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Technical Rules for Hazardous Substances	Risks resulting from skin contact - determination, evaluation, measures	TRGS 401
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The Technical Rules for Hazardous Substances (TRGS) convey the state of the art, the status of occupational medicine and occupational hygiene and other established findings concerning activities involving hazardous substances as well as their classification and labelling.

They are established by the

Committee on Hazardous Substances (AGS)

and adapted by the Committee to the current status of development.

The TRGS are announced by the Federal Ministry of Labour and Social Affairs in the Bundesarbeitsblatt (Federal Labour Gazette, BArbBl.).

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1 Scope

(1) The present TRGS is applicable to activities involving skin contact with materials, preparations or products. It defines the concrete terms of gathering information on and assessing the risk associated with these activities which is called for in the Gefahrstoffverordnung (Hazardous Materials Ordinance - GefStoffV) Section 7. In addition, it is designed to provide employers with the definition of measures to be taken in respect of activities bearing potential dermal risks, especially as regards the selection and assessment of personal protective equipment and skin products.

(2) Dermal risks are present if

- wet work, or
- activities involving hazardous substances that are hazardous to the skin, absorbed through the skin or sensitising to the skin

are carried out under such circumstances that health risks for the employees cannot be excluded.

(3) The present TRGS contains basic requirements. More specific TRGS shall prevail and shall be preferably applied (refer to Annex 1).

(4) More concrete definitions should be adopted in the form of industry-specific rules on the basis of the present TRGS with respect to certain industries, working methods or trades (for a definition, refer to TRGS 440, Section 2 (16)).

2 Definitions

2.1 Skin contact

Skin contact is the direct contact of skin with liquids, pastes, solids, including splashes on the skin or contact with contaminated working clothes or contaminated surfaces. Skin contact is also present if the skin gets in contact with aerosols, gases, and vapours.

2.2 Hazardous to the skin (also refer to Section 3.2.1)

(1) Substances and preparations are hazardous to the skin if they can damage the skin following skin contact (e.g. by causing burns and/or irritant effects). The following R-phrases indicate that this property applies to the relevant material: R 34, R 35, R 38, R 66.

(2) Other substances or preparations that do not satisfy the conditions for the above R-phrases, but may have damaging effects on the skin in the event of prolonged or repeated contact can also be hazardous to the skin. This classification may also apply in the event of mechanical influences (friction, microlesions).

2.3 Absorbed through the skin (also refer to Section 3.2.2)

Substances which can enter the human body through the skin due to their physical-chemical properties are considered capable of being absorbed through the skin. The following R-phrases indicate that this property applies to the relevant material: R 21, R 24, R 27.

2.4 Sensitising the skin (also refer to Section 3.2.4)

Any substances and preparations are sensitising when absorbed through the skin if they elicit a reaction of hypersensitisation such that on future exposure to the substance, preparation or a product containing the substance characteristic adverse effects can be produced. The following R-phrase indicates that this property applies to the relevant material: R 43.

2.5 Wet work (also refer to Section 3.3.5)

Activities where workers spend a major part of the working time in wet environments or wear moisture-resistant gloves or clean their hands frequently and intensively are covered by the term wet work.

3 Gathering information

3.1 General

(1) The employer shall gather the information necessary to assess the risk and define the measures concerning all activities, working methods and working conditions in which skin contact with substances, preparations and products may occur.

(2) Information must be gathered on

1. properties of the hazardous substances that are dangerous to health, such as:
 - hazardous to the skin (irritating, causing burns, irritant, degreasing),
 - absorbed through the skin, or
 - sensitising to the skin,
 - other properties that may pose a risk to the skin (e.g. abrasive).
2. activities and working methods in order to assess the type, scope and duration of a possible skin contact,
3. working conditions of a physical or chemical nature that may increase the risk to the workers.

3.2 Gathering information that is specific to the substance

(1) When gathering information that is specific to a certain substance, in particular, the employer shall obtain information from the following sources: Safety data sheet, technical fact sheet, labelling, TRGS 900, 905, 906, 907 as well as the list of MAK (occupational exposure limit) and BAT (biological tolerance value) values published by DFG (Deutsche Forschungsgemeinschaft).

(2) If a material is not labelled, this does not automatically mean that no risk is present. For this reason, it has to be verified whether or not the safety data sheet or other product information contains references to properties that may be hazardous to the skin, absorbed through the skin or sensitising to the skin. Alternatively, employers may contact the manufacturer or the organisation placing the material on the market to find out whether or not any such determinations have been made. In addition, experts may use the properties of chemically similar substances (structure-effect relationships) for assessing the risk.

(3) If no information is available (e.g. in Section 8 or 11 of the safety data sheet or industry provisions), the following measures shall be taken at minimum

- protective measures relating to substances that are hazardous to the skin (R 38) and
- protective measures relating to substances that are absorbed through the skin (R 24)

with respect to the relevant substances and preparations.

(4) If a hazardous substance has been classed R 26 or R 28, and if no information concerning the absorption of the substance through the skin has been provided in Section 11 of the safety data sheet, the protective measures relating to the absorption of the substance through the skin in accordance with R 27 shall be taken.

3.2.1 Hazardous substances hazardous to the skin

(1) Hazardous substances are hazardous to the skin if they can cause skin diseases (burns, irritation, irritant contact dermatitis) and are furthermore characterised by one of the following criteria:

1. Classification to:
 - R34 (Causes burns),
 - R35 (Causes severe burns),
 - R38 (Irritating to skin),
 - R66 (Repeated exposure may cause skin dryness or cracking)
2. $\text{pH} \leq 2$ or ≥ 11.5 which leads to the classification as causing burns unless determinations to the contrary have been made.

3.2.2 Hazardous substances absorbed through the skin

(1) Hazardous substances that are absorbed through the skin can enter the human

body both through previously damaged skin and through intact skin where they can cause organic diseases. This definition applies to hazardous substances that are characterised by one of the following criteria:

1. Designated as being absorbed through the skin in TRGS 900
 2. Classification to
 - R21 (Harmful in contact with skin),
 - R24 (Toxic in contact with skin),
 - R27 (Very toxic in contact with skin), and
 3. all combinations of these R phrases,
 - especially with R39/... (Danger of very serious irreversible effects),
 - R48/... (Danger of serious damage to health by prolonged exposure), or
 - R68/... (Possible risks of irreversible effects).
- (2) If the list of MAK and BAT values established by the DFG contains references to cutaneous absorption (substances labelled with "H"), the hazardous substances shall be considered to be absorbed through the skin.
- (3) Annex 3a contains examples of groups of substances for which experience has shown that harmful effects will occur if absorbed through the skin.
- (4) In particular, when dealing with hazardous substances absorbed through the skin, direct skin contact and absorption by the substance in the gas/vapour phase or as aerosols must be accounted for. Annex 2 lists examples of substances whose absorption in the gas/vapour phase constitutes an additional relevant route of absorption.
- (5) Hazardous substances which by themselves are not absorbed through the skin, or to a low extent only, bear the risk of being absorbed through the skin when combined with other substances. The hazard assessment shall take the increased absorption of hazardous materials into account which occurs with substances that act as carriers. Important examples of substances that act as carriers include, e.g., dimethyl sulfoxide (DMSO), N,N-dimethyl formamide (DMF) and glycol compounds.

3.2.3 Other properties of substances

- (1) With respect to those hazardous substances that have been characterised by one of the following R phrases or have been classified accordingly in TRGS 905, it must be determined under all circumstances whether or not they can be absorbed through the skin:
- R40 (Limited evidence of a carcinogenic effect),
 - R62 (Possible risk of impaired fertility) or R63 (Possible risk of harm to the unborn child)
 - R45 (May cause cancer),
 - R46 (May cause heritable genetic damage),
 - R60 (May impair fertility) or R61 (May cause harm to the unborn child),
 - R68 (Possible risks of irreversible effects).

(2) A relevant absorption through the skin shall be assumed whenever there is no evidence to the contrary, or no information at all can be obtained.

(3) Examples of hazardous substances that may be absorbed through the skin and have been marked by R 45, R 46, R 60 or R 61 are listed in Annex 3b.

3.2.4 Hazardous substances sensitising to the skin

Hazardous substances are sensitising to the skin if they have been labelled R 43 (May cause sensitisation by skin contact); for more information, refer to TRGS 540 and TRGS 907.

3.3 Gathering information that is specific to the activity

(1) The employer shall determine

- the type, scope and duration of the skin contact,
- any conditions pertaining to the working place that will increase the risk shall be considered in the determinations made.

(2) In addition, it shall be verified whether skin contact and/or absorption through the skin are possible during the gas/vapour phase or by means of aerosols.

(3) Where biomonitoring has been completed in the course of preventive medical check-ups performed in accordance with GefStoffV Section 16 (1), its results may be included in the determination of the type, scope and duration of skin contact, in particular, if dealing with hazardous substances absorbed through the skin, provided that the doctor's confidentiality is preserved.

(4) The determination of the type, scope and duration of the skin contact with substances that are absorbed through or sensitising to the skin requires special expert knowledge. If the employer himself does not possess such expert knowledge, he shall seek expert guidance, e.g., from the company doctor or the occupational safety specialist.

3.3.1 Type of skin contact

Skin contact may be the result of, for example, splashes, aerosols, direct skin contact or through work equipment or indirect contact with contaminated clothes or contaminated surfaces.

3.3.2 Scope of skin contact

(1) The scope of skin contact is defined by the size of the body parts affected as well as the frequency and intensity of contact and shall be determined by an analysis of the activities or the working method. Considerations shall include the quantity of the substance acting on the skin as well as its concentration.

(2) A distinction is made between:

- large-area skin contact (direct skin contact or uptake during the vapour or gaseous phase or aerosols) and
- small-area skin contact (e.g. splashes).

3.3.3 Duration of skin contact

(1) The duration of the skin contact can be estimated with due regard to the following distinction:

- short-term contact (< 15 minutes/shift),
- long-term contact (> 15 minutes/shift).

If repeated skin contact is to be expected, the duration of exposure to the relevant hazardous substances during an entire shift shall be ascertained.

(2) For hazardous substances that are hazardous to the skin or have sensitising properties, the duration of skin contact shall commence upon contamination and shall not be terminated unless it has been efficiently eliminated.

3.3.4 Hazardous work conditions (excluding wet work)

Work conditions that result in a dermal risk or aggravate the relevant effects of hazardous substances include:

- acid or alkali environments not subject to classification which may nevertheless cause irritant skin diseases in the event of prolonged contact,
- strong contamination or mechanical stress (microlesions through sharp-edged particles) which may inflict preliminary damages to the skin,
- exposure to other working substances with a hazardous effect on the skin but not being covered by one of the classification criteria of GefStoffV (such as detergents, disinfectants, degreasing solvents).

3.3.5 Wet work

(1) The employer shall determine whether the criteria for wet work are met. This includes activities where employees spend a large part of the working time, i.e.

- regularly more than 2 hours, with their hands in wet environments, or
- spend a corresponding amount of time wearing moisture-proof protective gloves, or
- have to clean or disinfect their hands frequently or intensively.

(2) Time spent working in wet environments and time spent wearing moisture-proof protective gloves shall be added up.

(3) Under moisture resistant protective gloves (e.g. latex, nitrile), heat and moisture may collect through the occlusion effect subject to the duration for which they are worn and an individual disposition. The top layers of the stratum corneum and epidermis swell. This can be seen in the maceration of the skin ("washerwoman's hands").

4 Risk assessment

4.1 General

(1) The employer shall, on the basis of the information determined according to Section 3 hereof and,

- the properties of substances,
- the type, scope and duration of exposure, and
- the additional information to be ascertained,

assess the risk and define the necessary measures to be taken.

(2) Under the present TRGS, the risk is classified in three categories:

- low risk as a result of skin contact,
- mean risk as a result of skin contact,
- high risk as a result of skin contact.

(3) The sequence of priorities of the safeguards shall be followed under all circumstances: substitution, technical (including closed-system), organisational and hygienic safeguards have priority over personal protective measures.

(4) The technical, organisational, hygienic and personal measures listed in subsections 5, 6 and 7 hereof shall be selected in accordance with the amount of risk present with the aim to minimise contact of the skin with hazardous substances according to the state of the art.

(5) In particular, the risks resulting from skin contact with hazardous substances that are absorbed through the skin are difficult to assess. For this reason, employers are advised to obtain counselling from persons with expert knowledge in accordance with Article 7 (7) of the GefStoffV, such as the company doctor, with respect to the risk resulting from absorption through the skin of any substances.

(6) The following conditions must be additionally considered in the risk assessment:

1. Physical conditions:

- an increased blood circulation in the skin and thus an increased risk is to be expected when working in hot environments, subject to heat radiation or physical work,
- a higher risk is to be assumed in the event of skin contact with hazardous substances and subsequent exclusion of air (for example, in the event of

contamination under protective gloves),

- an increased risk will most likely be present in the event of skin contact with hazardous substances in connection with or after activities which have been known to result in mechanical damages to the skin in the form of microlesions.

2. Chemical conditions:

- if degreasing substances act on the skin at the same time or beforehand (soaps, tensides, solvents), an increased risk will be present because degreasing the skin may increase absorption.
- if greasy substances of different moisture content (cosmetics, skin protection products) are simultaneously or previously applied to the skin, absorption of hazardous substances through the skin may be increased due to swelling of the top layers of the stratum corneum and epidermis or a higher solubility of hazardous substances,
- if a substance not soluble in grease or water is present in dissolved form (for example, in solvents such as alcohol or acetone) the presence of risks shall be assumed.

3. Formation of deposits

As the top layers of the stratum corneum and epidermis may serve as a depot for substances absorbed through the skin, hazardous materials absorbed through the skin may still be released from this depot and into the body even when exposure is no longer present. Intensive cleaning of the skin, in particular, cleaning with products containing solvents, mechanical cleaning or cleaning with hot water, may result in an increased release of hazardous substances from the depot. It is advisable to clean the skin using cold or lukewarm water and soap.

(7) The result of the hazard assessment shall be documented. If the result of the hazard assessment should differ from Section 4.2, it shall be justified.

4.2 Classification of risk categories

The risk categories are subject to

- the hazardous properties,
- the nature and extent of exposure,
- the working conditions.

4.2.1 Wet work

Wet work poses mean risks as a result of skin contact.

4.2.2 Hazardous substances hazardous to the skin

(1) Low risks as a result of skin contact are present:

1. in all activities involving skin contact with hazardous substances that have

- been labelled R 66,

provided that the substance does not have any other properties that are hazardous to the skin

2. in all activities involving small-area and short-term skin contact with hazardous substances that have

- been labelled 38,

or other properties hazardous to the skin in accordance with GefStoffV Article 3 (1) No. 4

3. in all activities involving hazardous substances and

- skin contact through contaminated working clothes or surfaces

(2) Mean risks as a result of skin contact are present:

1. in all activities involving small-area and short-term skin contact with hazardous substances that have

- been labelled 34 or
- been labelled 35 or
- pH values below 2 or above 11.5

2. in activities involving

- large-area and short-term skin contact or
- small-area and long-term skin contact

3. regarding hazardous substances that have

- been labelled R 34, R 38 or
- pH values below 2 or above 11.5 or

other properties hazardous to the skin in accordance with GefStoffV Article 3 (1) No. 4.

(3) High risks as a result of skin contact are present:

1. in all activities involving large-area and long-term skin contact with hazardous substances that have

- been labelled 34, R 38 or
- pH values below 2 or above 11.5 or

other properties hazardous to the skin in accordance with GefStoffV Article 3 (1) No. 4.

2. in activities involving
 - large-area and short-term skin contact or
 - small-area and long-term skin contact or
 - large-area and long-term skin contact with hazardous substancesregarding hazardous substances that have
 - been labelled R 35.

4.2.3 Hazardous substances absorbed through the skin and other properties of substances

- (1) Low risks as a result of skin contact are present:
 1. in all activities involving small-area and/or short-term skin contact with hazardous substances that have
 - been labelled R 21
 2. in all activities involving hazardous substances that have
 - skin contact through contaminated working clothes or surfaces
- (2) Mean risks as a result of skin contact are present:
 1. in activities involving
 - small-area and short-term skin contact or
 - large-area and short-term skin contact or
 - small-area and long-term skin contact
 2. regarding hazardous substances that have
 - been labelled R 21 (no small-area and short-term skin contact) or
 - been labelled 24 or
 - been labelled 40, R68 which are absorbed through the skin
 3. in all activities involving
 - R 62, R 63 which are absorbed through the skin
- (3) High risks as a result of skin contact are present:
 1. in all activities involving skin contact with hazardous substances that have
 - been labelled 27 or

- been labelled 24 if additionally classified as R34 and/or 35.
2. in all activities involving large-area and long-term skin contact with hazardous substances that have
 - been labelled 21, R24 or
 - been labelled 40, R68 if absorbed through the skin
 3. in all activities involving skin contact with hazardous substances that have
 - been labelled 45, R46, R60 or R61 if absorbed through the skin

4.2.4 Hazardous substances sensitising to the skin

(1) Low risks as a result of skin contact are present:

in the event of skin contact through contaminated working clothes or surfaces with hazardous substances that have

- been labelled 43.

(2) Mean risks as a result of skin contact are present:

in other activities involving hazardous substances that have

- been labelled 43.

5 **Substitute material, substitute procedures, and closed system**

(1) In the event of skin contact based on the activity or the working method, and if a mean or high risk is present in accordance with section 4.2 hereof, substitution should be preferably carried out. If substitution is not viable, the employer shall indicate his reasons for this conclusion in his risk assessment.

(2) A closed system shall be provided if

- there is skin contact based on the activity or the working method,
- the risk assessment carried out under Section 4.2.3 has resulted in a high risk, and
- substitution is not technically feasible.

(3) Where it is not technically possible to use a closed system, the exposure shall be reduced according to the state of the art. This can also be achieved by using suitable substitute methods, such as tools, instruments and work equipment designed to prevent or reduce skin contact (refer to Annex 4).

(4) Assistance for the evaluation of less hazardous substances is provided by TRGS 440.

6 Technical and organisational hygienic protective measures

6.1 General hygienic measures

(1) If the result of the risk assessment has revealed a low risk, the protective measures to be taken will follow the rules laid down in TRGS 500.

(2) Of special relevance with respect to risks to the skin are the following measures:

- The employees must have a wash station available (preferably one with water temperature control) as well as suitable towels.
- Skin that has been contaminated with hazardous substances must be cleaned immediately. Cleaning must be as gentle as possible. The skin must be dried carefully.
- Employees should not wear jewellery on their hands or wrist while at work. Reactions or skin diseases can develop from chemicals or the moisture that collects under the jewellery,
- Water-based solvents that contain substances or preparations that can be hazardous to the skin, absorbed through the skin or sensitise the skin should not be allowed to dry on the hand. They should be washed off so that the evaporation of the water does not increase the concentration of the hazardous substance on the skin.

6.2 Wet work

(1) For wet work, the employer shall take the additional measures stipulated in Section 6.3 hereof in addition to the general hygienic measures described in Section 6.1. Besides, he should ensure through organisational measures that wet work should be distributed as equally as possible among several employees to reduce overall exposure for each individual. The employer should strive to alternate between work in dry and work in wet environments, with the wet work being kept to a minimum.

6.3 Additional measures

6.3.1 General

(1) If a mean or high risk is present based on the result of the risk assessment, additional protective measures shall be taken in accordance with Sections 6.3.2 and 6.3.3 in addition to the general hygienic measures described in Section 6.1.

(2) The employer shall take technical and organisational protective measures in order to eliminate the risk resulting from skin contact or to reduce this risk to a minimum.

6.3.2 Technical protective measures

(1) Technical protective measures include, without being limited to, the following:

- partially or fully closed systems,
- use of tools by which skin contact is avoided,
- encapsulation, extraction or ventilation.

(2) Where it is not possible to use any technical protective measures, in whole or in part, e.g. during sampling processes or maintenance work, organisational or personal protective measures shall be taken that are capable of ensuring employee protection.

(3) Annex 4 contains examples of technical protective measures.

6.3.3 Organisational protective measures

The following organisational protective measures shall be initiated by the employer under all circumstances:

- working clothes that have been contaminated and/or soaked with hazardous substances shall be immediately changed. The employer shall ensure that the clothes can be immediately changed under such circumstances. Proper cleaning shall be arranged for by the employer at his cost. If contamination occurs regularly, the employer shall provide the employees with working clothes.
- any equipment and surfaces contaminated with hazardous substances shall be cleaned regularly,
- protective clothing shall be cleaned by the employer,
- it shall be ensured that towels used for cleaning machines are not used for cleaning hands. Harmful residues can damage the hands; metal and other shavings can also cause microlesions.

7 Personal protective measures

7.1 General

(1) If the skin contact persists even after application of the additional measures described in Section 6.3 hereof, the employer shall reassess the remaining risk. Should such a risk assessment reveal that risk to the skin cannot be excluded by additional state-of-the-art measures, the employer shall arrange for personal protective measures which are to be applied by the employees.

(2) For the purpose of the present TRGS, personal protective measures normally consist of protective gloves and skin products. They are discussed in Sections 7.2 and 7.3.

- (3) The personal protective measures described in the present TRGS primarily refer to contact with the skin on hands and forearms. Contact with skin on other parts of the body (in particular, the feet and legs) shall be subject to specific protective measures. Examples of such activities are listed in Annex 5.
- (4) The application of personal protective measures is designed to minimise skin contact, without normally being capable of entirely preventing it.
- (5) As interaction between skin products and gloves cannot be ruled out, the employer shall take due note of such possible interaction in the selection of the personal protective equipment.
- (6) The employer shall provide sufficient quantities of suitable personal protective equipment as necessary and shall ensure that they are actually used in accordance with the operating instructions.
- (7) A possible risk associated with the use of personal protective equipment shall be duly considered when selecting such equipment, for example, rotating parts, allergens in gloves and wet work if moisture-proof gloves have to be worn for longer periods of time.
- (8) In exceptional cases, an evaluation of the risks may lead to the conclusion that not wearing gloves may be associated with a lower risk than occasional contact with small areas of the skin for a short period of time if it is guaranteed that the skin parts affected can be immediately cleaned. This assessment shall be made by the company doctor and shall be documented in the risk assessment.

7.2 Protective gloves

7.2.1 General

- (1) Protective gloves must not be worn for longer periods of time than necessary.
- (2) As regards the use of moisture-proof gloves at work, employers should strive for appropriate change between activities with and without gloves because the skin may be damaged by sweat if moisture-proof gloves have to be worn for longer periods of time. How often the gloves have to be changed shall be defined in the scope of the risk assessment. It is recommended to change gloves at least once per hour, or to wear cotton glove liners. The maximum continual time for wearing gloves without changing them should not exceed 4 hours. The time intervals in which gloves should be changed shall be borne in mind in the organisation of the work process.
- (3) Wearing moisture-proof gloves without a change for more than four hours is to be considered irritating for the purposes of GefStoffV Article 9 (3) 2nd sentence and shall not be allowed to be a permanent protective measure or to become a substitute for the implementation of safety measures of a technical or organisational nature.
- (4) When workers put on or take off the gloves, they shall take care to prevent any contamination that may be present on the outside from entering the glove or getting in contact with the skin. The proper method for putting on or taking off gloves shall be practised in the course of the advisories and instructions provided by the employer. The gloves shall be disposed of when they have been worn for the anticipated period of time.

- (5) Workers should inspect protective gloves prior to use for tears, holes, swelling or other visible damages. Damaged gloves shall be disposed of immediately.
- (6) When using chemical-resistant protective gloves, it must be noted that their protective effect is impaired by the effects of ultraviolet radiation (sunlight).

7.2.2 Selection of suitable protective gloves

(1) The protective gloves must be selected with due regard to the work substances and work processes. In addition to providing protection against chemicals, they shall be resistant to mechanical damage and satisfy ergonomic demands.

(2) If workers are at a risk resulting from hazardous substances, the employer shall select protective gloves that at least comply with the requirements of protection index class 2 for chemical-resistant gloves. This property can be detected by the following symbol:



(3) Disposable medical gloves which merely comply with the requirements of DIN EN 455, and leather gloves are not considered chemical-resistant gloves.

(4) Where disposable medical gloves made of latex are used by medical personnel for hygienic reasons, their protein content shall not exceed 30 µg/g glove material. Disposable medical gloves made of latex shall not be powdered.

(5) If leather gloves are used, e.g., because of mechanical risks, they must be free of chromate, and shall not pose any additional risks (e.g. resulting from pesticides, biocides, production process substances). The maximum chromate content will be based on the detection limit evaluated (analytical method in compliance with CEN/TS 14495) and shall not exceed 3 mg/kg. The details concerning the substances contained shall be derived from the information material provided by the manufacturer or obtained from the manufacturer.

(6) The protective gloves shall be selected with due regard to the practical conditions of their use. The following information can be obtained from the safety data sheet:

Parameter A) Glove material,

Parameter B) Penetration time (equivalent to the maximum duration it may be worn) of the glove material in accordance with TRGS 220 subject to the intensity and duration of skin exposure.

If necessary, the safety data sheet also indicates:

Parameter C) The glove material and the minimum material thickness necessary as well as the maximum time the glove may be worn under practical conditions,

Parameter D) The actual glove brand including its manufacturer or distributor.

In addition, the following parameter E) shall be determined by the employer with respect to the relevant workplace and duly accounted for in the selection:

- other substances, preparations, products or manufactures used,
- working methods,
- mechanical stress acting on the glove,
- duration and intensity of contact,
- thermal stress acting on the glove,
- ergonomic demands (size and fit),
- requirements concerning the tactile sense.

(7) Employers shall proceed as follows when selecting the appropriate protective glove:

1. If a glove brand has been specified in the safety data sheet, the employer shall verify whether the intended use is in compliance with the use specified in the safety data sheet, and no other hazardous substances are used. This determination shall be duly considered in the selection process. If the intended use complies with the manufacturer's specifications, the specified brand may be used. If the product is used for other purposes, or if other hazardous materials are additionally employed, the assessment must be repeated with due regard to the parameters determined under E above.
2. If no glove brand is indicated in the safety data sheet, but parameters A - C are known, the appropriate gloves shall be selected with respect to the parameters listed under E above. The rules for selecting protective gloves (BGR 195) include assistance concerning the determination of the gloves. If the employer does not have the required knowledge, the appropriate protective gloves shall be determined in cooperation with the glove manufacturer and/or the manufacturer of the chemicals. The following shall be accounted for:
 - the maximum period of time during which the glove may be worn must be corrected by the glove manufacturer or the manufacturer of the chemicals if the material thickness is lower.
 - if the penetration time has been specified for standard conditions (23°C), the length of time during which the gloves may be worn shall be corrected by the glove manufacturer or the supplier or the chemicals. If this correction is not specified by the glove manufacturer or the supplier of the chemicals, employers are advised to reduce the maximum time during which the gloves may be worn to no more than 1/3 of the penetration time specified.
3. If no information is available for parameters A - C, or if this information is incomplete, the employer shall query the information with the supplier of the chemicals or shall ask him for a glove brand that satisfies the requirements. Alternatively, he may determine the information concerning parameters A - C himself and select appropriate gloves in accordance with the parameters listed in E and the procedure described under 2 above.

Annex 6 hereto contains a flow chart that illustrates the procedure to be applied.

(8) The selection of the appropriate gloves shall also account for the sensitisation of a worker's skin, if present. For more information concerning the allergens contained in protective gloves, please refer to the lists of allergens

(www.GISBAU.de), for example.

7.3 Skin products

(1) Skin products are substances to be externally applied to the skin. The term skin products comprises skin protection products, products for cleaning the skin and skin care products. Skin products should not be used without the advice of a person having expert knowledge in the field of occupational safety and health, in particular, the company doctor. Skin products shall at minimum comply with the requirements of the EC Cosmetics Directive (76/768/EEC), which has been incorporated into German national law by the Food, Commodities and Feed Code, and the Cosmetics Ordinance, as amended. Where skin products are used as a personal protective measures at the workplace, they shall comply with the additional requirements set forth in the paragraphs below.

(2) Skin protection products are applied to the clean and dry skin prior to an activity that is damaging to the skin. It is pointed out that skin protection products may adversely affect the protection properties of protective gloves, especially if they contain grease.

(3) Only skin protection products may be used which have been submitted to an efficiency test by the manufacturer. For more information, reference is made to the following websites, for example: *

1. Liability insurance expert committee on "Personal Protective Equipment, specialised area of skin protection"
2. Working group on occupational and environmental dermatology (ABD), Federal Association for Skin Protection and Cosmetic, Toiletry, Perfumery and Detergent Association.

(4) Products for cleaning the skin are used to remove contamination from the skin after an activity that was damaging to the skin. The intervals in which the skin is cleaned shall be reduced to the required number, and the intensity of cleaning and the selection of the detergent shall be commensurate with the degree of contamination.

(5) Skin care products are used to promote the skin's ability to regenerate. They are used when exposure at the workplace is finished and the skin has been cleaned.

(6) The employer must obtain the following information in order to select appropriate skin products:

- Classification of the skin products according to the three groups specified in Subsection 1 2nd sentence,
- concrete information concerning the application area of the products,
- information concerning the proven efficiency of skin protection products. If this information is not known, it may be obtained from the manufacturer of the products or the organisation placing them on the market.

* Re. 1: www.hvbg.de/d/fa-psa/pdf_bild/leithautpdf.pdf

Re. 2: www.ikw.org/pages/prodgr_details.php?info_id=193&headline=informationen.de
www.bvh.de/index.php?home=Mitgliedernews&sprache=0

(7) Skin products may also result in risks that have to be accounted for in the course of the risk assessment, e.g. irritating effects caused by skin cleaning products that wear out or decrease the skin, the allergic potential of the substances contained in skin products, a pH value outside the limits of compatibility, penetration-promoting effects.

(8) The use of the skin protection products must be matched to the work method because these products may result in an increased absorption of substances through the skin in connection with certain work substances (e.g. polycyclic aromatic hydrocarbons and solvents).

(9) The times at which the skin products should be efficiently applied shall be borne in mind in the organisation of the work process.

7.4 Personal protective measures in the event of other skin contact

(1) If there still is a risk resulting from skin contact in the area of other parts of the body (for examples, refer to Annex 5), despite the technical and organisational protective measures which have been applied, other personal protective measures shall be taken that are appropriate with respect to the respective risk, for example, by wearing a chemical protection coverall. For the appropriate protective measures, reference is made to the safety data sheet, or a query must be directed to the manufacturer/supplier.

8 Monitoring the efficiency of the protective measures

(1) The efficiency of the technical protective measures performed shall be verified on a regular basis in intervals not exceeding three years and whenever the work method has been changed. Verification shall include, in particular, a test of the operativeness of technical safeguards (by measuring impurities and contamination).

(2) Any non-compliant situations shall be immediately remedied.

(3) Workers shall use the technical and organisational protective measures and the personal protective equipment for their intended purpose.

(4) The employer shall monitor the appropriate implementation of the protective measures taken, the proper use of protective gloves and skin protection products and cleaning of the hands. The proper application of the skin protection products and proper cleaning of the hands may be verified by measurements, if possible.

9 Informing the employees

(1) The result of the risk assessment including the measures adopted shall be included in the advisories and shall be communicated in the course of the instructions. It is recommended to define the skin cleaning, care and protection products in a skin protection programme which should be displayed in suitable places, e.g., in places where workers can wash their hands.

(2) If the success of the protective measures depends on the organisational and personal protective measures taken to a substantial extent, it may be necessary to provide the advisories and instructions several times a year.

(3) The employer should encourage employees to report skin hazards and recommend protective measures.

(4) The employer shall ensure that the workers receive specific information concerning the risks resulting from skin contact determined by the employer in the course of the advisories and instructions provided by the employer with respect to occupational medicine and toxicological consequences and that they are informed of the correct application of the prescribed protective measures (proper use of the personal protective equipment provided, such as protective gloves, skin protection etc.). In the course of providing this general advice on occupational medicine and toxicology issues, workers may be made aware of individual concerns and possible skin diseases. In addition, the workers shall be informed about the medical check-ups offered in accordance with GefStoffV Article 16 (3). If it should be necessary from the occupational medicine point of view, occupational medicine and toxicological advice should be provided in cooperation with a specialist for occupational medicine or a doctor who additionally qualifies as a "company doctor".

(5) Where the risk assessment reveals that protective gloves are not necessary, the special rules of behaviour to be observed in this case must be specifically pointed out in the advisories and instructions.

10 Occupational medicine precautions

(1) If risks resulting from skin contact cannot be excluded according to the results of the risk assessment, the employer shall arrange for occupational medicine precautions.

(2) If the risk assessment performed for activities using the hazardous materials that are absorbed through the skin in accordance with subsection 4.2.3 hereof as listed in Annex V No. 1 to GefStoffV reveals that a high risk is present, the employer shall arrange for specific occupational medicine check-ups in accordance with GefStoffV Article 16 No. 2. The following substances listed in Annex V No. 1 to GefStoffV are absorbed through the skin:

- Acrylonitrile
- Aromatic nitro and amino compounds
- Benzene

- Tetraethyl and tetramethyl lead
- Dimethyl formamide
- Glycerin trinitrate and glycol dinitrate (nitroglycerin/nitroglycol)
- Carbon disulfide
- Methanol
- Polycyclic aromatic hydrocarbons
- Tetrachlorethene
- Toluene
- Xylol

(3) If wet work is carried out for more than 4 hours per day, or activities involve exposure to uncured epoxy resins or isocyanates or if natural rubber latex gloves with an allergen content of more than 30 micrograms of protein are worn, the employer shall arrange for special occupational medicine check-ups in accordance with GefStoffV Art. 16 in connection with Annex V No. 2.1 thereto.

(4) The performance of these check-ups in accordance with paragraphs 2 and 3 shall be a prerequisite of employment or continued employment for activities of this type.

(5) If biomonitoring is carried out in the course of occupational medicine check-ups, TRGS 710 shall be observed.

(6) Occupational medicine check-ups shall be offered to workers in accordance with GefStoffV Art. 16 in connection with Annex V No. 2.2 thereto if they perform wet work for more than 2 hours, or if the relevant activities involve solvents or carcinogenic or mutagenic substances of categories 1 or 2. Workers shall not be under an obligation to accept this offer. The check-up is not a prerequisite for engaging in the relevant activities. The employer shall not receive a copy of the results of any check-ups performed according to this offer.

11 Documentation

The employer shall document the result of the risk assessment, in particular, the search for substitute substances, the protective measures taken and the result of the verification of their efficiency as well as the advisories and instructions provided to the employees and shall maintain a list in accordance with GefStoffV Art. 14 (4) No. 3 if necessary. Employees subject to mandatory examinations in accordance with GefStoffV Annex V shall be included in a preventive check-up record.

12 Literature

- [1] Employers' third-party liability insurance association, principle "G 24 Skin diseases (except skin cancer)"

- [2] Employers' third-party liability insurance association, principle "G 40 carcinogenic hazardous substances - general"
- [3] BGR 195 "Use of protective gloves"
- [4] Deutsche Forschungsgemeinschaft: MAK- und BAT-Werte-Liste. Abschnitt VII. Hautresorption (List of MAK and BAT values. Section VII Absorption through the skin). Wiley-VCH-Verlag
- [5] DIN EN 374 parts 1-3 "Protective gloves against chemicals and microorganisms"
- [6] DIN EN 388 "Protective gloves against mechanical risks"
- [7] DIN EN 420 "Protective gloves - general requirements"
- [8] DIN EN 455 "Medical gloves for single use"
- [9] EU Cosmetics Directive (76/768/EEC)
- [10] Cosmetics Ordinance
- [11] Food, Commodities and Feed Code
- [12] List in accordance with Annex I to Directive 67/548/EEC
- [13] List of allergens in protective gloves: www.GISBAU.de
- [14] TRGS 440, "Determination and assessment of chemical risks at work places: determination of dangerous substances and methods for the assessment of substitutes"
- [15] TRGS 500 "Protective measures: Minimum standards"
- [16] TRGS 524 "Refurbishment and works in contaminated areas"
- [17] -TRGS 540 "Sensitising substances"
- [18] TRGS 710 "Biomonitoring"
- [19] TRGS 900 "Limit values in the air in workplaces - air limit values"
- [20] TRGS 903 "Biological tolerance values - BAT values -"
- [21] TRGS 905, 'List of carcinogenic, mutagenic or teratogenic substances'
- [22] TRGS 906, "List of carcinogenic activities or methods in accordance with Gefahrstoffverordnung Article 3 (2) No. 3"
- [23] -TRGS 907 "List of sensitising substances"

Annexes

- Annex 1: Activity- and industry-specific applications of TRGS "Risks resulting from skin contact"
- Annex 2: Substances substantially absorbed through the skin during the vapour phase
- Annex 3: Substances absorbed through the skin and groups of substances causing organic diseases

Annex 4: Examples of solutions for reducing or preventing skin contact

Annex 5: Activities associated with skin contact not only at the hands

Annex 6: Flowchart for selecting suitable protective gloves

Annex 1: Activity- and industry-specific applications of TRGS “Risks resulting from skin contact”

The activity- and industry-specific applications of TRGS “Risks resulting from skin contact“ are listed below.

The list will be amended.

- TRGS 530 "Hair dressing trade"

Annex 2: Substances substantially absorbed through the skin during the vapour phase (non-final list)

Below, please find examples of substances whose absorption in the gas/vapour phase constitutes an additional relevant route of absorption.

- 2-Butoxyethanol,
- 2-Methoxyethanol,
- 2-Ethoxyethanol and
- Polycyclic aromatic hydrocarbons in hot condition.

Annex 3: Substances absorbed through the skin and groups of substances causing organic diseases

3a Substances and groups of substances for which experience has shown that their absorption through the skin will result in damages to health (non-final list)

Below, please find examples of groups of substances for which experience has shown that harmful effects will occur if absorbed through the skin.

- aromatic and aliphatic amino and nitro compounds such as aniline, toluidine, nitrobenzene, triethylamine or anisidine,
- numerous phenol compounds, including phenol, cresol or hydrochinon;
- special solvents such as DMF, glycol ether, ethylbenzene,
- halogenated hydrocarbons including chlorobenzene, chloroform, carbon tetrachloride,
- numerous pesticides, especially organophosphates, e.g. parathion;
- some organic metal compounds, especially highly toxic methyl mercury compounds,
- hydrofluoric acid, nitric acid,
- dimethyl sulfoxide,
- gasoline, antifreeze, brake fluid.

3b Substances absorbed through the skin which are labelled R45, R46, R60 or R61

Name	Classification	Symbol	R phrases
Acrylonitrile	F; R11 Carc.Cat.2; R45 T; R23/24/25 Xi; R37/38-41 R43 N; R51/53	F; T; N	45-11-23/24/25-37/38-41-43-51/53
Benzene	F; R11 Carc.Cat.1; R45 Muta.Cat.2; R46 T; R48/23/24/25 Xn; R65 Xi; R36/38	F; T	45-46-11-36/38-48/23/24/25-65
Diethylene glycol dimethyl ether	R10 R19 Repr.Cat.2; R60-61	T	60-61-10-19
Ethyl sulfate	Carc.Cat.2; R45 Muta.Cat.2; R46 Xn; R20/21/22 C; R34	T	45-46-20/21/22-34
2-Nitro toluene	Carc.Cat.2; R45 Muta.Cat.2; R46 Repr.Cat.3; R62 Xn; R22 N; R51/53	T; N	45-46-22-62-51/53
$\alpha,\alpha,\alpha,4$ -Tetrachlorotoluene	Carc.Cat.2; R45 Repr.Cat.3; R62 T; R48/23 Xn; R21/22 Xi; R37/38	T	45-21/22-37/38-48/23-62
Tetraethylplumban	Repr.Cat.1; R61 Repr.Cat.3; R62 T+; R26/27/28 R33 N; 50/53	T+; N	61-26/27/28-33-50/53-62

Annex 4: Examples of solutions for reducing or preventing skin contact

Process	Industry	Technical/organisational solution
Pouring, bottling, decanting, mixing of substances	Large scale industry	Filling fluids from drums into reactors/vessels using drum tilting devices (instead of simple drum pumps)
	Large scale industry	Filling solids/granulated substances using cellular wheel sluices
	Large scale industry	Filling granulated polymer matter and additives into extruder using pneumatic handling devices
	Large scale industry	Introducing solids into reactors/boilers using closed metering worms, continuous mechanical handling equipment
	Large scale industry	Introducing solids using bag opening machine in a sluice
	Large scale industry	Filling stations for barrels in closed, automatic design (e.g. retracting and extending the filling nozzle for highly toxic substances at high vapour pressures within extraction chamber only)
	Large scale industry	Emptying solids from bigbags using specially sealed docking system
	Large scale industry	Automatic bagging (e.g. automatic withdrawal of plastic bags from a film roll, filling, sealing, piling)
	Laboratory	Using pipetting aids and dispensers for laboratory flasks
	Laboratory	Handling of particularly hazardous substances inside a glove box
	Laboratory	Use of vessels and containers with level indicator to avoid overfill
	Building trade	Provision of multi-component coats and adhesives in combined drums instead of separate drums.
Transport and storage of substances	Large scale industry	Use of fixed pipelines instead of flexible hoses and couplings
	Large scale industry	Use of tightly sealing pumps for delivering fluids (e.g. pumps with double mechanical seal, canned motor pumps with magnetic clutches)
	Large scale industry	Application of the "go-devil" technology (instead of manual flushing and cleaning of pipelines)
	Laboratory	Storage of chemical substances in the lab in tightly sealed threaded flasks (instead of ground flasks with glass, cork or rubber plugs)
Sampling	Large scale industry and laboratory	Sampling systems in closed design (instead of open sampling taps, sampling buckets etc.), e.g. use of sampling flasks with rubber septum, injection of liquid sample using hollow needle, within a closed box (with extraction, if necessary)
	Large scale industry	On-line measurements for process control or quality monitoring instead of individual sampling
Cleaning	Large scale industry	Cleaning screens and filters through automatic counterflushing (instead of pulling and cleaning the screen manually)
	Large scale industry and laboratory	Drum and bottle cleaning systems in fully automatic, closed design
Special working methods	Large scale industry, painting/lacquering	Automatic colour mixing system
	Painting/lacquering	Coating using coating machines/calendars (instead of manual painting)
	Painting/lacquering	Powder coating (instead of manual application/spraying of solvent-containing lacquers)
	Painting/lacquering	Immersion-painting

Process	Industry	Technical/organisational solution
	Painting/lacquering	Lacquering in spray booths with extraction. This also prevents or reduces worker exposure
	Painting/lacquering	Immersion baths for pickling stainless steel components with automatic hoisting and dripping facility
	Painting/lacquering	Use of adhesion glues with separating foil
	Painting/lacquering	Application of coats using large-diameter rollers in order to minimise the rolling speed, and thus the risk of splashes.
	Building trade	Use of prefabricated industrial building elements (instead of conventional bricklaying)
	Building trade	Stripping of silicone joints using tools instead of fingers
	Metalworking	Use of CNC machines in metalworking (instead of manual processes with possible direct contact with cooling lubricant)
		Preparation of glass fibre reinforced components using resin transfer moulding (RTM process) instead of manual lamination
	Metalworking	Automatic soldering stations (instead of manual soldering)
	Metalworking	When turning metal parts, shavings may wind around the part and the tool. They are removed using a chip hook, thus avoiding skin contact with the cooling lubricant and the sharp-edged shavings. Setpoint value monitoring for cooling lubricants mixed with water in order to prevent excessive concentrations of substances that are damaging to the skin (e.g. alkalinity, biocides, specific additives)
	Metalworking	Cleaning of seam welds on stainless steel parts using a paste-like mixture of hydrofluoric acid/nitric acid. Technical protective measures are not possible; the use of suitable gloves, body protection and respiratory protection at work is normally absolutely sufficient.
	Metalworking	Robot-controlled adhesion processes in automobile production
	Miscellaneous	Inspection systems using remote-controlled probes (instead of accessing or disconnecting lines, ducts and confined spaces).

Annex 5: Activities associated with skin contact not only at the hands (non-final list)

Below, some activities are listed as examples where skin contact may occur not only at the hands.

- kneeling activities with skin contact (e.g. floor plasterers, floor tilers),
- mixing with free-running agitator (mixing and “running clean” of multi-component products and contamination of clothes),
- cleaning the inside of vessels and tanks,
- skin contact in the face in the presence of vapours when handling epoxy resins,
- processing of products by spray application methods (e.g. spray loaders when spraying pesticides),
- activities involving exposure to cooling lubricants,
- repair work carried out on machines and plants,
- oil change in car workshops.

Annex 6: Flowchart for selecting suitable protective gloves

