote

2 Statutory regulations

2.1 Statutory regulations on acquiring, handing over to others, using, storing, transporting and destroying fumigants, in particular

- the authorization of the fumigants by the Federal Biological Research Centre
- the permission and certificate of competence, duty to announce fumigations
- protection rules, prohibitions
- labelling and packaging rules, storage rules,
- recording duty with practical examples
- transportation rules

2.2 Legal bases

- Hazardous Substances Ordinance with Annex V Number 5
- Technical Rules for Hazardous Substances
- Dangerous goods ordinances
- Penal Code (homicide caused by negligence (§ 222), bodily injury caused by negligence (§ 230), fire caused by negligence (§ 309))
- Waste Law
- Plant Protection Act and the Ordinance on Prohibitions of Use of Plant Protection Products
- the Foodstuffs and Commodities Act, Ordinance on Maximum Residual Amounts
- Federal Immission Control Act (§§ 3, 4 and 22)
- Act on breaches of regulations

3 Fumigation procedures

3.1 Conventional methods

3.1.1 with the various fumigants

3.1.2.1 in various areas of application

4 Essential aspects of fumigation technology

4.1 Knowledge of construction and materials

- Gastightness of room-delimiting constructions and materials
- Sealing materials
- Sealing methods
- Testing for leakproofness

4.2 Possibilities for testing in consideration of

4.2.1 the success of the intended fumigation (good, pests, temperature)

4.2.2 the effects on the environment

- penetration of the gas into other buildings, the need for informing and possibly evacuating the neighbourhood
- traffic routes, supply centres and similar
- nasal nuisance to the neighbourhood

4.3 Closing off, securing and labelling fumigated rooms as well as clearing and securing structurally connected buildings and building complexes

4.4 Ventilation of fumigated rooms in consideration of the effects on the environment according to 4.2.2.

4.5 Release

5 Gas concentration measurements

- Selection of suitable equipment and methods
- Handling
- Sources of error

6 Personal protective equipment

- Respiratory protection
- Protective clothing

7 First aid

- special first-aid measures for handling fumigants (general course and first aid are preconditions for participation in the course)
- first aid by laypersons or by a physician, poison information centres
- equipment, medicines, resuscitation measures, organizational measures for transportation (transport routes, telephone)

8 Regulations and rules of the German Statutory Accident Insurance Institutions

8.1 Regulations of the German Statutory Accident Insurance Institutions

8.2 Rules, information and principles of the German Statutory Accident Insurance Institutions

9 A fumigation exercise

10 Discussion of accidents during fumigations

11 Discussion

12 Examination

The examination must be performed according to Number 4.3 of the Technical Rule. The practical exercises each end with the practical examination.

Duration of the course, teachers and number of participants

- Duration of a course for one fumigant: 5 days including the examination, at least 35 lessons of tuition of 45 minutes each (unrestricted certificate of competence).
- In the case of limitation to individual areas of use the duration of tuition can be shortened accordingly.
- Number of participants approx. 25 persons
- Teachers: experts, physician, authority representative

Annex 2 to Technical Rule 512 "fumigations"

Announcement of the intended handling of fumigants according to Technical Rule 512

Sender (exact address and telephone number) _____ _____

In accordance with Annex V, Number 5.2.2 of the Hazardous Substances Ordinance we hereby announce that a fumigation is to be performed.

Fumigant: .....
(type and quantity)

Authorization No.: .....

Good or object to be fumigated:

.....

(type and quantity, e.g. tonnage or volume)

Place of use (street, house no., postcode, place)

.....
.....

☐	building,	☐	ship/barge
☐	room,	☐	grain store
☐	transport container in the building,	☐	loose-material floor
☐	transport container on a ship	☐	silo cell
☐	wagon, number:	☐	sack stack
☐	greenhouse	☐	outdoor area

Site plan is enclosed, use of the neighbouring buildings has been entered.

	Head of fumigation	Expert/ holder of certificate of competence
Name, first name		
Address		
Telephone		
During the fumigation also contactable on phone		

In accordance with Annex 5, Number 5 of the Hazardous Substances Ordinance, the head of fumigation named here possesses a certificate of competence that is sufficient for the intended fumigation.

Testing for leakproofness on:		at	o'clock (if necessary)
Start of fumigation:	probably	at	o'clock
Start of ventilation:	probably	at	o'clock
Probable release:		at	o'clock

.....

(place, date)

....

Signature of holder of certificate of competence

Signature of the named head of fumigation

Information to: (e.g. town clerk's office, port authority, competent German Statutory Accident Insurance Institution*, occupational safety and health authority)

☐ Copy to sent on
☐ Copy to sent on

*) Only in the case of fumigations of buildings, rooms, corn stores, loose-material floors and similar

Annex 3 to Technical Rule 512

Pharmaceuticals and aids for first aid in the case of fumigations according to Number 16

The following pharmaceuticals and aids for first aid must be kept ready at the fumigation site in the case of fumigations with bromomethane, hydrogen cyanide, phosphorus hydride or sulphuryl difluoride.

- Not required in the case of fumigations during transportation on sea vessels. The full on-board set of pharmaceuticals according to the medical first aid guide is sufficient here -.

Attention must be paid to the storage conditions and the expiry dates of the pharmaceuticals!

For the first-aider (non-physician, e.g. head of fumigation)

Pharmaceutical, aid	Number	Comments, examples
Ventolair or AeroBec controlled dosage Aerosol	1 pce.	Not for hydrogen cyanide
Circulatory insufficiency agent, increases blood pressure, liquid	15 ml	Etilefrin (e.g. Effortil® solution)
Single-use eye drops	10 pcs.	
Mask device for resuscitation with infection protection	1 pce.	AIRVITA BI Protect
Cotton buds	1	OP
Gauze bandages 6 cm	5 pcs.	
Gauze bandages 10 cm	5 pcs.	
Elastic bandage 8 cm	1 pce.	
Leucofleece 2.5 cm/5 m	1 pce.	
Wound closure strips	10 pcs.	
Hansaplast 4 cm/l m	1 pce.	
Hansaplast 8 cm/l m	1 pce.	
Disinfectant in small pack	3 pcs.	
Pair of scissors	1	
Aluminium blanket	1	

Advice on the pharmaceuticals:

1. Ventolair or AeroBec controlled dosage aerosol

These highly effective pharmaceuticals serve, on the one hand, in prevention and, on the other, in the treatment of states of swelling in the respiratory tract and the accumulation

of liquid in the lung (pulmonary oedema).

As a therapy after the inhalation of very toxic fumigants one administers on suspicion, i.e. also in the absence of symptoms of illness, four jets of Ventolair or Aerobec immediately after the accident and, in each case, a further four jets after 2 hours until the symptoms disappear.

Correct handling is important, i.e. the dosing aerosol must be depressed during the inhalation phase.

2. Circulatory insufficiency agent:

In the case of circulatory insufficiency, indicated by a pale complexion, hardly palpable pulse, dizziness and tiredness, it is possible to administer liquid hypertensive agents in the form of drops. A precondition for this is that the injured person can swallow. The drops already take effect when they are kept in the mouth for a while and are not swallowed immediately. The effect is also good if the drops are diluted in water.

3. Single-use eye drops:

These drops are used after the eye has been cleaned and rinsed.

For the physician:

Drug, aid	Number	Comments, examples
Prednisolone 1000 mg ampoule	1 amp.	Not for hydrogen cyanide
4-DMAP ampoule	2 amp.	Not for hydrogen cyanide
Sodium thiosulphate 25 % injection solution	1 inj. bottle	Not for hydrogen cyanide
Diazepam 2 ml ampoule	5 amp.	
Ringer's lactate solution, infusion solution	2x500ml	Ecoflacplus
Cardiovascular agent, hyptertensive	5 amp.	Effortil solution in ampoules
Fairly strong agent to depress states of agitation	30 ml	Diazepam drops (e.g. Valiquid 0.3)
Braunula	3 pcs.	
Disposable syringe 5 ml and 10 ml	5 pcs. each	
Disposable injection needle no. 1 and number 2	5 pcs. each	
Tourniquet	1 pce.	

Advice on the pharmaceuticals for the physician

1. Prednisolone amp.:

Since the clinical symptoms of poisoning often appear late (bromomethane, phosphorus hydride) the use of prednisolone is also indicated in the case of suspicion: immediate intravenous administration of 250 mg prednisolone, up to 1000 mg on the first day.

2. 4-DMAP amp.:

4-DMAP (4-dimethylaminophenol) serves in the initial treatment of poisoning with hydrogen cyanide ("prussic acid"). Immediate use is required when clinical signs of hydrogen cyanide poisoning are present: (tachycardia, tachypnoea, headache, dizziness; in addition, states of anxiety, agitation, clouding of consciousness, convulsions and coma. In the final stage bradycardia, hypotension and cessation of breathing.

Dose 3-4 mg 4-DMAP / kg body weight i.v.

3. Sodium thiosulphate 25% injection solution

Sodium thiosulphate-inf. serve in the treatment of hydrogen cyanide poisoning. After administration of 4-DMAP subsequently infuse 50-100 mg sodium thiosulphate / kg body weight i.v.

4. Ventolair or AeroBec controlled dosage aerosol (Continue to) administer Ventolair or AeroBec controlled dosage aerosols: immediately after admission of the patient as well as 120 min after admission four jets in each case. As long as symptoms persist, continue to administer four jets every two hours.

Annex 4 to Technical Rule 512

Further training course

to extend the specialist knowledge of holders of certificates of competence for the performance of fumigations using.....

Preconditions:

- The participants must be in possession of a valid certificate of competence in accordance with the Hazardous Substances Ordinance.
- First-aider course and certificate of suitability in accordance with the Hazardous Substances Ordinance.

1st Day

1st double lesson :

1 . Properties and mode of action of the fumigant

1.1 Repetition of the properties of the fumigant, the basic physical and chemical terms, methods of detection as well as the explosive range and the ignition temperature.

1.2 Repetition of the mode of action of the fumigant on man and animals, limit values, signs of poisoning.

2nd and 3rd double lesson:

2 Statutory regulations

2.1 Fundamentals

- The Chemicals Act
- The Hazardous Substances Ordinance with Annex V Number 5
- Technical Rules for Hazardous Substances, in particular Technical Rule 512
- Hazardous goods ordinances
- The penal code
- Waste law
- The Plant Protection Act
- The ordinance on prohibitions of the use of plant protection products
- The Foodstuffs and Commodities Act
- The Federal Immission Protection Act
- The Administrative Offences Act.

2.2 Extension of knowledge of the relevant rules contained in the statutory regulations provided under 2.1

- Permission and certificate of competence
- Announcement duty
- Protection rules
- Prohibitions
- Labelling and packaging rules
- Rules on keeping fumigants, duty to keep records
- Transportation rules
- Criminal acts and administrative offences

7th lesson :

3 Regulations and rules of the Statutory Accident Insurance Institutions

3.1 Accident prevention rules

3.2 Guidelines and information sheets

2nd day

1st and 2nd double lesson:

4 Essential aspects of fumigation technology

4.1 Knowledge of construction and materials

- Gastightness of room-delimiting constructions and materials
- Sealing materials
- Sealing methods
- Testing for leakproofness

4.2 Tests

4.2.1 of the success of the intended fumigation (good, pests, temperature)

4.2.2 of the substance-related effects on the environment

- Penetration of the gas into other buildings, the need to inform and possibly evacuate the neighbourhood
- traffic routes, supply centres and similar
- nasal nuisance to the neighbourhood

4.3 Closing off the surrounding area, securing and labelling fumigated rooms as well as clearing and securing structurally connected buildings and building complexes

4.4 Ventilation of the fumigated rooms in consideration of the effects on the environment in accordance with Number 8.3

4.5 Release

3rd double lesson:

5 Gas concentration measurements

- Selection of suitable equipment and methods in accordance with Technical Rule 512
- Handling
- Sources of error
- Exercises

4th double lesson:

6. Personal protective equipment in accordance with Technical Rule 512

- Respiratory protection
- Protective clothing
- Instruction of wearers of respirators with exercises

9th lesson:

7. Company-specific operating instructions according to § 20 of the Hazardous Substances Ordinance

3rd day

1st double lesson:

8 First aid

- special first-aid measures for handling the fumigant (general first-aid training is a precondition for participation in the course)
- first aid by laypersons
- by a physician, poison centres
- equipment, medicines, resuscitation measures, transport
- organizational measures (transport routes, telephone)

2nd double lesson:

9. Discussion of accidents and harmful effects on the environment (considerable nuisances) during fumigations

10 Concluding discussion

Discussion of questions that remain unanswered

The further training course concludes with a test according to the multiple-choice procedure. The results must be discussed with the participants after the test has been conducted. Successful participation may only be certified in the case of participants that have passed the course.

Duration of the course, teachers and number of participants

- Duration of course for one fumigant: 3 days with at least 25 lessons each lasting 45 minutes,
- Number of participants: approx. 25 persons,
- teachers: experts, physician, authority representative

Annex 5 to Technical Rule 512

Classification company: _____

Report

on the suitability of ship cargo holds for fumigation during transportation at sea on the ship _____

The cargo holds no.:_____ and the adjacent rooms of the ship at the berth _____

were inspected by the undersigned inspector in the presence of

_____(skipper)
_____(head of fumigation)

in accordance with Number 9.5 Section 3 of Technical Rule 512 fumigation on the_____ on behalf of _____

.

The following were examined:

- The cargo holds intended for fumigation
- The state of the structural elements delimiting the rooms (in particular the rooms which can be entered during the operation of the ship) including all openings with their covers and the seals of all hatch covers and flaps
- Whether any living and recreation rooms are adjacent to the cargo holds that are suitable for fumigation.

For this purpose, the cargo holds that were in a cleaned state, including the adjacent rooms, were opened for inspection. As far as necessary, at the order of the inspector, covers and flap seals were tested for leak-proofness. In so far as they were accessible, cable and other ducts as well as shut-off devices of connected pipelines (such as, e.g. bilge, electrical, cargo, smoke detector and CO_2 pipeline systems) were inspected visually.

The following additional measures are considered necessary:

Smoke test prior to loading yes no

(Dosage, for example in the case of the use of smoke cartridges

(potassium chlorate 23.5 %): 100g powder for approx. 80 $m^{3.}$)

_____

_____

Result:_____

_____, the_____

(Inspector) _____,

Annex 6 to Technical Rule 512

Certificate

of the physician authorized according to § 30 of the Hazardous Substances Ordinance (GefStoffV) regarding the result of the examination according to Annex V No. 5 of the Hazardous Substances Ordinance (fumigations) or
Annex V No. 6 of the Hazardous Substances Ordinance (pest control)

Mr/Ms _____ _____ _____
Name First name Date of birth

was examined by me on the _____.__

Type of examination:

☐ Examination according to Annex V No. 5.2 Section 2 No. 2 of the Hazardous Substances Ordinance and Number 4.2 Section 3 of Technical Rule 512 as well as Number 5.1 No. 2 of Technical Rule 522 (fumigations)

☐ Examination according to Annex V No. 6.3.2 Section 4 No. 3 of the Hazardous Substances Ordinance and Number 4.1 No. 3 of Technical Rule 523 (pest control)

On the basis of the recommendation of the Federal Ministry of Labour and Social Affairs with regard to the performance of examinations to determine the suitability of applicants for certificates of competence for fumigations (Federal Labour Gazette, issue 12/1995, p. 41).

Result of the examination:

The examination has not revealed any grounds for suspecting physical or mental non-suitability for handling the fumigant ……..or pest-control agents.

☐ Able to wear respiratory protection according to principle G 26 of the Statutory Accident Insurance Institution

☐ **Not** able to wear respiratory protection according to principle G 26 of the Statutory Accident Insurance Institution

Examination centre
(stamp)

_____
Date

_____
Signature

Annex 7 to Technical Rule 512

Permit holder **Name:**

Address:

RELEASE CERTIFICATE (according to Number 11 of Technical Rule 512)

The fumigation took place from - to / on the_____200_. Third-party fumigation□
Release location:_____

I hereby confirm that in the ventilated

□ building, room □ Transport container
– No._____

□ Stack of sacks □ Ship/barge □ Silo cell
No._____

□ Wagon – No._____ □ Corn store, loose-material floor etc. □_____

the measured concentration of the following in the room atmosphere amounts to (delete as applicable)**:**

□	Hydrogen cyanide	less than/equal to	2 ppm
□	Bromomethane (methyl bromide)	less than/equal to	0.5 ppm
□	Phosphorus hydride (phosphine)	less than/equal to	0.01 ppm
□	Sulphuryl difluoride	less than/equal to	1 ppm

The detection took place at a representative point using suitable measurement devices whose measurement range records this limit.

Measurement device:_____ measurement point/s_____

There is no risk from the fumigants checked in the above.
No hazardous fumigant concentration is to be expected in the released object as a result of desorption of the fumigant (subsequent release of gas) (Number 11.2 of Technical Rule 512).
(For other risks see the information sheet "release of fumigated containers or vehicles ")
The labelling according to Number 8.5 of Technical Rule 512 was removed.
One copy of this release certificate was handed over to the contractor (e.g. for the freight papers), a further copy was affixed to the entrance area of the released object or to the inside of the container.

Place, date Signature of the head of fumigation

Annex 8 to Technical Rule 512

Theoretical examination of knowledge about fumigation

To acquire a certificate of comprehensive knowledge about fumigation according to Technical Rule 512 a total of 60 questions – 48 in a multiple-choice procedure as well as 12 calculation and formulation questions – are asked in the written examination. In the multiple-choice procedure the questions are divided among the individual subject areas as follows.

Eight questions from each of the following sections of Annex 1 of Technical Rule 512:

- Properties and mode of action of the fumigants
- Statutory regulations
- Fumigation technology

Up to five questions from each of the following sections of Annex 1:

- Fumigation methods
- Gas concentration measurements
- Personal protective equipment
- First aid
- Rules and regulations of the Statutory Accident Insurance Institutions

The formulation and calculation questions are taken from the entire curriculum with particular emphasis being given to the sections 3 and 4 (fumigation methods and fumigation technology).

Answer options:

In the multiple-choice procedure there can be up to 4 answer options.

Method of evaluation:

In the multiple-choice procedure there is one point per question if all answers were correctly selected.

For the calculation or formulation questions there is one point if they have been fully and correctly answered.

Time provided: 120 minutes are given in order to answer the test questions.

Re-examination is possible if the test result falls below the 51 % level by only a small amount.

With the exception of a compendium of formulae and a calculator, no aids are permitted in the examination.