German DWA
Set of Rules

Advisory Guideline DWA-M 507-1E

Levees Built Along Watercourses
Part 1: Planning, Construction and Operation

December 2011

Deiche an Fließgewässern – Teil 1: Planung, Bau und Betrieb

DWA Set of Rules
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Deutsche Gesellschaft
für Geotechnik e. V.
German Geotechnical Society

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Advisory Guideline jointly elaborated by
Deutsche Gesellschaft für Geotechnik e. V. (DGGT),
Deutsches TalsperrenKomitee (DTK),
Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e. V.

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Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e. V.
Theodor-Heuss-Allee 17 · 53773 Hennef · Germany
Tel.: +49 2242 872-333 · Fax: +49 2242 872-100
E-Mail: info@dwa.de · Internet: www.dwa.de

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

In the light of the severe flood events that have occurred on several rivers in Germany over the last years, the DWA Expert Committee WW-4 “Talsperren und Flusssperren” (dams and river barrages) of the German Association for Water, Wastewater and Waste (DWA) decided to review and update the DVWK-Advisory Guideline 210 “Flussdeiche” (levees). Although Guideline DVWK-M 210 currently still serves – besides DIN-Standard 19712 – as technical rule for all approaches dealing with the different aspects of planning, design, construction and maintenance of levees, it was the panel’s task to consider and summarise the generally accepted rules of technology in this field.

The effort was geared at a holistic, coherent revision of this complex topic, taking also smaller levees into account. Hence, the leaflet’s application could not remain restricted to levees, and that is why a levee classification system has been introduced herein, categorised by height and inherent damage potential. The system may be of importance for a variety of aspects relating to engineering based dimensioning. Based on the currently applicable rules and standards, a geotechnical verification concept has been developed, under consideration of partial safety factors. Particular emphasis has been given to the required proof of internal erosion safety of both levee and subsoil. Given that also in future great efforts will have to be undertaken with respect to the refurbishment of existing levee systems, a separate chapter has been devoted to this aspect. Also contained herein are hints as to the issues of quality assurance, levee maintenance, levee monitoring as well as levee defence.

Advisory Guideline DVWK-M 210 “Flussdeiche” (levees) will be withdrawn upon publication of this white paper.

Authors

The Advisory Guideline was prepared by the DWA working group WW-4.3 (Deiche an Fließgewässern, levees along watercourses), within the DWA expert committee WW-4 "Talsperren und Flusssperren" (WW-4. "Dams and River Barrages); the latter is a common expert panel that includes the Deutsche Gesellschaft für Geotechnik (German geotechnical society) (DGGT) and the Deutsches TalsperrenKomitee (German Dam and Reservoir Committee (DTK)).

The DWA working group WW-4.3 ('levees along watercourses) has the following members:

BIEBERSTEIN, Andreas	Dr.-Ing., Karlsruher Institut für Technologie (KIT), Institut für Bodenmechanik und Felsmechanik, Karlsruhe (Sprecher)
BIELITZ, Eckehard	Dipl.-Ing., Landestalsperrenverwaltung des Freistaates Sachsen, Pirna
BUSCHHÜTER, Erik	MR Dipl.-Ing., Ministerium für Klimaschutz, Umwelt, Landwirtschaft, Natur- und Verbraucherschutz des Landes Nordrhein-Westfalen, Düsseldorf, vormals Staatliches Umweltamt Krefeld, Krefeld
HASELSTEINER, Ronald	Dr.-Ing., Enerjisa, Ankara, Türkei, vormals Technische Universität München, Lehrstuhl für Wasserbau und Wasserwirtschaft, München
KAST, Karl	Dr.-Ing., Dr.-Ing. Karl Kast + Partner Ingenieurgemeinschaft für Umwelt- und Geotechnik, Ettlingen
POHL, Reinhard	apl. Prof. Dr.-Ing. habil., Technische Universität Dresden, Institut für Wasserbau und Technische Hydromechanik, Dresden

As guest:

SCHOLZ, Rosemarie	Dr.-Ing., Planungsgesellschaft Scholz + Lewis mbH, Dresden

Project organiser at the DWA Head Office:

SCHRENK, Georg	Dipl.-Geogr., Hennef Department Water and Waste Management

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Karlsruhe, September 2011 Andreas Bieberstein

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User Notes

This Advisory 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 Advisory 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 Advisory 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 Advisory Guideline.

Introduction

Along the course of every water stream there are areas susceptible to inundation, such as natural flood plains, into which flood water can extend. Without adequate protection measures, such flood events would cause severe damages in particular in densely populated regions.

To minimise the harmful effects of flooding, it is required to:

- keep such areas clear, in as far as possible, from uses sensitive to flooding;
- reduce flood run-offs by upstream retention and/or to
- take protection measures in flood-prone zones.

From a water management point of view, it is particularly advantageous to promote flood retention by decelerating the run-off in the area concerned, by water percolation, by flood polders (flood plains), by flood retention basins as well as by dams and reservoirs. Locally, flood ways or flood diversion channels can be used to prevent a larger proportion of flood waters from entering the endangered zones. However, these measures cannot ensure that flood waters are one hundred per cent retained and/or diverted everywhere, without causing any damage.

One of the oldest methods in flood protection is the construction of levees, the protective effect of which is adapted to the polder´s vulnerability to flood hazards. For economic reasons it is generally not possible to dimension such levees so as to provide maximum protection against the highest possible flood risks. Also, the desired level of safety can be affected by other public interests such as, above all, concerns with regard to urban development, to potential impacts on landscape and alluvial ecosystems, and also to social aspects.

Given that levees, like other hydraulic flood protection structures, typically cut off a part of the natural flood zones from the watercourses, they can possibly also give rise to negative effects.

1 Scope

This Advisory Guideline applies to levees built along watercourses (e.g. river levees), without tidal influence and sea polders. It does not cover by-pass flood retention basins built according to DIN 19700-12, weirs according to DIN 19700-13, and sea levees.

The recommendations given in this Advisory Guideline – in particular those referring to questions associated with subsoil erosion, routing of pipelines and vegetation covers – can be applied correspondingly to flood retaining walls and mobile flood protection facilities (BWK-M6) as well as to combinations thereof, in due consideration of the specific requirements placed on these structures.