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Technical rules for Hazardous substances	Demolition, renovation and maintenance work with old mineral wool	TRGS 521
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The Technical Rules for Hazardous Substances (TRGS) reflect the state of the art, occupational medicine and occupational hygiene as well as other established scientific knowledge for activities involving hazardous substances, including their classification and labelling. They are published by the

Committee on Hazardous Substances (AGS)

and adjusted by it in line with developments.

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1 Scope of application

(1) TRGS 521 applies to the protection of employees and other persons during demolition, renovation and maintenance work with old mineral wool (see number 2.3), during which fibre dusts classified as carcinogenic are released.

(2) This TRGS describes protective measures that must be taken during demolition, renovation and maintenance work involving old mineral wool. It provides the employer with assistance in determining the protective measures.

(3) For activities involving new mineral wool (see section 2.4), the provisions of sections 4 and 5 of TRGS 500 "Protective measures" apply.

(4) TRGS 521 specifies the requirements for the protection of employees and other persons according to §§ 10 and 11 of the Ordinance on Hazardous Substances and in particular Annex III No. 2 "Particulate hazardous substances" and Annex IV No. 22 of the Ordinance on Hazardous Substances for biopersistent mineral fibres.

(5) Even if the fibre dust concentration at the workplace specified in 3.3 (50,000 fibres/m³) is complied with, a cancer risk cannot be ruled out according to the current state of scientific knowledge. Further measures to minimise the concentration of fibre dust should therefore be sought.

2 Definitions

2.1 Wool

Wool is a disorderly accumulation of fibres with different lengths and diameters.

2.2 Mineral wool

- (1) The collective term mineral wool covers insulating materials made of artificially produced stone or glass wool.
- (2) Mineral wool consists of artificial mineral fibres, which consist of non-directional, glassy (silicate) fibres with a mass content of more than 18 percent of oxides of sodium, potassium, calcium, magnesium and barium.

2.3 Old mineral wool

- (1) For the purposes of this TRGS, old mineral wools are biopersistent artificial mineral fibres according to Annex IV No. 22 of the Ordinance on Hazardous Substances. According to TRGS 905 According to the "List of carcinogenic, mutagenic or reprotoxic substances", the fibre dusts released from old mineral wool are to be assessed as carcinogenic.
- (2) Since June 2000, the ban on the manufacture and use of old mineral wool has been in force according to Annex IV No. 22 of the Ordinance on Hazardous Substances. It can be assumed that mineral wool installed before 1996 is old mineral wool within the meaning of this TRGS.

2.4 New mineral wool

The mineral wool made of artificial mineral fibres that have been produced since about 1996 and meet the exemption criteria of Annex IV No. 22 of the Ordinance on Hazardous Substances is referred to as new mineral wool.

2.5 Demolition work

Demolition work includes the demolition of structures, the scrapping of vehicles including ships, the dismantling of plant or equipment, etc., including the necessary ancillary work.

2.6 Redevelopment work

Remediation work includes the removal of mineral wool insulation materials and, if necessary, replacement, including the necessary ancillary work.

2.7 Maintenance work

Maintenance work includes all measures to maintain the target condition (maintenance), to determine and assess the actual condition (inspection) and to restore the target condition (repair).

2.8 Disassembly

Dismantling is the largely non-destructive removal of products that can release fibre dust, especially in the context of maintenance work.

2.9 Fibre dust

Fibrous dusts within the meaning of this TRGS are dusts containing artificial inorganic mineral fibres with a length greater than 5 µm, a diameter smaller than 3 µm and a length-to-diameter ratio greater than 3 to 1 (WHO fibres) and are thus considered to be alveolar.

2.10 Artificial mineral fibres

Artificial mineral fibres (AMF) are fibres synthetically produced from mineral raw materials. In addition to the differentiation according to chemical composition, man-made fibres, in contrast to natural and ubiquitous fibres, basically have parallel edges.

2.11 Products

Products within the meaning of this TRGS are substances, preparations and articles.

2.12 Thermal stress

Thermal stress on products made of artificial mineral fibres occurs when they have been exposed to a temperature that has a negative effect on the dusting behaviour. In the case of mineral wool insulation materials, this effect usually occurs at a thermal load of 200° C and above.

2.13 Dusting behaviour

The dusting behaviour describes the property of products with regard to a possible release of fibre dusts and other dusts.

3 Information gathering and risk assessment

3.1 General

(1) Before starting the activities, the employer shall carry out a risk assessment. The basis of the risk assessment for demolition, renovation and maintenance work with old mineral wool (ASl work) are numbers 3 and 4 of this TRGS.

(2) The employer must first determine whether the employees carry out activities during which fibre dusts classified as carcinogenic may be released. It must be taken into account that these products were not subject to compulsory labelling when they were placed on the market.

(3) The employer must obtain the information necessary for the risk assessment from the distributor or from other accessible sources (e.g. documentation of the builder/client, Quality Association for Mineral Wool¹⁾.

(4) Mineral wool products installed before 1996 must be assumed to be classified as carcinogenic category 2 according to TRGS 905. This classification can only be refuted by individual proof. This individual proof can be requested from the Gütegemeinschaft Mineralwolle.

(5) Since 1996, mineral wool products have been manufactured in Germany that are considered harmless. Activities involving these products do not require any additional requirements apart from the minimum requirements according to TRGS 500.

(6) If no information is available on the assessment of the mineral wool products - this will be the rule in practice when working on/with installed products - the assessment is to be based on old mineral wool. This assessment is the basis for Tables 1a and 1b.

(7) Since 1.6.2000, old mineral wool insulating materials may no longer be manufactured, marketed and used (Annex IV No. 22 GefStoffV²⁾ and Chemicals Prohibition Ordinance³⁾. Due to the ban on use, activities with old mineral wool insulation materials are therefore only permissible in the course of demolition, renovation and maintenance work.

1) GGM Gütegemeinschaft Mineralwolle e.V., Odenwaldring 68, D-64380 Rossdorf bei Darmstadt, see also www.mineralwolle.de

2) Ordinance on Hazardous Substances of 23.12.04 (BGBl. I p. 3758)

3) Chemicals Prohibition Ordinance of 25 June 2003 (BGBl. I No. 26)

(8) Due to the prohibition of use, dismantled old mineral wool insulation materials must not be reinstalled. The only exceptions to the ban on reassembly (reinstallation) are old mineral wool insulation materials dismantled in the course of maintenance work, if no or only low exposure to fibre dust is to be expected (see Tables 1a and 1b). The ban on use according to Annex IV No. 22 of the Ordinance on Hazardous Substances does not include a requirement to remove existing insulation made of old mineral wool.

(9) The risk assessment must be carried out by a competent person in relation to the activity. The following points must be taken into account:

1. Extent and duration of inhalation exposure,
2. Working conditions and procedures including the work equipment and the quantity of mineral wool product,
3. necessary protective measures,
4. Protection against mechanical irritation of eyes, skin and mucous membranes and
5. Specifications for checking the effectiveness of the protective measures taken.

(10) As part of the risk assessment, the employer shall assess the extent, nature and duration of the exposure of workers. For fibre dusts, the concentration is given in fibres/m³ (F/m³).

(11) Measurement results from comparable activities can, if the information determination, the measurement procedure and the measurement result are in accordance with TRGS 402, be used as a basis for the measurement.

"Determination and assessment of the concentration of hazardous substances in the air in working areas" "Determination and assessment of the hazards of activities involving hazardous substances: Inhalation exposure" can be used for the risk assessment.

(12) It must be checked whether working procedures have been selected for the respective application in such a way that the release of fibre dusts is as low as possible.

(13) The employer shall assess the effectiveness of the protective measures laid down in the risk assessment.

(14) The risk assessment must be documented before starting the activities. Detailed documentation is not required for the activities listed in Tables 1a and 1b.

3.2 Concept of exposure categories

(1) As part of the risk assessment, the employer must determine the fibre dust concentrations occurring during ASI work by measuring the workplace. Activities are assigned to one of three exposure categories, which are associated with concrete protective measures corresponding to the state of the art. This assignment is made depending on the expected fibre dust concentrations and the duration and frequency of the activities. If the state of the art measures are implemented, the fibre dust concentration ranges specified in section 3.3 result for exposure categories 1, 2 and 3.

(2) In Tables 1a "Building construction" and 1b "Technical insulation", selected activities during ASI work have been compiled. For these activities, it is possible to estimate the fibre dust concentration at the workplace on the basis of existing measurement results. The basis for this estimation are the results of representative exposure measurements by manufacturers, professional associations, etc., which have been published in the literature⁴.

(3) The determination of the fibre dust concentration is not necessary if

1. the activities listed in Tables 1a and 1b are carried out by the employer and their effectiveness is verified, or
2. all measures of exposure categories 1, 2 and 3 are applied by the employer (e.g. for activities not mentioned in Tables 1a and 1b or if the possibility of waiving measures of categories 1 or 2 is not to be used).

(4) If individual activities which are not listed in Tables 1a and 1b can be equated by analogy with the activities listed there, the activities can be assigned to an exposure category (justification required in the risk assessment).

3.3 Exposure categories and protective measures for old mineral wool-Insulation materials

(1) Protective measures for exposure category 1 apply to activities which, taking into account the protective measures described, are known from experience to lead to no or only very low fibre exposure, i.e. where the fibre dust concentration is below 50,000 fibres/m³.

(2) Protective measures for exposure category 2 apply to activities which, taking into account the protective measures described and the type of activity, cause low to medium fibre exposure, i.e. where the fibre dust concentration is between 50,000 fibres/m³ and 250,000 fibres/m³.

(3) Protective measures for exposure category 3 apply to all activities that are not listed in Tables 1a and 1b and thus cause a higher fibre dust exposure than 250,000 fibres/m³ according to the state of the art.

3.4 Efficiency test

(1) If the measures assigned to the exposure categories are implemented, it can be assumed that the requirements of the Ordinance on Hazardous Substances are fulfilled.

(2) If these regulations are deviated from, at least equivalent protective measures must be taken. The deviation must be justified in the documentation of the risk assessment.

⁴ see point 6 "Further regulations and leaflets", in particular [10], [20] and [21].

- (3) As a result of the risk assessment, methods for checking the effectiveness of the existing protective measures and those to be taken must also be established. This is to ensure that the protective measures reduce exposure over the period of the activities to the extent necessary for the safety and health of the workers.
- (4) Technical protective measures, e.g. ventilation and extraction equipment, must be regularly checked for sufficient function and effectiveness. This must be done at least annually for technical equipment (e.g. industrial hoovers) for protection against inhalable dusts. The employer can set the intervals himself within this specified framework. The manufacturer's specifications and other legal requirements must be observed. The result of the test must be recorded and documented.
- (5) If measurements are required to determine the exposure level (fibre dust concentration), only measuring bodies with the necessary expertise may be commissioned for this purpose. The measurement results must be recorded and kept by the employer in the same way as personnel records. In the event of plant shutdowns, the measurement results must be handed over to the competent accident insurance institution.
- (6) There is currently no health-based occupational exposure limit (OEL) for classified dusts from mineral wool insulation materials. Based on the exposure level determined, it can be assessed whether the state of the art has been reached for certain activities involving mineral wool products.

4 Protective measures

4.1. Measures for exposure category 1

- (1) The basic protective measures (§ 8 of the Ordinance on Hazardous Substances and TRGS 500) must always be taken for activities in exposure category 1. The implementation of these generally applicable minimum standards also ensures protection against mechanical irritation of eyes, skin and mucous membranes by thick fibres.
- (2) Activities involving old mineral wool at workplaces that vary in location and time (e.g. construction sites) must be recorded once in the company's list of hazardous substances, irrespective of the construction site.
- (3) The working method must be selected according to the state of the art so that as little fibre dust as possible is released, e.g. non-destructive removal, industrial Hoover.
- (4) Dismantled material must not be thrown.
- (5) The whirling up of dust must be avoided. The workplace must be cleaned regularly.
- (6) Do not blow off dust and dust deposits with compressed air or sweep dry, but collect them with industrial hoovers (category M) or wet cleaning.

(7) Waste must be packed as dust-tight as possible at the point of origin, moistened if necessary and labelled. Closed containers (e.g. bins, tear-proof sacks, big bags) are to be used for transport.

(8) To determine the permissible disposal route, waste must be assigned to the waste types of the European Waste Catalogue (EWC). According to the national Waste Catalogue Ordinance (AVV), waste from old mineral wool has the waste code number 170603*.

(9) In the individual federal states, state-specific regulations apply for disposal. The proper disposal must therefore be enquired about with the local and technically competent authority.

(10) Workers should wear loose-fitting work clothes and protective leather gloves or nitrile-coated cotton gloves. Skin care products should be used after work if the skin is sensitive.

(11) The employees are to be instructed on the basis of the operating instructions about the dangers, rules of conduct and protective measures during the activities.

4.2 Measures for exposure category 2

(1) All measures of exposure category 1 are to be carried out. In addition, the following measures are required.

(2) If the release of fibre dusts cannot be prevented, they must be completely collected and disposed of at the point of emission or formation by ventilation measures (e.g. industrial vacuum cleaners), as far as this is possible.

(3) Suitable hoovers (at least dust class M⁵) must be used for cleaning work or damp cleaning methods must be employed.

(4) It is recommended to provide personal protective equipment (respiratory protection, safety goggles) if requested by the employees.

(5) Air extracted from work areas in which activities involving category 2 fibre dusts classified as carcinogenic are carried out may not be returned. By way of derogation from sentence 1, the air extracted from a work area may be returned to it if it has been sufficiently purified of such substances using procedures or equipment recognised by the authorities or by the employers' liability insurance association. The air must then be conducted or purified in such a way that these fibrous dusts do not get into the air breathed by other employees. The ventilation systems and in particular the separation systems must be regularly inspected. This requires the

1. daily inspection,
2. monthly maintenance and
3. annual general inspection

⁵) see DIN EN 60335-2-69 Annex AA. A positive list of tested dust removing machines is regularly published in the BIA manual, code 510210.

and, if necessary, repair. Written records of the maintenance work shall be kept and submitted to the surveillance authority on request.

- (6) The number of exposed persons must be reduced to a minimum through organisational protection measures. Only these persons may have access to the work areas. The work areas must be marked.
- (7) The spread of dust to other work areas must be prevented as far as possible.
- (8) Hard-to-clean objects or equipment (e.g. carpets, radiators) should be covered.
- (9) Washing facilities shall be provided for employees.
- (10) Employees shall be offered an occupational health examination.

4.3 Measures for exposure category 3

- (1) All measures of exposure categories 1 and 2 must be carried out. In addition, the following measures are required.
- (2) The employer must provide the employees with personal protective equipment (PPE). Half masks with P2 filters or particle filtering half masks FFP2 or filtering devices with blower TM 1P are suitable as respiratory protection. For overhead work, protective goggles must also be provided.
- (3) Employees wearing respiratory protection must be examined by an occupational health officer (e.g. in accordance with G 26 "Respiratory protection equipment").
- (4) Workers shall be provided with a breathable protective suit type 5 (DIN EN ISO 13982). After use, the protective suits shall be collected in tightly sealed containers. The employer shall organise the cleaning or disposal of the protective clothing.
- (5) The personal protective equipment provided must be used by the employees. The wearing time limit for personal protective equipment in accordance with BGR 190 must be taken into account.
- (6) Separate storage facilities for street and work clothes must be available.

Table 1 a: Activities - Building construction sector

For activities not listed in tables 1a) and 1b), the measures of exposure category 3 shall be applied.

	Activities	Exposure category
1	Work on exterior walls, on sloping roofs or on flat roofs	
1.1	Removal of cladding, facing, roofing or flat waterproofing with exposure of the insulation material.	
1.1.1	- without dismantling the insulation material	1
1.1.2	- with dismantling/removal ⁶ of the insulation material (when working on external walls without workplace enclosure with air-impermeable foils/tarpaulins, such as by scaffold cladding with plastic sheeting).	2
1.1.3	- with dismantling/removal of less than 20 m ² of the insulation material, e.g. for inspection work or for the installation of windows, doors, roof openings (e.g. skylights), vapour pipes, antenna masts or the like.	1
2	Work on composite thermal insulation systems or comparable systems with exposure of the insulation material.	
2.1	- With dismantling/removal of the insulation material (without workplace enclosure with air-impermeable sheeting, such as by scaffold cladding with plastic sheeting).	2
2.2	- with dismantling/removal of less than 20 m ² of the insulation material	1
3	Work on interior walls (partition walls, facing shells)	
3.1	- without dismantling the insulation material	1
3.2	- with disassembly/removal of the insulation material	2
3.3	- with dismantling/removal of less than 3 m ² of the insulation material, e.g. for the installation of switches, doors, sockets, lights and the like.	1
4	Work on ceiling linings and suspended ceilings	
4.1	Opening of ceiling sections for maintenance and inspection work with dismantling/removal of:	
4.1.1	- Cassettes with inserted insulation boards	1
4.1.2	- insulation boards laid on or fixed to the underside of the ceiling, laminated or shrink-wrapped in foil	1
4.1.3	- unprotected insulation boards or mats placed on top or in place	2
4.1.4	- unprotected insulation boards of less than 3 m on top or in place ²	1
4.2	Work in false ceilings, e.g. laying cables, pipes and conduits in ceilings with suspended ceilings.	
4.2.1	- protected insulation materials (lamination/covering)	1
4.2.2	- unprotected insulation materials and work in the false ceiling area	2
5	Work on floating screeds	
5.1	- without dismantling the insulation material	1
5.2	- with disassembly/removal of the insulation material	2
5.3	- with disassembly/reassembly of less than 3 m ² of the insulation material	1

⁶ Remounting is generally only permissible for activities of exposure category 1; see section 3.1 para. 8 of this TRGS.

Table 1 b: Activities - Technical Insulation Division

For activities not listed in tables 1a) and 1b), the measures of exposure category 3 shall be applied.

	Activities	Exposure category
1	Dismantling/removal of sheathing or moulded parts, such as sheet metal sheathing without removing the insulation material.	
1.1	- for installations or parts of installations not subject to thermal loads	1
1.2	- for thermally stressed systems or system parts	2
2	Dismantling/removal of insulating fittings, removable insulation or insulation with sheathing, e.g. caps or bonnets, covers or inspection chambers, fittings made of coated glass fibre fabric.	
2.1	- for installations or parts of installations not subject to thermal loads	1
2.2	- for thermally stressed systems or system parts	2
3	Dismantling/removal of acoustic elements (sound enclosures, baffles, enclosures) with inserts of mineral wool insulation materials and an inner cover of glass fibre fleece, perforated sheet or similar.	1
4	Dismantling/removal of insulation materials on e.g. pipelines, ventilation ducts, containers	
4.1	For thermally stressed systems or system parts	
4.1.1	- in well-ventilated rooms or outdoors and disassembly/reassembly of less than 20 m ² of the insulation material	2
4.1.2	- in well-ventilated rooms or outdoors and disassembly/reassembly of less than 1 m ² of the insulation material	1
4.1.3	- in confined and poorly ventilated spaces and disassembly/reassembly of less than 1 m ² of the insulation material.	2
4.2	For systems or system parts that are not subject to thermal loads	
4.2.1	- in well-ventilated rooms or outdoors	2
4.2.2	- outdoors and dismantling/reassembly of less than 20 m ² of the insulation material	1
4.2.3	- in well-ventilated rooms and disassembly/reassembly of less than 3 m ² of the insulation material	1
4.2.4	- in confined and poorly ventilated spaces and disassembly/reassembly of less than 3 m ² of the insulation material.	2
4.2.5	- in confined and poorly ventilated spaces and disassembly/reassembly of less than 1 m ² of the insulation material.	1

Table 2: Assignment of exposure category and occupational safety measures

Request		Exposure category 1	Exposure category 2	Exposure category 3
Legal basis GefStoffV	Occupational safety measure			
§ 7	Information gathering and risk assessment	X	X	X
§ 8 Para.2; Annex III No. 2.3	Low dust machining	X	X	X
§ 8 Para. 2	Low dust cleaning	X	X	X
§ 8 par. 4 and 6	Waste treatment and waste labelling	X	X	X
§ 14 Para. 1	Operating instructions	X	X	X
§ 14 para. 2	Instruction	X	X	X
§ 7 Para. 8	Inclusion in the hazardous substances register of the company	X	X	X
§ 8 Para. 2	Organisational protective measures	X	X	X
§ 8 Para. 2	Selection of suitable working methods	X	X	X
§ 8 Para. 2	Foil cover when cleaning is not possible	-	X	X
§ 9 Para. 2	Technical measures for minimising fibre dust	-	X	X
§ 9 Para. 9	Ban on smoking/snuffing at the workplace. Prohibition of food intake.	-	X	X
§ 10 Para. 2	Respiratory protection and safety goggles for overhead work	-	X ¹	X
§ 10 Para. 2	Protective suits	-	X ¹	X
§ 10 Para. 2	Cleaning or disposal of clothing	-	X	X
§ 10 Para. 2	Washing facilities	-	X	X
§ 10 Para. 3	Delimit and characterise the work area	-	X	X
§ 15 and 16	Occupational health screening	-	X ²	X
§ 9 Para. 3	Separate storage facilities for road and work clothing	-	-	X

Explanation of table 2

X =Finds application

- =not applicable

¹ =Provide at the request of the employees

² =Occupational health screening must be offered.

5 Further regulations and leaflets

1. Ordinance on Protection against Hazardous Substances (GefStoffV) of 23 December 2004 (BGBl. I p. 3759), Ordinance on Safety and Health Protection when Providing Work Equipment and Using it at Work, on Safety when Operating Systems Requiring Monitoring and on the Organisation of Occupational Health and Safety (Betriebssicherheitsverordnung - BetrSichV) of 27 September 2002 (BGBl. I p. 3777).
2. Ordinance on Workplaces (Arbeitsstättenverordnung - ArbStättV) - of 12 August 2004 (Federal Law Gazette I p. 2179)
3. Ordinance on Safety and Health Protection on Construction Sites (Baustellenverordnung - BaustellV) of 10 June 1998 (BGBl. I p. 1283).
4. TRGS 402 "Determination and assessment of the concentration of hazardous substances in the air in working areas" Determination and assessment of hazards during activities involving hazardous substances: Inhalation exposure"
5. TRGS 500 "Protective measures
6. TRGS 555 "Operating instructions and information for employees".
7. TRGS 900 "Occupational exposure limit values
8. TRGS 905 "List of carcinogenic, mutagenic or reprotoxic substances".
9. TRGS 906 "List of carcinogenic activities or processes according to §3 para. 2 no. 3 of the GefStoffV".
10. BG rule: Use of protective clothing (BGR 189)
11. BG rule; use of breathing apparatus (BGR 190)
12. BG rule: Operation of work equipment (BGR 500)
13. BG-Information: Method for the determination of respirable fibres - light microscopic method (BGI 505-31)
14. BG-Information: Separate determination of the concentration of inorganic fibres in working areas - Scanning electron microscopic method (BGI 505-46)
15. Rules for safety and health protection at workplaces with workplace ventilation (BGR 121)
16. List of certified respiratory protective devices (BGI 693, old: ZH 1/606) Ordinance on workplaces (Arbeitsstättenverordnung - ArbStättV): §§ 45-47.
17. BGIA Workbook: Measurement of Hazardous Substances; BG/BIA Recommendations 1012 X/93 "Insulation in Building Construction and Technical Insulation with Mineral Wool Insulation Materials" (Note: withdrawn June 2000)
18. Hauptverband der gewerblichen Berufsgenossenschaften (HVBG) - Berufsgenossenschaftliches Institut für Arbeitsschutz (BGIA) (ed.), Arbeitsschutzlösungen für ausgewählte Stoffe und Verfahren, pp. 126- 157; October 2006; Sankt Augustin

19. Hauptverband der gewerblichen Berufsgenossenschaften (Hrgs.), Arbeitsmedizinische Vorsorge - Berufsgenossenschaftliche Grundsätze für arbeitsmedizinische Vorsorgeuntersuchungen, 3rd edition, Gertner Verlag Stuttgart.
20. Handling mineral wool insulating materials (glass wool, rock wool), Handlungsanleitung der Berufsgenossenschaft der Bauwirtschaft (ed.), retrieval no. 341 or on the Internet at www.gisbau.de
21. VDI 3469 Sheet 1, Edition: Whiteprint 2006, Production, processing of fiber-containing materials. - Basics; Overview
22. VDI 3469 Sheet 6, Edition: Gründruck 2006, Production, Processing of Mineral Wool Insulation Materials
23. Mineral Wool Quality Association: www.mineralwolle.de