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Guideline DWA-M 512-1E

Sealing Systems in Hydraulic Engineering
Part 1: Earthwork Structures

February 2012

Dichtungssysteme im Wasserbau – Teil 1: Erdbauwerke

HTG Hafentechnik Schifffahrt Logistik

DGGT
Deutsche Gesellschaft
für Geotechnik e. V.
German Geotechnical Society

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Joint Publication eloborated by
German Port Technology Association (HTG),
German Geotechnical Society (DGGT),
German Association for Water, Wastewater and Waste (DWA).

The German Association for Water, Wastewater and Waste (DWA) is strongly committed to the development of secure and sustainable water and waste management. As a politically and economically independent organisation it is professionally active in the field of water management, wastewater, waste and soil protection.

In Europe DWA is the association with the largest number of members within this field. Therefore it takes on a unique position in connection with professional competence regarding standardisation, professional training and information. The approximately 14,000 members represent specialists and executives from municipalities, universities, engineering offices, authorities and companies.

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Foreword

Based on a survey carried out among the professional panels of the technical/scientific associations concerned

- Deutsche Vereinigung für Wasserwirtschaft, Abwasser and Abfall e.V. (DWA)
- Deutsche Gesellschaft für Geotechnik e.V. (DGGT)
- Hafentechnische Gesellschaft e.V. (HTG)

and in the light of the technological advances and new product developments that have been taking place in the construction industry, it was found necessary to revise urgently the following DVWK Guidelines:

- No. 215/1990: Dichtungselemente im Wasserbau (Sealing Elements in Hydraulic Engineering)
- No. 221/1992: Anwendung von Geotextilien im Wasserbau (Application of Geotextiles in Hydraulic Engineering)
- No. 223/1992: Asphaltdichtungen für Talsperren und Speicherbecken (asphalt sealing systems for dams and reservoirs)
- No. 225/1992: Anwendung von Kunststoffdichtungen im Wasserbau und für den Grundwasserschutz (application of geomembranes in hydraulic engineering and groundwater protection)
- No. 237/1996: Deponieabdichtungen in Asphaltbauweisen (application of asphalt sealing systems in landfill sealing).

In response thereto, the DWA-technical committee/working group 'Dichtungssysteme im Wasserbau' (sealing systems in hydraulic engineering) was established in July 2002, to act as Working Group WW-7 within the DWA under joint chairmanship with the DGGT Working Group DWA-AK 5.4, working in parallel and in conjunction with the various competent committees of the HTG. This approach was chosen to take into account the partly overlapping fields of activities of DWA, DGGT, and HTG. The new technical committee started work immediately with two DWA working groups:

- DWA-Arbeitsgruppe WW-7.1 "Internal / subsoil sealing systems" (Chair: Dr.-Ing. Frank Kleist)
- DWA-Arbeitsgruppe WW-7.2 "Surface sealing systems" (Chair: Dipl.-Ing. Petra Fleischer)

Both working groups dealt with sealing systems in earthwork structures. The results are summarised in this Guideline DWA-M 512-1 'Sealing Systems in Hydraulic Engineering – Part 1: Earthwork Structures'. This covers surface- and internal-sealing systems for earthwork structures in hydraulic engineering as they are applied in practice. There is no need to revise the section of the Guideline DVWK 225/1992 ('Anwendungen von Kunststoffdichtungsbahnen im Wasserbau und für den Grundwasserschutz') which deals with groundwater protection and landfill capping systems, since new Guidelines have been published in the meantime.

Sealing systems on solid structures are treated in DWA Working Group WW-7.4 (Chair: Dipl.-Ing. Sabine Mayer). The results of this Working Group have been published in the Guideline DWA-M 512-2 "Dichtungssysteme im Wasserbau" ("Sealing Systems in Hydraulic Engineering – Part 2: Concrete (solid) Structures") (Draft June 2015).

DWA Working Group WW-7.3 (Chair: Dr.-Ing. Dirk Heyer) – set up in response to the catastrophic floods of 2002 – completed its work with the publication of the DWA-Topics 'Dichtungssysteme in Deichen (Sealing Systems in Dikes) in 2005.

Convenors and chairpersons would like to thank all members of DWA-Working Group WW-7 for their commitment and voluntary work, in particular Dipl.-Ing. Christian Schmutterer for his editorial and organisational support of the expert committee's work, and they are pleased to present the new Guideline to the specialist community. The financial support of the HTG has made it possible to rapidly complete the considerable number of illustrations and figures.

Dresden/Espelkamp, January 2012

Prof. Dr.-Ing. H.-B. Horlacher
(Chairman for DWA)

Prof. Dr.-Ing. G. Heerten
(Chairman for DGGT/HTG)

Previous editions

DVWK-M 215/1990

DVWK-M 225/1992

Authored by

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Contents

List of Figures

List of Tables

User Notes

This Guideline has been produced by a group of technical, scientific and economic experts, working in an honorary capacity and applying the rules and procedures of the DWA and the Standard DWA-A 400. Based on judicial precedent, there exists an actual presumption that this document is textually and technically correct.

Any party is free to make use of this Guideline. However, the application of its contents may also be made an obligation under the terms of legal or administrative regulations, or of a contract, or for some other legal reason.

This Guideline is an important, but not the sole, source of information for solutions to technical problems. Applying information given here does not relieve the user of responsibility for his own actions or for correctly applying this information in specific cases. This holds true in particular when it comes to respecting the margins laid down in this Guideline.

1 Scope

This Guideline deals exclusively with sealing systems designed for application in hydraulic engineering. It is directed towards those specialists of engineering offices, construction firms and water-management authorities responsible for the design, construction and maintenance of hydraulic engineering plant and structures, or their components.

It covers surface- and internal-sealing systems for soil structures in hydraulic engineering as they are applied in practice. Described are surface and internal sealing systems used in earthwork structures, including asphalt and concrete sealing systems, geosynthetic clay liners, mineral sealings, geomembranes, fully grouted riprap, sheet pile walls and internal sealing systems made of hydraulically bound sealing-wall materials (concrete, plastic concrete, injections, jet grouting, diaphragm walls, thin slurry diaphragm walls, soil-grouting processes).

For each of these sealing systems, a summary is given of possible applications, construction materials, methods of placement, design principles, quality assurance and maintenance requirements, and reference is made to the latest developments and their applications. Surface-sealing systems for concrete structures are covered separately in Part 2 of the Guideline.

The recommendations given can be used as a basis for the pre-design and initial planning of a sealing system. For subsequent design, the relevant regulations must be consulted.

2 Normative References

On account of the number of sealing systems covered here, reference is made to a large number of regulations. The relevant regulations are referred to in the individual sections, and these regulations are listed in Appendix A.

3 Abbreviations and Symbols

3.1 Abbreviations

1	Explanation
AG	Client
AN	Contractor
BAM	Bundesanstalt für Materialforschung und -prüfung (Federal Institute for Materials Testing and Research)
BAW	Bundesanstalt für Wasserbau (Federal Waterways Engineering and Research Institute)
CE	Communauté Européenne; CE Conformity Marking. Products bearing the CE logo conform with all health, safety and environmental-protection requirements set up by EU Law. This means any product with this marking can be sold and used throughout all EU countries.
CEN	Comité Européen de Normalisation, European Committee for Standardisation