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## **Hazard identification recommendations from accident insurers (EGU) as per the Ordinance on Hazardous Substances**

Use of Cold-Welding Products for  
PVC-Floor Coverings

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# Preface

These hazard identification recommendations from accident insurers (EGU) as per the Ordinance on Hazardous Substances (GefStoffV) have been prepared by the applicant organisation in cooperation with

- the statutory accident insurance institutions and the
- Institute for Occupational Safety and Health of the German Statutory Accident Insurance together with the
- Federal Institute for Occupational Safety and Health and other measuring bodies, e.g., the federal states where relevant.

These EGU recommendations are reviewed every five years by the “EGU” project group for the “Hazardous substances” subject area. Should changes be necessary (this relates to revision or withdrawal of a recommendation), these will be published.

They are published by the “Hazardous substances” subject area in the specialised field of “Raw materials and chemical industry” of the German Statutory Accident Insurance (DGUV)” and included in the set of rules to be ordered under DGUV Information 213-701 et seq. This information is also disseminated online as well as within the various sectors by the individual accident insurers.

These recommendations were drawn up for the first time in February 2008 by the German trade association of the building industry (BG Bau), Berlin, and the company Werner Müller, Frankenthal. They were revised in 2019 and replace the “BG- Information BG/BGIA-Empfehlungen für die Gefährdungsbeurteilung nach der Gefahrstoffverordnung – Einsatz von Kaltschweißmitteln für PVC-Bodenbeläge” (Trade Association Information: Trade Association/Trade Association Institute for Occupational Health and Safety Recommendations for Risk Assessments as per the Ordinance on Hazardous Substances – Use of Cold-Welding Products for PVC-Floor Coverings”) from 2008.

## 1. General

Measures from the German Occupational Safety and Health Act (ArbSchG) [1] and 7th Social Code (SGB VII) [2] to prevent work-related health hazards are specified in the Ordinance on Hazardous Substances (GefStoffV) [3] and the associated technical rules and also explained through rules, regulations and information from the German Statutory Accident Insurance (DGUV).

The procedures, activities and protective measures described in the hazard identification recommendations from accident insurers as per the Ordinance on Hazardous Substances are directed primarily at the latter ordinance. Other hazards which could result from the workplace and the use of work equipment are to be considered separately in a risk assessment, e.g., as per the Ordinance on Workplaces (ArbStättV) [4] and the ordinance on industrial safety and health when using work equipment (BetrSichV) [5]. Within the scope of the risk assessment, occupational health precautions must be agreed with the respective doctor in accordance with the Ordinance on Occupational Health Precautions (ArbMedVV) [6].

The Ordinance on Hazardous Substances stipulates that the type and extent of exposure of employees be determined and assessed. This can be achieved via workplace measurements or equivalent non-measurement investigation procedures. The EGU recommendations in line with the Ordinance on Hazardous Substances are an aid for hazard assessment as they can be used for existing and derived protective measures as well as for checking their effectiveness as per the technical rules for hazardous substances 400 - Risk assessment for activities involving hazardous substances (TRGS 400) [7].

Moreover, these recommendations can be used as a non-metrological method for providing information and carrying out the exposure assessment as per the technical rules for hazardous substance 402 - Determination and assessment of concentrations of hazardous substances in the air in working areas (TRGS 402) [8]. As such, companies can considerably reduce their own investigative/measurement work. This is of particular relevance for metrological investigations as in individual cases these may no longer be necessary.

## 2. Scope and Instructions

These EGU recommendations provide operations with practical instructions on how to ensure compliance with occupational exposure limits and other assessment standards as well as other means of ensuring that the state of the art has been achieved.

If the conditions set out and the protective measures are observed, it can be assumed that the minimisation rule as per Section 7 of the Ordinance on Hazardous Substances is satisfied for the hazardous substances named here.

When following these EGU recommendations for cold welding to create a waterproof seam sealing on PVC flooring, the following prerequisites must be fulfilled:

- Use of a PVC-Cold-Welding Product with a maximum tetrahydrofuran (THF) content of 90% (e.g., Werner Müller GmbH, PVC-Cold-Welding Liquid Type A, PVC-Cold-Welding Paste Type C and T).

These Cold-Welding Products come in tubes of up to 150 g and cans of up to 1 l. The Cold-Welding Products in cans must be filled into small plastic bottles (250 ml) for working.

Criteria for the direct application of protective measures are set out for the tasks described in order to forgo metrological monitoring of the THF concentration at workplaces. In addition to the inhalation hazards, the dermal hazards are also taken into consideration. Physico-chemical hazards do not occur when THF-based PVC-Cold-Welding Products are used as intended. If the individual hazard assessment concludes that fire and explosion risks cannot be ruled out, further protective measures as per Section 11 Ordinance on Hazardous Substances must be taken.

When applying these EGU recommendations, the other requirements of the Ordinance on Hazardous Substances, and in particular the provision of information and the obligation to carry out substitution checks and to respect the hierarchy of protective measures continue to apply.

In the case of changes in the work area or changes in procedures, the user of these recommendations must check the up-to-dateness of these EGU recommendations and document the result immediately and otherwise once a year.

These checks are carried out within the scope of the risk assessment as per Section 6 Ordinance on Hazardous Substances.

## 3. Definitions

Terms are used as per the glossary of terms for the regulations of the Ordinance on Industrial Safety and Health (BetrSichV), the Ordinance on Biological Substances (BioStoffV) and the Ordinance on Hazardous Substances (GefStoffV) [9];

### 3.1. Cold-Welding

The welding of PVC using a Cold-Welding Product is a physical process which is often also referred to as solvent welding. Here the adjacent flooring edges are solvated by the solvent contained in the Cold-Welding Product. The now mobile PVC molecules become “entangled” to create a permanent and secure connection once the solvent has evaporated.



## 4. Working Methods and Activities

PVC flooring is normally sealed watertight at the seams. To this end, the seal is prepared with professional seam cut (closely cut seam) and the edges of the flooring are covered with adhesive tape. The adhesive tape is then cut and, in the case of hard PVC flooring, the seam area is also heated up slightly using a blow dryer or iron. The adhesive is then applied to the joint from the tube or small plastic bottle. This is done by pressing the needle, or a part of the nozzle in the case of T-nozzles, deep into the seam and guiding it along the joint so that a closed liquid film around 5 – 6 mm in width is left on the adhesive tape.

After approximately 10 minutes, the adhesive tape can be pulled off, taking the excess adhesive with it.

About 2 to 5 g of Cold-Welding Product are required per metre for a closely cut seam. If there are joints between the flooring sheets (type C) and if flooring with a greater overall thickness is used, consumption can increase up to 20 g/m. Since the adhesive is applied by pressing on the tube or bottle and the relatively small containers have to be guided safely, the time for applying the adhesive is limited for ergonomic reasons.






## 5. Hazard Identification and Assessment

### 5.1. Dangerous substances

Werner Müller PVC Cold-Welding Liquid Type A and PVC Cold-Welding Paste Type C and T contain tetrahydrofuran (THF), polyvinyl chloride (PVC) and matting agent (amorphous silica). THF has the CAS no.: 109-99-9 and the EC no.: 203-726-8.

As per the Regulation (EU) 1272/2008 on the classification and labelling of chemicals (CLP Regulation), THF is classed as a hazardous substance [10]. In addition, THF is to be labelled with the signal word “Danger”.

**Table 1:** Classification and labelling of THF as per the CLP Regulation\*

Hazard class	Hazard category	Labelling	H-statement
Carcinogenicity	Cat. 2		H351
Eye irritation	Cat. 2		H319
Specific target organ toxicity — single exposure	Cat. 3		H335
Acute toxicity, ingestion	Cat. 4		H302
Flammable liquid	Cat. 2		H225 EUH019

\* Minimum classification or manufacturer information

Source: [www.dguv.de/ifa/gestis/gestis-stoffdatenbank/index.jsp](http://www.dguv.de/ifa/gestis/gestis-stoffdatenbank/index.jsp)

<b>H225</b>	Highly flammable liquid and vapour.
<b>H302</b>	Harmful if swallowed.
<b>H319</b>	Causes serious eye irritation.
<b>H335</b>	May cause respiratory irritation.
<b>H351</b>	Suspected of causing cancer.
<b>EUH019</b>	May form explosive peroxides.

In accordance with TRGS 900 [11] the following occupational exposure limit (AGW) applies for THF:

- AGW = 150 mg/m<sup>3</sup> (50 ml/m<sup>3</sup>)
- Short-term value (KZW): 300 mg/m<sup>3</sup>
- Peak limit: Short-term value category 2 (I)
- Exceedance factor 2, duration 15 min, 4 times per shift, interval 1 h.
- Comment H: Absorbed by skin
- Comment Y: A risk of foetal distress need not be feared if the AGW and the biological limit value (BGW) are observed.

The MAK (Maximum Concentrations at the Workplace) Commission has classified THF in the carcinogenic category 4 [12]. This means that if the MAK value is observed (corresponds to the AGW), no contribution to the risk of cancer in humans is to be expected.

The biological limit value is 2 mg THF per l urine (TRGS 903) [13].

**5.2. Exposure to hazardous substances**

The measurement results on which the evaluations are based were collected between 1998 and 2016. Cold-Welding Product consumption was between 2 and 19 g/m.

The concentrations of THF in the breathing air when cold-welding joints with Werner Müller

Cold-Welding Liquid Type A and Cold-Welding Paste Type C and T were determined (see Table 2 and Figure 1). For the most part, the measurements were taken over 1 or 2 hours. This work is not normally performed over the entire shift. The measurements were nevertheless taken as shift averages since, in individual cases, cold welding may be carried out over the entire shift.

**Table 2:** Overview of THF measured values for PVC-Cold-Welding (mg/m<sup>3</sup>)

Measured values	Minimum value	50 percentile	95 percentile	Maximum value
46	2.0	49.0	134.0	213.0

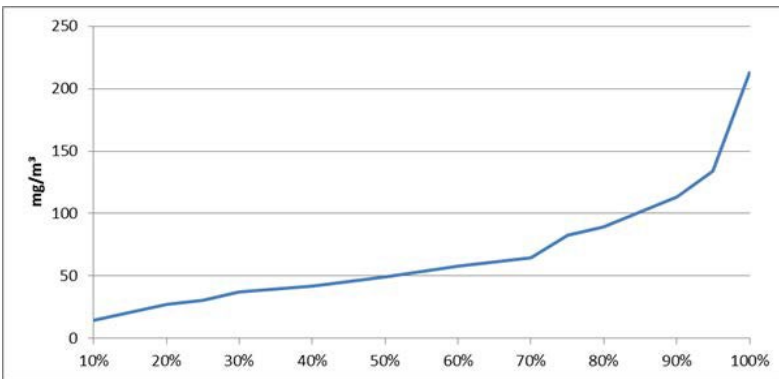


Fig. 1: Overview of the calculated THF measured values for PVC-Cold-Welding (mg/m<sup>3</sup>)

### **5.3. Assessment of the hazardous substance exposure**

Of the 46 values measured at the workplace, one was above the occupational exposure limit for THF, all the other measured results were mostly below half of the occupational exposure limit.

Accompanying measurements with a photoionisation detector which displays the results directly, have shown that the short-term value is observed at all times.

Biomonitoring was also performed with three measurements. No THF was detected in urine in any of the cases.

For the risk assessment, the 95% value of 134 mg/m<sup>3</sup> is used. Overall, the measurements confirm that the occupational exposure limit for THF is observed when using Werner Müller PVC-Cold-Welding Products. If the specifications given in these recommendations are observed, no further exposure measurements are necessary.

## 6. Protective measures and effectiveness review

Respiratory protection is not required when used properly. Consequently, good ventilation and aeration of the working room must be ensured, especially in the floor area. Vapour-air mixtures of THF are heavier than air. If the Cold-Welding Product has to be refilled, only suitable and labelled containers may be used.

Avoid all contact with the skin. Safety gloves made of nitrile must be worn when refilling Cold-Welding Products to protect against possible splashes.

The employer must check effectiveness as per TRGS 500 and, if necessary, get expert advice [14].

Moreover, given the minimal risk when cold-welding to produce watertight seams in PVC flooring, no further requirements are made in terms of effectiveness checks.

# References

(Note by Translation: Only applying for Germany/Europe, might differ to other countries!)

The relevant rules, regulations and information which must be observed in particular are listed below. The latest versions of the cited health and safety regulations must be applied.

[1] Law on the implementation of measures to improve the safety and health of workers at work (Labour Protection Act – ArbSchG) version from 7th August 1996; dated October 2015. Available online at: [www.bmas.de/DE/Service/Gesetze/arbeitsschutzgesetz.html](http://www.bmas.de/DE/Service/Gesetze/arbeitsschutzgesetz.html)

[2] Seventh Book of the Social Code – Statutory accident insurance (SGB VII) version from 7th August 1996; dated July 2017. Available online at [www.bmas.de/DE/Service/Gesetze/sozialgesetzbuch-7-gesetzliche-unfallversicherung.html](http://www.bmas.de/DE/Service/Gesetze/sozialgesetzbuch-7-gesetzliche-unfallversicherung.html)

[3] Regulation on protection against hazardous substances (Ordinance on Hazardous Substances – GefStoffV) version from 26th November 2010; dated March 2017. Available online at [www.bmas.de/DE/Service/Gesetze/gefahrstoffverordnung.html](http://www.bmas.de/DE/Service/Gesetze/gefahrstoffverordnung.html)

[4] Ordinance on workplaces (Workplaces Ordinance – ArbStättV) version from 12th August 2004; dated November 2016. Available online at [www.bmas.de/DE/Service/Gesetze/arbeitsstaettenverordnung.html](http://www.bmas.de/DE/Service/Gesetze/arbeitsstaettenverordnung.html)

[5] Ordinance on safety and health protection in the provision of work equipment and its use at work, on safety in the operation of installations requiring inspection and on the organisation of occupational health and safety (Ordinance on Industrial Safety and Health – BetrSichV) version from 3rd February 2015; dated March 2017. Available online at [www.bmas.de/DE/Service/Gesetze/betriebsicherheitsverordnung.html](http://www.bmas.de/DE/Service/Gesetze/betriebsicherheitsverordnung.html)

[6] Ordinance on Occupational Health Precautions (ArbMedVV) version from 18th December; dated July 2019. Available online at [www.gesetze-im-internet.de/arbmedvv/BJNR276810008.html](http://www.gesetze-im-internet.de/arbmedvv/BJNR276810008.html)

- [7] Technical rules for hazardous substances: Risk assessment for activities involving hazardous substances (TRGS 400) version from: July 2017. Available online at: [www.baua.de/DE/Angebote/Rechtstexte-und-Technische-Regeln/Regelwerk/TRGS/TRGS-400.html](http://www.baua.de/DE/Angebote/Rechtstexte-und-Technische-Regeln/Regelwerk/TRGS/TRGS-400.html)
- [8] Technical rules for hazardous substances: Determination and assessment of the hazards involved in activities involving hazardous substances: Inhalation exposure (TRGS 402) version from: February 2010; last changed and amended: October 2016. Available online at: [www.baua.de/DE/Angebote/Rechtstexte-und-Technische-Regeln/Regelwerk/TRGS/TRGS-402.html](http://www.baua.de/DE/Angebote/Rechtstexte-und-Technische-Regeln/Regelwerk/TRGS/TRGS-402.html)
- [9] Glossary of terms for the regulations of the Ordinance on Industrial Safety and Health (BetrSichV), the Ordinance on Biological Substances (BioStoffV) and the Ordinance on Hazardous Substances (GefStoffV); version from April 2009 Available online at [www.baua.de/DE/Angebote/Rechtstexte-und-Technische-Regeln/Regelwerk/Glossar/Glossar\\_node.html](http://www.baua.de/DE/Angebote/Rechtstexte-und-Technische-Regeln/Regelwerk/Glossar/Glossar_node.html)
- [10] CLP Regulation (EU) No. 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures version from 2015.
- [11] Technical rules for hazardous substances: Occupational exposure limits (TRGS 900) version from 2006; last changed and amended: March 2020. Available online at: [www.baua.de/DE/Angebote/Rechtstexte-und-Technische-Regeln/Regelwerk/TRGS/TRGS-900.html](http://www.baua.de/DE/Angebote/Rechtstexte-und-Technische-Regeln/Regelwerk/TRGS/TRGS-900.html)
- [12] List of MAK and BAT (Biological Tolerance Values) values for 2019: Permanent Senate Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area. Report 55. Available online at: <https://onlinelibrary.wiley.com/doi/book/10.1002/9783527812110>
- [13] Technical rules for hazardous substances: Biological limit values (TRGS 903) version from: February 2013; last changed and amended: March 2020. Available online at: [www.baua.de/DE/Angebote/Rechtstexte-und-Technische-Regeln/Regelwerk/TRGS/TRGS-903.html](http://www.baua.de/DE/Angebote/Rechtstexte-und-Technische-Regeln/Regelwerk/TRGS/TRGS-903.html)
- [14] Technical rules for hazardous substances: Protective measures (TRGS 500) version from: September 2019. Available online at: [www.baua.de/DE/Angebote/Rechtstexte-und-Technische-Regeln/Regelwerk/TRGS/TRGS-500.html](http://www.baua.de/DE/Angebote/Rechtstexte-und-Technische-Regeln/Regelwerk/TRGS/TRGS-500.html)







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