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Hazardous materials

Handling mineral wool insulation (glass wool, stone wool)

Code of practice

Contents

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Introductory notes

These code of practice specify work safety measures for handling mineral wool insulation. A number of essential facts have changed since the first publication of the info sheet in October 1993.

Since that time, clear assessment criteria have been developed for evaluating the risk of cancer from man-made mineral fibres, and risk-dependent safety measures have been set in place.

Manufacturers of mineral wool insulation responded promptly to the regulations and have for a number of years been offering a new generation of insulation materials which are no longer classified as potentially carcinogenic.

Since 1 June 2000, the manufacture, sale and use of mineral wool insulation which does not meet the sign-off criteria of Appendix IV No. 22 of the Ordinance on Hazardous Substances have been banned in Germany.

These developments have made it necessary in practice to distinguish categorically between two kinds of mineral wool, i.e. the so-called "old" and "new" products.

"Old" mineral wool insulation, for the purposes of these code of practice, includes products which do ***not*** meet the sign-off criteria of Appendix IV No. 22 of the Ordinance on Hazardous Substances and are classified as "potentially carcinogenic".

"New" mineral wool insulation, on the other hand, does meet the sign-off criteria of Appendix IV No. 22 of the Ordinance on Hazardous Substances ***and*** is categorised as not potentially carcinogenic ("free of carcinogenic risk"). The manufacturer provides evidence of sign-off under Appendix IV of the Ordinance on Hazardous Substances and of the absence of carcinogenic risk in Section 11 (Toxicological information) of the safety data sheet in accordance with § 6 of the Ordinance on Hazardous Substances.

Certain products that are available in Germany bear the RAL quality mark. This shows that the sign-off criteria of Appendix IV No. 22 of the Ordinance on Hazardous Substances have been met. The publishers of these code of practice recommend the use of these products.

When working with products labelled with the RAL quality mark, only the minimum measures to protect employees from dust set out in numbers 4 and 5 of the Technical Rules for Hazardous Substances (TRGS 500) must be observed. These measures are described in Chapter 3 of these code of practice.

Contact with "old" mineral wool is now possible – or permissible – only during dismantling, demolition, repair and restoration work. Work of this kind is covered by TRGS 521.

RAL GÜTEZEICHEN
Erzeugnisse aus MINERALWOLLE

1. General information

1.1 What is mineral wool insulation?

Glass wool
Stone wool

Mineral wool insulation can take the form of glass wool or stone wool. These insulation materials are manufactured primarily from the raw materials for glass or from stones, as well as using recycling materials such as recycling glass. Binding agents and oils are added to these insulating materials. Use of synthetic resins as binding agents maintains the shape of the insulation materials, while the oils reduce the dust content.

These code of practice do not apply to high temperature insulation wool used in high temperature environments (ceramic fibres and high temperature glass fibres).

1.2 What does mineral wool consist of?

Fibres
Resin
Other additives

Mineral wool contains:
- at least 90% man-made mineral fibres with a vitreous structure,
- up to 7% synthetic resin, made of phenol, urea and formaldehyde,
- approximately 1% oils and other additives, e.g. water-repellent materials.

Volatile and solid components

During the manufacture of mineral wool-insulation, the synthetic resin is cured with hot air, removing volatile matter (like formaldehyde or phenol) from the product. The cured synthetic resin (e.g. bakelite) remains in the insulation material. Mineral wool insulation contains no asbestos or silicogenic dust.

Length
Diameter

The glass and stone wool fibres contained in the insulation materials normally have an **average length** of a few centimetres and an **average diameter** of 3-5 micrometres[1]. They are generally not respirable on account of their length.

Some fibres released during assembly and processing can be caught in the lungs.

[1] 1 micrometre (µm) is a millionth of a metre and a thousandth of a millimetre

2. Possible health implications from handling

2.1 Itching

Skin irritation

When mineral wool insulation is handled, the fibres can cause mechanical skin irritations. These are caused by coarser fibres (with a diameter over 5 micrometres), which can pierce the skin owing to their rigidity and cause unpleasant itching. Tolerance can clearly be built up when mineral wool is handled over longer periods; in spite of continued exposure to the fibres the itching abates. However, the danger of inflammation still remains.

Previously existing skin problems can be exacerbated by handling mineral wool products.

2.2 Allergies

Allergies

There are no known cases of allergic reactions to glass and stone wool fibres. However, the additives in the mineral wool may cause problems for allergy sufferers.

2.3 Dust exposure

Dust exposure

Fibrous dust is released during processing. Like any other mineral dust, the fibrous dust from the mineral wool insulation can cause eye irritation.

Furthermore, temporary inflammatory irritations of the large airways, the throat and the nasal mucosa have been known to occur. In particular, demolition – i.e. the **destructive** removal of mineral wool – can lead to considerable exposure to fibrous dust. The effects of this fibrous dust can, as with all dusts, damage the function of the respiratory organs.

2.4 Cancer risk

Cancer risk

Mineral wool insulation contains respirable fibres. The risk emanating from these fibres is the subject of much discussion and is explained in more detail below.

2.4.1 In principle, when is there a cancer risk from fibres?

The danger depends on diameter, length and durability

All kinds of fibres can cause cancer if they are suitably long and thin (of specified lengths and diameters) and sufficiently resistant to being broken down by the body.

These fibres are not visible to the naked eye. However, they exist in high concentrations in the air in the workplace if mineral wool insulation is handled improperly and not according to these code of practice.

Unlike asbestos fibres, which fan out, splitting longitudinally and thus becoming increasingly thinner and more dangerous, glass and stone wool fibres break transversally, thus becoming shorter and shorter. Since the diameter remains the same, the fragments turn more and more to small specks of dust and are then comparable with any other dust in their effect.

The **durability** of the fibres is of importance, because the fibres must remain in the lungs for a certain time to be able to induce cancer. As soon as the fibre is removed from the lungs, disintegrates or is simply broken up several non-fibrous (short) parts, it loses its carcinogenic potential.

Not comparable with asbestos. Mineral wool fibres possess a low level of durability that is not comparable with that of asbestos.

Biodurability (biopersistence) studies have shown that today's manufactured glass and stone wool fibres have a half-life of less than 40 days – this is, more than half of their fibres will have degraded within 40 days. By contrast, manufactured mineral wool fibres manufactured in earlier years have half-lives of several hundred days, while blue asbestos, for example, possesses a durability of more than 100 years.

2.4.2 Assessment of the fibre properties

Assessment of the fibres The assessment of the fibres is based primarily on their durability/solubility. In Germany this is determined using the chemical composition and/or the biodurability determined in animal experiments.

The situation in Germany Products installed before 1996 must be regarded as having a carcinogenic risk. This risk can only be discounted by means of verification in the individual case. The Gütegemeinschaft Mineralwolle (GGM) e.V. provides assistance for the assessment of "old" mineral wool that is already in place.[2]

Mineral wool products manufactured in Germany since 1996 are deemed harmless. No additional precautions must be observed when handing these products beyond the minimum handling requirements.

There may still be a carcinogenic risk from products installed after 1996. In these cases, too, the risk can be disproved only by individual verification.

Since 1 June 2000 in Germany all new products regarded processed in Germany must be deemed harmless according to Appendix IV, No. 22 of the Ordinance on Hazardous Substances (Gefahrstoffverordnung).

2.5 Safe handling measures

The handling measures required are determined based on the assessment of the fibres: measures exceeding the minimum protective measures are required only in the case of fibres with carcinogenic risk.

The contractor or the contractor's agents must therefore determine how the fibres are to be assessed before taking up the work.

Besides this assessment, the nature and scope of operations are also significant in determining the protective measures to be taken. It is up to the contractor or the contractor's agents to ensure that the necessary measures are observed, depending on the hazard.

In practice there are primarily two possibilities:

Practical possibilities

Handling "new" mineral wool insulation
The products are described as "free of carcinogenic risk". In general, this applies only for contact with new products.

Handling "old" mineral wool
The products are categorised as potentially carcinogenic or no information is available concerning the assessment of the products. This is particularly applicable to products installed before 1996. In this case further checks should be made to see if the work in question can be categorised under Tables 1a and 1b of TRGS 521 (see Appendix I).

[2] Gütegemeinschaft Mineralwolle e.v. (GGM), Odenwaldring 68; 64380 Rossdorf; Email: info@mineralwolle.de, see also www.mineralwolle.de

3. Handling “new” mineral wool insulation

“New” mineral wool

Minimum protective measures to protect employees from dust must be taken even for glass and stone wool fibres considered harmless. Implementation of the minimum protection measures offers particular protection from respiratory problems and from skin itching effects caused by fibres.

Minimum-rotective measures

- Pre-fabricated mineral wool insulation is preferable. This can either be supplied by the manufacturer or be cut at a central point on-site.
- Only open packed insulation materials at the work site.
- Do not throw material.
- Do not use any high-speed motorised saws without an extraction system.
- Cut on a hard surface with blade or scissors; do not tear.
- Ensure good ventilation at the workplace. Avoid raising dust.
- Do not dry sweep any incidental dust and dust deposit or blow-clean with compressed air; remove with an industrial vacuum cleaner (Category M) or wet-clean.
- Keep the workplace clean and clean it regularly. Collect cut-offs and waste immediately and put into appropriate containers, e.g. bins or plastic bags.
- Wear loose-fitting work clothes that fully cover the body and protective gloves made of leather or nitrile-coated cotton.
- After completion of the work wash away any plaster dust with water.
- For activities involving dust formation outdoors, such as tipping procedures, work with your back to the wind and ensure that no employees stand in the path of the dust plume.

4. Handling “old” mineral wool insulation

“Old” mineral wool

Since 1 June 2000, “old” mineral wool insulation should no longer be in use. Because of the ban, contact with “old” mineral wool insulation is now possible – or permissible – only during dismantling, demolition, repair and restoration work.

The ban also means that dismantled “old” mineral wool insulation may in principle no longer be installed. Therefore, in this context, the term “installation” should be understood as merely, for example, “re-installation” in the course of inspection work.

If no information is available on the assessment of the fibres – this will in practice be the norm for work on/with installed products – they should be assumed to be assessed as “old” mineral wool, i.e. as carrying a cancer risk. This assessment of installed products does not imply a removal order.

However, for jobs where no information exists as to the extent of exposure to dust, the whole catalogue of measures of the Ordinance on Hazardous Substances for handling carcinogenic fibrous dust should be applied.

However, this does not seem appropriate for tasks which from experience only lead to a small amount of fibrous dust.

4.1 Exposure categories

TRGS 521 provides practical assistance regarding the range of protective measures on/with installed products. This technical regulation assists the employer in laying down protective measures. It contains a list of tasks for both the buildings sector and the technical sector that come under each of the exposure categories.

The TRGS 521 task list is given in **Appendix I** of these code of practice.

Exposure category E1
comprises tasks which, from experience, entail only low fibrous dust exposure, taking into account the protective measures described.

Exposure category E2
comprises tasks expected to entail a low to medium fibrous dust exposure, taking into account the protective measures and the type of task described.

Exposure category E3
All tasks not mentioned in the tables or for which the exposure category E2 restrictions are not observed are always covered by exposure category E3.

4.2 Threshold limit value for workplace air

There is at present no health-based workplace threshold limit value for categorised fibrous dust from mineral wool insulation.

Determining the extent of exposure makes it possible to assess whether best practice has been met for particular tasks using mineral wool products.

4.3 Measures for "old" mineral wool insulation

4.3.1 Catalogue of measures for exposure category 1

Exposure category E1

Minimum protection measures for handling fibrous dust *(as Chapter 3 Handling "new" wool)*

- Inclusion in the hazardous substances list of the company (that is, on a one-off, per-company basis and independent of construction site).
- Low dust processing and low dust cleaning.
- Removed material not to be thrown.
- Development of a standard operating instruction.
- Instruction of employees.
- Waste to be placed in dust-proof packaging at point of origin, preferably immediately, and to be labelled. Closed containers (e.g. tubs, tearproof bags, big bags) should be used for transport.

4.3.2 Catalogue of measures for exposure category 2

Exposure category E2

All exposure category 1 measures

- Selection of appropriate working methods.
- Technical measures for minimising fibrous dust.
- Industrial vacuum cleaners (at least dust class M) to be used for cleaning work.
- Regular servicing and maintenance of ventilation equipment.
- Restriction of the number of employees through organisational protection measures.
- Provision of personal protective equipment.
- Breathing protection
  – Half/quarter-face mask with P2 filter or
  – Half-face mask with filtering face piece FFP2 or
  – Filter device with blower TM 1P.
- Protective gloves made of leather or nitrile-coated cotton.
- Safety goggles.
- Breathable protective clothing Type 5.
- Definition and signing of work areas.
- Sheet coverings where adequate cleaning is impossible.
- Dust-proof packaging.
- Smoking/tobacco ban in the workplace.
- Provision of washing facilities.
- Cleaning or disposal of clothing.
- Supply of work-related medical examination.

4.3.3 Catalogue of measures for exposure category 3

Exposure category E3

All exposure category 2 measures

- Occupational restrictions for young people.
- Personal protective equipment shall be worn.
- Occupational medical precautions (G 26 – breathing apparatus).
- Cleaning or disposal of protective clothing.
- Separate changing rooms for street and work clothes, washroom with showers (decontamination unit).

5. Waste disposal

Disposal To determine the correct means of disposal, mineral fibre waste must be categorised according to type of waste under the European Waste Catalogue (EWC). Under the national Waste Catalogue Ordinance (Abfallverzeichnisverordnung, or AVV), waste from "old" mineral wool has the waste code number 170603*.
(The * represents hazardous waste.)

State-specific regulations on disposal apply in individual German federal states. The local authorities responsible for disposal must therefore be consulted to determining the correct categorisation for disposal of waste.

Appendix:

I. List of tasks by exposure category

(Tables 1a and 1b of TRGS 521)

II. Standard Operating Procedure (example)

Handling installed mineral wool (potentially carcinogenic fibrous dust)

*(The * represents hazardous waste.)

Appendix I

For tasks not mentioned in Tables 1a and 1b, exposure category 3 measures apply.

Table 1a

Tasks – Buildings sector		***Exposure categories***
1.	***Work on exterior walls, sloping roofs or flat roofs***	
1.1	Removal of cladding, insulating panels, roof coverings or flat roof sealing with exposure of insulation materials	
1.1.1	– without removal of the insulation material	S1
1.1.2	– with removal/installation of insulation material (for work on exterior walls without workplace enclosure with airtight sheeting/tarpaulin (such as scaffold cladding with plastic sheeting))	S2
1.1.3	– with removal/installation 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. domed rooflights), outlet vents, aerial masts etc.	S1
2.	***Work on composite thermal insulation systems or similar systems with exposure of insulation materials***	
2.1	– with removal/installation of insulation material (without workplace enclosure with airtight sheeting, for example through rack lining with plastic sheeting)	S1
2.2	– with removal/installation of less than 20 m^2 of insulation material	S2
3	***Work on interior walls (partition walls, facing sheets)***	
3.1	– without dismantling of the insulation material	S1
3.2	– with removal/installation of insulation material	S2
3.3	– with removal/installation of less than 3 m^2 of the insulation material, e.g. for installation of counters, doors, sockets, lights etc.	S1
4	***Work on ceiling cladding and suspended ceilings***	
4.1	Opening up of individual ceiling sections for maintenance and inspection work	
4.1.1	– Removal/installation of removable insulation components with inlaid insulation panels	S1
4.1.2	– Removal/installation of concealed or laminated insulation panels mounted on the floor underside or shrink-wrapped	S1
4.1.3	– with removal/installation of fitted and inlaid unprotected insulation panels or mats	S2
4.1.4	– Removal/installation of fitted and inlaid unprotected insulation slabs of less than 3 m^2	S1
4.2	Work in ceiling voids, for example laying of cables, lines and pipes	
4.2.1	– for ceilings with fitted protected insulation materials (lamination/covering)	S1
4.2.2	– for ceilings with fitted unprotected insulation materials and work in ceiling voids	S2
5	***Work on floating floors***	
5.1	– without removal of the insulation material	S1
5.2	– with removal/installation of insulation material	S2
5.3	– with removal/installation of less than 3 m^2 of insulation material	S1

For tasks not mentioned in Tables 1a and 1b, exposure category 3 measures apply.

Table 1b

Tasks - Technical insulation sector		***Exposure categories***
1.	***Removal/installation of jackets or moulds such as sheet metal casings without removal of the insulation material***	
1.1	– with non-thermally stressed equipment or components	S1
1.2	– with thermally stressed equipment or components	S2
2.	***Removal/installation of insulating mouldings, detachable insulation or insulation with jackets, such as*** – of lids or hoods – of casings or inspection shafts – of mouldings made from coated glass cloth e.g. on valves, sliders, expansion bellows and other fittings	
2.1	– with non-thermally stressed equipment or components	S1
2.2	– with thermally stressed equipment or components	S2
3	***Dismounting/assembly of acoustic elements (sound jackets, coulisses, enclosures) with intermediate layers of mineral wool insulation and an internal cover of fibre glass fleece, perforated metal plate or similar***	S1
4	***Removal/installation of insulation materials on e.g. pipes, air ducts, tanks***	
4.1	**with thermally stressed equipment or components**	
4.1.1	– in well-ventilated spaces or outside, removal/installation of less than 20 m^2 of insulation material	S2
4.1.2	– in well-ventilated spaces or outside, removal/installation of less than 1 m^2 of insulation material	S1
4.1.3	– in cramped and badly-ventilated spaces, removal/installation of less than 1 m^2 of insulation material	S2
4.2	**with non-thermal bonded equipment or system parts**	
4.2.1	– in well-ventilated spaces or outside	S2
4.2.2	– outside, removal/installation of less than 20 m^2 of insulation material	S1
4.2.3	– in well-ventilated spaces, removal/installation of less than 3 m^2 of insulation material	S1
4.2.4	– in cramped and badly-ventilated spaces, removal/installation of less than 3 m^2 of insulation material	S2
4.2.5	– in cramped and badly-ventilated spaces, removal/installation of less than 1 m^2 of insulation material	S1

Appendix II

This draft has to be completed with details due to work place and work activity.

Standard Operating Instruction No.: According to §14 GefStoffV (Ordinance on Hazardous Substances)	Company:

Construction site/Task: Date:

Handling installed mineral wool insulation
(potentially carcinogenic fibrous dust)

Hazards for people and environment

Mineral wool insulation of this product group can release thin fibres which are potentially carcinogenic in the lungs. Fibres can end up in the body through inhalation and can lead to damage to health. Larger fibres and fibre fragments can have a mechanical impact (itching) on the skin, in the upper respiratory tract and in the eyes.

Protective measures and rules of conduct

Work only where there is a supply of fresh air (open windows and doors), but no draft. Keep workplace clean; clean it regularly (e.g. with a damp mop). Use low-dust working procedures and equipment. In the rooms involved, vacuum or wet clean instead of dry sweeping (vacuum cleaner: at least category M). Do not clean with compressed air. Separate work areas in which fibrous dust may be discharged from other work areas and sign: "No access for unauthorised personnel". Do not throw material.

Avoid contact with eyes and skin. After finishing work wash dust away with water and change clothing. Wash exposed areas of skin thoroughly with soap; if necessary use skincare products.

Store street clothes separately from working clothes. Observe any occupational restrictions.

Eye protection: For overhead work and heavier dust formation wear protective goggles with side protection.

Hand protection: Wear protective gloves made from leather or nitrile-coated cotton.

Breathing protection: For minor handling activities (exposure categories E1/E2) the use of a half/quarter-face masks with P2 filter (white) and filtering face piece FFP2 is recommended.

For extensive and dust-heavy activities (e.g. exposure category 3) it is compulsory to use breathing protection.

Body protection: breathable disposable or reusable dust protective suit (Type 5).

Procedure in case of danger

Inform the supervisor immediately about faults on any equipment used for dust detection and removal. Product is not flammable.

Telephone number in case of accident:

First aid

First-aider:

After contact with eyes: In case of eye irritation do not rub, but clean with plenty of water; if necessary consult a doctor.

Correct disposal

Collect waste immediately at point of origin in an appropriate container such as a plastic bag. Teep dust formation as low as possible in so doing. Try not to let contained air squeeze back out when sealing. Label containers or packed material with information about the type of waste and with the notice 'Contents can release potentially carcinogenic fibrous dust'.

Employer's signature

Literature

Technical regulations for dangerous substances: (in the updated version)

TRGS 402	Determination and assessment of concentrations of hazardous materials in the air in work areas
TRGS 500	Protective measures
TRGS 521	Demolition, restoration and repair/ maintenance work with old mineral wool
TRGS 555	Standard Operating Instruction and information for employees

Regulations and guidelines:

GefStoffV	Ordinance on protection against hazardous substances (Ordinance on Hazardous Substances).
ChemVerbotsV	Ordinance on prohibitions and restrictions for the sale of hazardous substances, preparations and products according to the Chemicals Act. (Chemicals Prohibition Regulation)
BGI 505-31	Procedure for the determination of respirable fibres - optical microscopy method - *(formerly ZH 1/120.31)*
BGI 505-46	Procedure for the separate determination of respirable asbestos fibres and other inorganic fibres – scanning electron microscopy method – *(formerly ZH 1/120.46)*

Other:

AGI Q 132	Mineral wool
DIN 18165	Fibre insulation material for the building industry, Part 1
VDI 3469	Emission reduction; fibrous dust, Sheet 1 and 10

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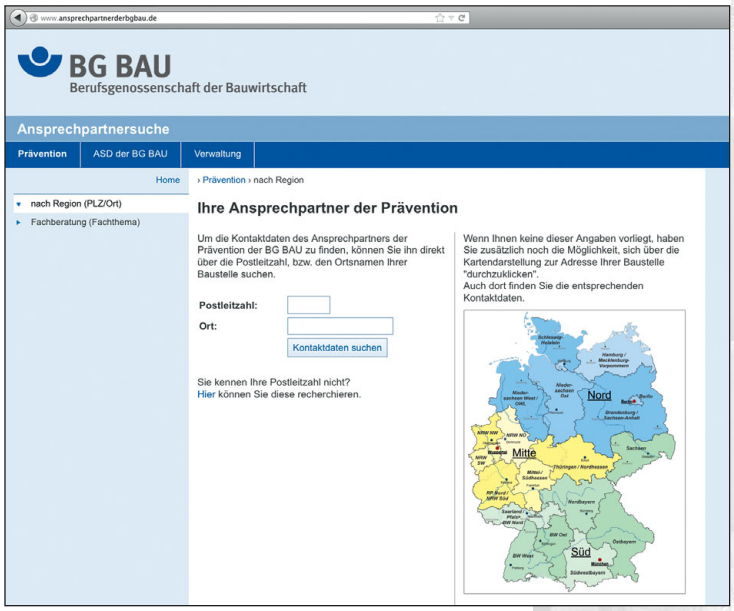

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