Bundesministerium
für Digitales
und Verkehr

ZTV-W

Additional technical terms of contract – hydraulic engineering

for

concrete and reinforced concrete hydraulic structures Performance category 215

May 2025 edition

EU Notification No XXX

NB:

Notified in accordance with Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services (OJ L 241, 17/9/2015, p. 1).

215

Bundesanstalt für Wasserbau
Kompetenz für die Wasserstraßen

Bundesministerium
für Verkehr, Bau
und Stadtentwicklung

05/2025

ZTV-W

Additional technical terms of contract – hydraulic engineering

Published by the Federal Ministry for Digital and Transport (BMDV), Department of Waterways and Shipping.

Production and distribution by the Federal Institute for Hydraulic Engineering (BAW).

Set up by working groups of the working group ‘Standard performance descriptions in hydraulic engineering’ with the significant participation of experts from the Federal Waterways and Shipping Administration, as well as the Federal Institute for Hydraulic Engineering, the Federal Institute for Water Science, representatives of state ministries and their subordinate departments for inland and seaports, water management, coastal protection, environmental protection, engineering offices and specialist planners of hydraulic engineering, drainage cooperatives, dam and water associations as well as material testing institutes.

Karlsruhe · May 2025

Table of Contents

List of Tables

List of Figures

List of Annexes

Preliminary remark

This ZTV-W is structured in a similar way to the relevant parts and, where applicable, sections of the relevant reference standards (see Figure 1). The numbering and section numbers in the relevant parts of the ZTV-W LB 215 refer to sections in the relevant parts of the concrete standards.

Goods lawfully marketed in another Member State of the European Union or in Turkey, or originating and lawfully marketed in an EFTA State that is a contracting party to the Agreement on the European Economic Area, are deemed to be compatible with this measure. The application of this measure is subject to Regulation (EC) No 764/2008 of the European Parliament and of the Council of 9 July 2008 laying down procedures relating to the application of certain national technical rules to products lawfully marketed in another Member State and repealing Decision No 3052/95/EC (OJ L 218, 13.8.2008, p. 21).

The terms ‘coordination’ or ‘to coordinate’ are used to denote existing cooperation rights in accordance with the first sentence of § 4(1)(2) VOB/B in conjunction with §§ 311 and 241(2) of the German Civil Code.

The contractor shall ensure that the monitoring and access rights granted to the customer pursuant to § 4 (1) (2) VOB/B also extend to workstations, workshops and storage areas of the subcontractors and to manufacturing and/or supply plants.

Scope of the ZTV-W LB 215

(1) The additional technical terms of contract – hydraulic engineering (ZTV-W) for concrete and reinforced concrete hydraulic structures (performance category 215), citation format ZTV-W LB 215, apply to the construction of solid hydraulic structures, e.g. locks, weirs, barrages, pumping stations, inverted siphons, culverts, fish ladders, harbour structures, quay walls, including their ancillary facilities, unless agreed upon otherwise.

(2) For the construction of the reinforced concrete structures mentioned under (1) in seawater and coastal areas, as well as in estuaries, the BAW-MBM also applies in exposure classes XS2 and XS3.

(3) They do not apply to road bridges, railway bridges and tunnels (cf. ZTV-ING). They do not apply to special civil engineering components such as bored piles, diaphragm walls, micropiles. They do not apply to underwater concrete.

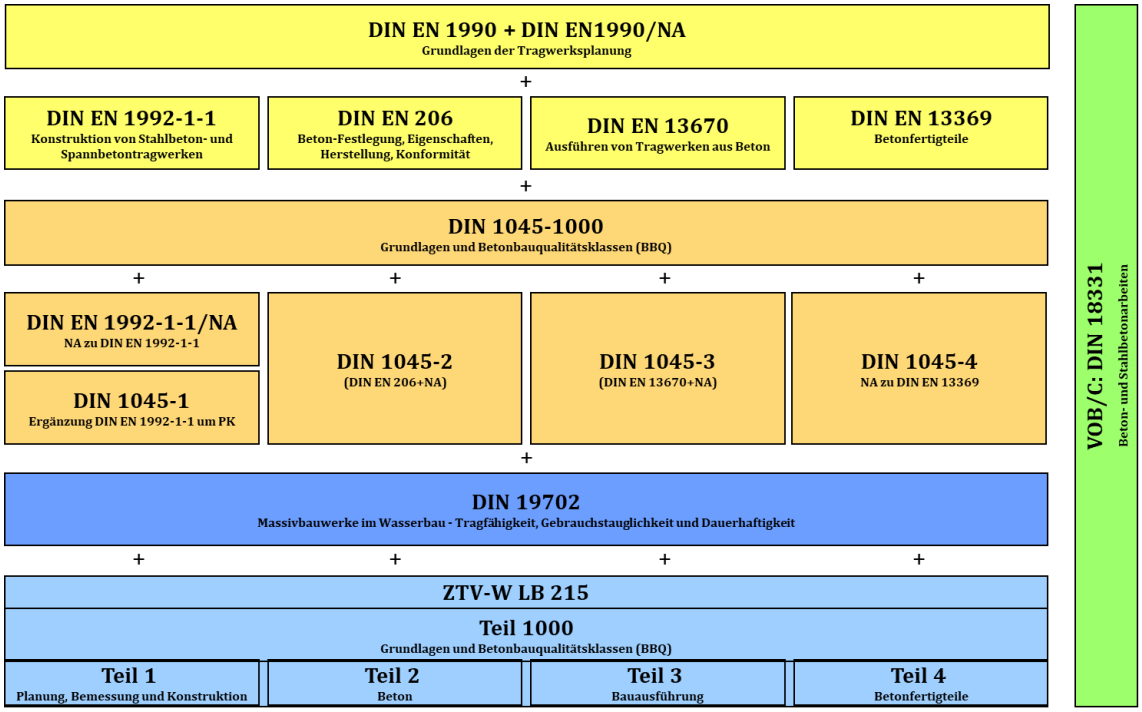
(4) The regulations for facing formwork in accordance with ZTV-W LB 219 must be observed for construction methods in connection with facing formwork**.**

(5) ZTV-W LB 215 shall apply in conjunction with:
the basic standards:
- DIN EN 1990 and DIN EN 1990/NA (hereinafter: DIN EN 1990)

and concrete standards:
- DIN EN 1992-1-1 and DIN EN 1992-1-1/NA (hereinafter: DIN EN 1992-1-1)
- DIN 1045-1000
- DIN 1045-1
- DIN 1045-2
- DIN 1045-3

and the hydraulic engineering standard (subject-specific DIN standard):
- DIN 19702

in the following order: ZTV-W LB 215 before DIN 18331 before the hydraulic engineering standard before concrete standards before basic standards.



Grundlagen der Tragwerksplanung	Fundamentals of structural design
Konstruktion von Stahlbeton und Spannbetontragwerken	Construction of reinforced concrete and pre-stressed concrete supporting structures
Beton Festlegung, Eigenschaften, Herstellung, Konformität	Concrete - Specification, performance, production, conformity
Ausfuhren von Tragwerken aus Beton	Execution of concrete structures
Betonfertigteile	Precast concrete elements
Teil 100 Grundlagen und Betonbauqualitätsklassen	Part 100: Fundamentals and concrete construction quality classes
NA zu DIN EN, Ergänzung DIN EN 1992-1-1 um PK	NA according to DIN EN, addition of PK to DIN EN 1992-1-1
Massivbauwerke im Wasserbau – Tragfähigkeit, Gebrauchstauglichkeit und Dauerhaftigkeit	Solid structures in hydraulic engineering – load-bearing capacity, usability and durability
Grundlagen und Betonbauqualitätsklassen	Fundamentals and concrete construction quality classes
Teil 1 Planung, Bemessung und Konstruktion, Teil 2 Beton, Teil 3 Bauausführung, Teil 4 Betonfertigteile	Part 1: Planning, design and construction, Part 2 Concrete, Part 3 Construction, Part 4 Precast concrete products

Figure 1: Overview of the relevant standardisation situation for ZTV-W LB 215

Basic principles

(1) All parts of ZTV-W LB 215 and the specification of works must always be observed together for planning, design and construction, as well as for concrete and construction.

(2) The regulations in ZTV-W LB 215 are generally aimed at a planned useful life (design working life) for structures and components of 100 years. In the case of structures according to Part 1000, Table 1, line 6a), this useful life is highly likely to be reached without significant repair measures in the case of adequate maintenance. The regulations in ZTV-W LB 215 shall apply to structures in accordance with Part 1000, Table 1, line 6a and, unless explicitly excluded, Part 1000, Table 1, line 6b.

(3) The regulations in ZTV-W LB 215 also aim to ensure the impermeability to water required for the use of these structures for components with surfaces that are in constant or temporary contact with water. Stricter requirements may be required for areas in contact with water around special category spaces (e.g. engineering rooms). In this instance, these requirements are given in the specification of works.

(4) For bulky components (minimum component dimension ≥ 0.8 m), DAfStb-RL MB is to be applied as a secondary addendum to ZTV-W LB 215. For components whose smallest dimension is < 0.8 m, DAfStb-RL MB is to be applied accordingly if particular consideration is to be given to constraint and residual stresses (e.g. components with surface-area constraints).

(5) BAW-MBB shall apply to secondary concrete in terms of planning, materials and construction.

(6) DIN 18197 must be observed for the planning and construction of waterstops and the DIN 7865 series must be observed for elastomer waterstops. BAW-MAB must be observed for the planning and construction of expansion joints.

(7) If there are specific requirements for the appearance of concrete surfaces, these are laid down in the specification of works on the basis of DBV-2.

Part 1000: Basic principles and quality classes of concrete construction (BBQ)

4 Specification of concrete construction quality classes (according to DIN 1045-1000, 4)

(Replacement of DIN 1045-1000, 4 (5))
(5) The planning and construction process is subject to the BBQ phases specified in the specification of works.

(Replacement of DIN 1045-1000, 4 (9))
(9) DIN 1045-1000, Table 2, line 6, is replaced by Table 1. The further assignment to the classes is derived from DIN 1045-1000, Table 2. The use cases according to ZTV-W LB 215, Part 1000, Table 1 are specified by the client in the specification of works.

(Addendum to DIN 1045-1000, 4)
(11) The regulations in technical specification DIN 19702 are aimed at a planned useful life for structures and components of 100 years.

(Replacement of DIN 1045-1000, Table 2, line 6)

Table 1: Hydraulic engineering-specific class definitions

		Application			PK	BK	AK	BBQ
	Criterion 1	Criterion 2	Criterion 3	Examples				
0	1	2			3	4	5	6
6a	The regulations in technical specification DIN 19702 are aimed at a planned useful life for structures and components of 100 years.	high availability requirement or difficult or impossible to access for repairs	water-impacted	locks on waterway classes ≥ III, weirs, non-temporarily sealable inverted siphons and culverts, water-impacted ancillary facilities (pumping stations, overflow tanks), large pumping works, barrages, fish ladders or a part of them as an integral part of locks or weirs of waterway class ≥ III	S[1)]	S[1)]	S[1)]	S
6b	The regulations in technical specification DIN 19702 are aimed at a planned useful life for structures and components of 100 years.	limited availability acceptable and easy to access for repairs and reparability	water-impacted	locks on waterway classes I and II, small, redundant weirs, quay walls, temporarily sealable inverted siphons and culverts, water-impacted ancillary facilities (pumping stations, overflow tanks), pumping works, fish ladders or a part of them as an integral part of locks or weirs of waterway class I and II	S[1)]	S[1)]	S[1)]	S
6c	The regulations are aimed at a planned useful life for structures and components of at least 50 years (see also DIN 1045-2, Annex F)	limited availability acceptable and easy to access for repairs	-	ancillary facilities such as operations buildings, lighting foundations, solitary fish ladders (not part of an overall facility)	DIN 1045-1000, Table 2 except line 6			

1) All regulations for class E at minimum shall apply to class S, unless agreed upon otherwise in ZTV-W LB 215 or on a project-specific basis.

5 Measures to ensure concrete construction quality (re DIN 1045-1000, 5)

5.3 Specifications and technical requirements (re DIN 1045-1000, 5.3)

(Replacement of DIN 1045-1000, 5.3)

(1) Specifications and requirements for the respective planning classes are set out in ZTV-W LB 215 Part 1.

(2) Specifications and requirements for the respective concrete classes are set out in ZTV-W LB 215 Part 2.

(3) Specifications and requirements for the respective execution classes are set out in ZTV-W LB 215 Part 3.

(4) Specifications and requirements for precast concrete parts are set out in ZTV-W LB 215 Part 4.

Annex A (re DIN 1045-1000, Annex A)

A.1 General (re DIN 1045-1000, Annex A, A.1)

(Addendum to DIN 1045-1000, A.1)

(4) The preliminary concrete construction concept is part of the specification of works. Unless agreed upon otherwise in the specification of works, the contractor shall update the preliminary concrete construction concept under its responsibility for the concrete construction concept and shall coordinate it with the client. Changes compared to the preliminary concrete construction concept must be presented transparently and require coordination. Effects on individual contractual services must be presented (e.g. interactions with the quantity of reinforcement, ready-mixed concrete, construction joints).

A.2 Concrete structures cast in situ (re DIN 1045-1000, Annex A, A.2)

A.2.1 BBQ tender meeting (re DIN 1045-1000, Annex A, A.2.1)

A.2.1.1 Duties (re DIN 1045-1000, Annex A, A.2.1.1)

(Replacement of DIN 1045-1000, A.2.1.1)
(3) The aim of the BBQ tender meeting is to develop parameters for the tendering of concrete properties, concrete pouring and concrete curing, taking into account the project-specific boundary conditions from the design in a preliminary concrete construction concept.

The preliminary concrete construction concept appended to the tender includes, in particular, the following points:

- design specifications (type of structure, type of component, structure requirements, actions);
- use of locally available resources;
- component dimensions, reinforcement content, concrete covering;
- architectural design, surfaces (e.g. exposed concrete);
- where applicable (compulsory for bulky components), concreting sections, blocking, joint design, formwork, concrete placement, pouring openings, vibration channels;
- seasonal influence on the production process;
- special boundary conditions for concrete pouring (e.g. vibrations);
- the use cases specified by the client in accordance with Section 4, (9);
- concrete logistics specific to construction sites.

A.2.1.2 Participants (re DIN 1045-1000, Annex A, A.2.1.2)

(Addendum to DIN 1045-1000, A.2.1.2)
(3) The competent person(s) with knowledge under DIN 1045-1000, 5.4 shall be provided by the designer for the BBQ tender meeting, unless agreed upon otherwise.

(4) The BBQ coordinator shall participate in the BBQ tender meeting.

A.2.2 BBQ execution meetings – kick-off meeting (re DIN 1045-1000, Annex A, A.2.2)

A.2.2.1 Duties (re DIN 1045-1000, Annex A, A.2.2.1)

(Replacement of DIN 1045-1000, A.2.2.1, (4))
(4) At least the points of Annex 2 shall be taken into account in the concrete construction concept, unless agreed upon otherwise in the specification of works.

A.2.2.2 Participants (re DIN 1045-1000, Annex A, A.2.2.2)

(Addendum to DIN 1045-1000, A.2.2.2)
(3) Unless agreed upon otherwise in the specification of works, the contractor shall be responsible for developing the project-specific concrete construction concept and determine the participants in coordination with the client.

(4) The BBQ coordinator and representatives of the client and contractor shall participate in the kick-off meeting, covering the specialist areas of design, concrete production, construction and hydraulic steelwork.

A.2.3 BBQ execution meetings – construction progress meetings (re DIN 1045-1000, Annex A, A.2.3)

A.2.3.1 Duties (re DIN 1045-1000, Annex A, A.2.3.1)

(Addendum to DIN 1045-1000, A.2.3.1)
(4) Unless agreed upon otherwise in the specification of works, the contractor shall be responsible for updating the project-specific concrete construction concept and determine the participants in coordination with the client.

Part 1 a) Design and construction

3 Materials (re DIN EN 1992-1-1, 3)

3.2 Reinforcing steel (re DIN EN 1992-1-1, 3.2)

3.2.4 Ductility characteristics (re DIN EN 1992-1-1, 3.2.4)

(Addendum to DIN EN 1992-1-1, 3.2.4)
(3) Only highly ductile reinforcing steel of grade B500B in accordance with DIN 488-1 shall be used. In addition, the ductility of the concrete steels used must be indicated on the reinforcement drawings.

4 Durability and concrete covering (re DIN EN 1992-1-1, 4)

4.2 Environnemental conditions (re DIN EN 1992-1-1, 4.2)

(Addendum to DIN EN 1992-1-1, 4.2)
(4) The client shall specify the exposure classes in the specification of works. Hydraulic engineering-specific examples of the assignment of exposure classes are given in Annex 1.

4.3 Durability requirements (re DIN EN 1992-1-1, 4.3)

(Supplementary to DIN EN 1992-1-1, 4.3)
(3) In the case of components that are in exposure class XM2 as a result of hydroabrasion, the structural design in accordance with DIN 19700-13 shall be such that the action of hydroabrasion resulting from the hydraulic boundary conditions is kept as low as possible.

(4) If a durability design is carried out according to BAW-MDCC for the components with exposure classes XD2 and XD3 (see Part 2, 5.3.2 (5)), the target value of the reliability index shall be selected depending on the accessibility of the component for inspection and repairs. The input parameters relevant to the design (surface chloride content $C_{S,\Delta x}$, reliability index $ß_0$), including a description of the fundamentals, are set out in the specification of works.

Comment 1: As a general rule, a reliability index of $\beta_0 = 1.5$ (i.e. about 93% certainty) shall be used. A target value for the reliability index of $\beta_0 = 0.5$ (i.e. approximately 70% certainty) may be selected for components according to Part 1000, Table 1, line 6b.

4.4 Verification procedure (re DIN EN 1992-1-1, 4.4)

4.4.1 Concrete covering (re DIN EN 1992-1-1, 4.4.1)

4.4.1.2 Minimum concrete cover, c_{min} (re DIN EN 1992-1-1, 4.4.1.2)

(Replacement of DIN EN 1992-1-1, 4.4.1.2)
(1) The minimum concrete cover c_{min} is 50 mm, the minimum concrete cover c_{min} of reinforcement parallel to the construction joint is 30 mm.

(2) It is not permissible to ensure sufficient resistance to wear from hydroabrasion by increasing the concrete cover (sacrificial concrete).

4.4.1.3 Allowance (re DIN EN 1992-1-1, 4.4.1.3)

(Replacement of DIN EN 1992-1-1, 4.4.1.3)
(1) The allowance Δc_{dev} is 10 mm; permissible deviations during construction are contained in Part 3, 11.4 (4).

6 Proofs in Ultimate Limit States (re DIN EN 1992-1-1, 6)

6.2 Shear force (re DIN EN 1992-1-1, 6.2)

6.2.5 Shear transfer in joints (re DIN EN 1992-1-1, 6.2.5)

(Addendum to DIN EN 1992-1-1, 6.2.5 (2))
(2) Regarding shear transfer between concretes cast in situ at different times ('construction joints'), the roughness and surface quality of a joint can be assumed to be categorised as 'rough' for formwork-lined joints and 'corrugated' for non-formwork-lined joints, provided that the corresponding construction joint preparation is performed in accordance with Part 3, 9.3 (2).

6.8 Verification against fatigue (re DIN EN 1992-1-1, 6.8)

6.8.1 General (re DIN EN 1992-1-1, 6.8.1)

(Addendum to DIN EN 1992-1-1, 6.8.1)
(3) The design and execution documents shall indicate whether they are subjected to predominantly static loading or not subjected to predominantly static loading. The criterion under which loading cycles are to be assumed to be subjected to predominantly static loading is laid down in DIN 19702, Section 5.3.2.4.

7 Proofs in Serviceability Limit States (re DIN EN 1992-1-1, 7)

7.3 Limitation of crack widths (re DIN EN 1992-1-1, 7.3)

7.3.1 General (re DIN EN 1992-1-1, 7.3.1)

(Addendum to DIN EN 1992-1-1, 7.3.1)
(11) The internal water pressure according to DIN 19702 may be ignored when determining the crack width.

7.3.2 Minimum reinforcement areas for limiting crack width (re DIN EN 1992-1-1, 7.3.2)

(Replacement of DIN EN 1992-1-1, 7.3.2 sentence (2))
(2) Stresses from early forces (as a result of concrete hardening) and late forces (as a result of temperature stress during the period of use and subsoil-structure interaction) must be determined for bulky components according to BAW-MRZ. The adiabatic temperature increase of concrete $\Delta T_{adiab,7d}$ may be assumed to be 36 K for bulky bottoms and comparable components and 43 K for bulky walls and comparable components.

7.4 Limitation of deformations (re DIN EN 1992-1-1, 7.4)

7.4.1 General (re DIN EN 1992-1-1, 7.4.1)

(Addendum to DIN EN 1992-1-1, 7.4.1)
(7) If deformation of the structure or individual components is to be limited according to the specification of works, e.g. joint gaps within concrete components or between the concrete component and steel hydraulic component, verifications must be carried out for all relevant directions.

8 Detailing of reinforcement – General (re DIN EN 1992-1-1, 8)

8.4 Anchoring of longitudinal reinforcement (re DIN EN 1992-1-1, 8.4)

8.4.4 Rated value of anchoring lengths (re DIN EN 1992-1-1, 8.4.4)

(Addendum to DIN EN 1992-1-1, 8.4.4 (1))
(1) For plane load-bearing structures of solid hydraulic structures, the design anchoring length coefficients α2, α3, α4, α5 may assumed to be 1.0.

9 Design and detailing rules (re DIN EN 1992-1-1, 9)

9.1 General (re DIN EN 1992-1-1, 9.1)

(Addendum to DIN EN 1992-1-1, 9.1)
(4) Construction sections and construction joints shall be planned by the contractor in accordance with their intended construction sequences on the basis of the requirements set out in the specification of works. The intended construction section geometry has a significant influence as a design input parameter on the determination of the crack-controlling reinforcement. If the construction sections deviate from the preliminary concrete construction concept, the contractor shall ensure that this does not necessitate an increase in the crack-controlling reinforcement. The intended construction sections and the arrangement of the construction joints (including all sealing elements) are to be coordinated with the client when the concrete construction concept is updated. The coordinated construction sections and the design of the construction joints (curing, preparation, type and number of sealing elements, joint formation of sealing elements, cleaning options, accessibility) shall be detailed in the concrete construction concept and in the execution plans.

The following planning requirements shall be taken into account when designing construction joints:

- Construction joints should be horizontal or vertical. In water level fluctuation areas (in the case of locks in the two areas of the top and bottom water levels), they shall be avoided.
- To ensure the water impermeability of construction joints in first stage concrete, additional sealing elements shall be provided according to Part 3, 9.3 (1) and (2). Two internal sealing levels shall be provided in construction methods with expansion joints; in monolithic construction, a central sealing level shall be provided.
- As sealing elements (primary sealing) for horizontal construction joints, joint plates shall be installed; for vertical construction joints, joint plates or elastomer waterstops with steel tabs in accordance with DIN 7865-1 shall be installed. Half of the width of the sealing elements shall be cast in concrete on both sides of the construction joint. Construction joint waterstops and plates shall be connected at the crossover points with each other and, if necessary, with expansion joint waterstops and at butt joints these shall be connected in a watertight manner. Elastomeric waterstop butt joints may only be linked by means of vulcanisation. Overlaps in the butt joint area of joint plates shall be sealed all the way around in a watertight manner Joint sheets shall be made of sheet metal at least 2 mm thick. The minimum width of the joint plates shall be 300 mm.

- As an additional precautionary measure for the concrete edge zone (secondary sealing) in exposed concrete surfaces and concrete surfaces in the tidal zone an injection hose shall be inserted in construction joints at a distance of no more than 8 cm behind the inner layer of the load-bearing reinforcement. Injection hose systems shall comply with DBV-4.
- On components bordering on interior spaces with special requirements for water impermeability (e.g. engineering rooms), injection hoses shall also be inserted in construction joints as potential redundancy sealing for later injections. Packers or junction boxes shall be placed outside the construction joints in locations that will accessible at a later stage. DBV-4 applies to the grouting of injection hoses.
- In construction with expansion joints, two sealing levels with internal expansion joint waterstops shall be provided in one expansion joint. The free ends of expansion joint waterstops shall be routed to run underneath the respective blinding layer.

(5) For the blinding concrete areas of lock chamber walls and heads, quays and similar components, the following rules apply:

- If the blinding concrete and the wall concrete below it are installed in layers of 0.3 m to 0.5 m ('fresh-on-fresh' execution), the entire concreting section shall be decisive for determining the stress from early forces. The adiabatic temperature increase of the concrete $\Delta T_{a\text{-}diab,7d}$ shall be assumed in accordance with Section 7.3.2 (2).
- When installing blinding concrete on the cured concrete of the concreting section underneath ('fresh-on-firm' execution), the layer thickness of the blinding concrete shall be a minimum of 0.2 m. Layer thicknesses of more than 0.4 m must be avoided with regard to stresses from forces. The tie bar shall be located either completely within the blinding concrete or in the wall concrete beneath it. If the tie bar is placed in the concrete wall, the blinding concrete shall be considered a cap, connected accordingly and reinforced independently.

(6) In case of zoned construction in areas that are subjected to hydroabrasion, the required edge concrete shall have a minimum thickness of 0.3 m.

Part 1 b)
Planning, design and construction

4 Basics of structural design, concrete construction quality classes and concrete construction concept (re DIN 1045-1, 4)

(Addendum to DIN 1045-1, 4 (3))

(3) – The type, number and layout of spacers and supports shall be shown on the reinforcement drawings.

- The layout of the expansion joints in the form of a waterstop system plan must be submitted to the client as construction documentation for approval.

(Addendum to DIN 1045-1, 4 (6))

(6) All regulations for design class PK-E at minimum shall apply to structures or components of design class PK-S, unless agreed upon otherwise in ZTV-W LB 215 or on a project-specific basis.

Part 2
Concrete

1 Scope (re DIN 1045-2, 1)

(Addendum to DIN 1045-2, 1, (2), 3rd indent)
(2) – The use of self-compacting concrete is only permissible for first stage concrete if agreed upon in the specification of works. Concrete from a compressive strength class of C40/50 is only permissible if agreed upon in the specification of works.

(Addendum to DIN 1045-2, 1, (6c))
BK-S: (6c) All regulations for concrete class BK-E at minimum shall apply to concretes assigned to concrete class BK-S at, unless agreed upon otherwise in ZTV-W LB 215 or on a project-specific basis.

4 Classification (re DIN 1045-2, 4)

4.1 Exposure classes in relation to environmental conditions (re DIN 1045-2, 4.1)

(Addendum to DIN 1045-2, 4.1 (1))
(1) Hydraulic engineering-specific exposure class examples can be found in Annex 1. The project-specific exposure classes are given in the specification of works.

5 Requirements for concrete and methods of verification (re DIN 1045-2, 5)

5.1 Basic requirements for starting materials (re DIN 1045-2, 5.1)

5.1.1 General (re DIN 1045-2, 5.1.1)

(Addendum to DIN 1045-2, 5.1.1, (1))
(1) Only starting materials that are listed as generally suitable or suitable in accordance with DIN 1045-2 may be used, unless agreed upon otherwise in the specification of works.

(Addendum to DIN 1045-2, 5.1.1)
(3) All proofs to be provided with regard to the suitability of starting materials for concrete production (results of standard investigations, results of initial tests, etc.) must be submitted to the client no later than 2 weeks before the start of the initial tests referred to in Section 9.5, unless agreed upon otherwise in the specification of works.

(4) The contractor shall present the results of the monitoring of the starting materials carried out by the notified body and, in the case of aggregates, the results of the in-house production control, to the client without delay.

5.1.3 Aggregates (re DIN 1045-2, 5.1.3)

(Replacement of DIN 1045-2, 5.1.3 (2))
(2) The use of industrially produced aggregates is not permitted for components in exposure classes XM, XF3 and XF4.

(Replacement of DIN 1045-2, 5.1.3 (3))
(3) The use of industrially produced light aggregates is not permitted.

(Addendum to DIN 1045-2, 5.1.3)
(6) Proof shall be furnished of the innocuous nature of fine particles of fine aggregates according to DIN EN 12620, Annex D, letters a), b) or c).

The following regulation does not apply to structures according to Part 1000, Table 1, line 6b):

(Addendum to DIN 1045-2, 5.1.3)
(7) Unless agreed upon otherwise in the specification of works, proof of the freeze-thaw or freeze-thaw with de-icing salt resistance of the aggregates in accordance with DIN EN 12620, 5.7.1, must not be more than 6 months old at any time during construction.

5.1.4 Mixing water (re DIN 1045-2, 5.1.4)

(Addendum to DIN 1045-2, 5.1.4, (1))
(1) The use of mixing water other than drinking water, groundwater or residual water from reprocessing plants for concrete production is not permitted.

5.1.5 Admixtures (re DIN 1045-2, 5.1.5)

(Replacement of DIN 1045-2, 5.1.5, (1))
(1) Unless agreed upon otherwise in the specification of works, the following admixtures may be used:
- concrete plasticisers;
- super plasticisers;
- stabilisers;
- air-entraining agents/hollow microspheres;
- retarding agents;
- sealants;
- retarding agents/concrete plasticisers;
- retarding agents/super plasticisers;
- viscosity modifiers.

The use of other admixtures is not permitted.

5.2 Basic requirements for composition of concrete (re DIN 1045-2, 5.2)

5.2.1 General (re DIN 1045-2, 5.2.1)

(Addendum to DIN 1045-2, 5.2.1, Table 16, footnote b))
Does not apply to components for which particular attention must be paid to forces and residual stresses (e.g. components with surface-area constraints).

(Replacement of DIN 1045-2, 5.2.1, (3))
(3) The concrete shall be designed in such a way as to minimise the separation and bleeding of fresh concrete.

5.2.2 Choice of cement (re DIN 1045-2, 5.2.2)

(Addendum to DIN 1045-2, 5.2.2)
(2) The following cements may be used in accordance with DIN EN 197-1 and DIN 1164-10 in accordance with DIN 1045-2, Tables F.3 and F.4, for which the concrete composition limits set out in DIN 1045-2, Tables F.1 and F.2 apply:

- CEM I
- CEM II/A-S, CEM II/B-S
- CEM II/A-P, CEM II/B-P
- CEM II/A-V, CEM II/B-V
- CEM II/A-T, CEM II/B-T
- CEM II/A-LL
- CEM II/A-D
- CEM II/A-M (S-LL), CEM II/A-M (S-T), CEM II/A-M (S-P), CEM II/A-M (S-D), CEM II/A-M (S-Q), CEM II/A-M (S-V)
- CEM II/A-M (D-LL), CEM II/A-M (D-T), CEM II/A-M (D-P), CEM II/A-M (D-Q), CEM II/A-M (D-V)
- CEM II/A-M (P-LL), CEM II/A-M (P-T), CEM II/A-M (P-Q), CEM II/A-M (P-V)
- CEM II/A-M (Q-LL), CEM II/A-M (Q-T), CEM II/A-M (Q-V)
- CEM II/A-M (V-LL), CEM II/A-M (V-T)
- CEM II/A-M (T-LL)
- CEM II/B-M (S-T), CEM II/B-M (S-D), CEM II/B-M (D-T)
- CEM II/B-M (S-LL), CEM II/B-M (T-LL), CEM II/B-M (V-LL), each with a maximum limestone powder content of 20%
- CEM III/A, CEM III/B

Only normal cements with low heat of hydration development (LH cements according to DIN EN 197-1) or very low heat of hydration (VLH cements according to DIN EN 14216) may be used for bulky components.

5.2.3 Choice of aggregates (re DIN 1045-2, 5.2.3)

The following regulation does not apply to structures according to Part 1000, Table 1, line 6b):

5.2.3.1 General (re DIN 1045-2, 5.2.3.1)

(Addendum to DIN 1045-2, 5.2.3.1)
(4) The grading curve shall be constant and should be between the limit grading curves A and B. In principle, for bulky components, an aggregate where D_{max} = 32 mm (for crushed aggregates $D_{max} \geq 22$ mm) shall be used.

(5) If aggregates larger than 8 mm are used, at least three separate grain groups shall be added.

(6) In addition to the requirements laid down in DIN 1045-2, Annex E.2, Table E.1, the following requirements shall be observed when using aggregates in concrete:

- Naturally assembled (not processed) aggregate in accordance with DIN EN 12620 shall not be used.
- The graduation of the grain composition of the coarse aggregate shall have a narrow range.
- In the case of crushed grains, the shape of coarse aggregates shall conform to at least category FI35 or SI40.
- The resistance to fragmentation of aggregates consisting of crushed rock shall at least conform to category LA50 or category SZ32.

- The lightweight organic impurities content shall not exceed 0.25% by mass in the case of fine aggregates and 0.05% by mass in the case of coarse aggregates.

The following regulation does not apply to structures according to Part 1000, Table 1, line 6b):

5.2.3.2 Aggregate mixtures (re DIN 1045-2, 5.2.3.2)

(Replacement of DIN 1045-2, 5.2.3.2 (1))
(1) Grain mixtures may not be used, unless agreed upon otherwise in the specification of works.

5.2.3.3 Recovered aggregates (re DIN 1045-2, 5.2.3.3)

(Replacement of DIN 1045-2, 5.2.3.3 (1))
(1) Recovered washed-out and recovered crushed aggregates shall not be used.

5.2.3.4 Recycled aggregates (re DIN 1045-2, 5.2.3.4)

(Replacement of DIN 1045, 5.2.3.4, (1)-(5))
(1) Recycled aggregate of single-origin Type 1 may be used for the production and processing of concrete up to compressive strength class C30/37. A maximum of 25% by volume of the coarse aggregate (as a proportion of the total aggregate) may be replaced. Type 2 recycled aggregate and finely recycled aggregate are not permitted. The use of recycled aggregate in exposure classes XF3, XF4, XA2, XA3, XD3, XS3 and XM, as well as for prestressed concrete and light concrete is not permitted. Concrete with recycled aggregate may only be used for components with predominantly stating loading in accordance with DIN 19702, 5.3.2.4, for components that are resistant to deformation or for components where creep behaviour can be neglected. In the case of components with humidity class WA, recycled aggregates are only permitted if they are classified in the alkali sensitivity class E I-S in accordance with Annex B.3 to the DAfStb-RL AKR.

Concrete with recycled aggregate shall comply with the general requirements for recycled aggregate in accordance with DIN 1045-2, E.3.1, irrespective of the degree of replacement, taking into account the additional requirements of ZTV-W LB 215, Part 2, Section 5.2.3.1. DIN 1045-2, Table E.3, footnote (c) does not apply. Concrete with recycled aggregate shall meet the specific requirements of DIN 1045-2, E.3.2.3 and E3.2.4.

5.2.3.5 Resistance to alkali silica reaction (re DIN 1045-2, 5.2.3.5)

(Addendum to DIN 1045-2, 5.2.3.5 (2))
(2) For the evaluation and use of aggregates containing harmful quantities of alkali-solvent silica, or where this possibility cannot be reliably excluded, and for the measures that may need to be taken in the case of concrete, in addition to DAfStb-RL AKR, BMVI-AKR shall be observed.

5.2.4 Use of mixing water (re DIN 1045-2, 5.2.4)

(Addendum to DIN 1045-2, 5.2.4, (1))
(1) Residual water from reprocessing plants for concrete production shall not be used for the production of air-entrained concrete.

5.2.5 Use of additives (re DIN 1045-2, 5.2.5)

5.2.5.1 General (re DIN 1045-2, 5.2.5.1)

(Replacement of DIN 1045-2, 5.2.5.1 (5))
(5) The two concepts of performance (see DIN 1045-2, 5.2.5.3 and DIN 1045-2, 5.2.5.4) are not permitted, unless agreed upon otherwise in the specification of works.

5.2.6 Use of admixtures (re DIN 1045-2, 5.2.6)

(Addendum to DIN 1045-2, 5.2.6)
(5) The simultaneous use of admixtures from different manufacturers within one concrete is excluded, unless agreed upon otherwise in the specification of works.

(6) Concrete in consistency classes ≥ F4 shall be produced with plasticising admixtures, and the consistency of the starting concrete shall be ≤ F2.

(7) Delay times of more than 12 hours must be agreed upon with the client.

5.2.9 Concrete temperature (re DIN 1045-2, 5.2.9)

(Addendum to DIN 1045-2, 5.2.9)
(3) The fresh concrete temperature at the transfer point shall be adapted to the permissible fresh concrete temperature at the site of application. In order to comply with the maximum fresh concrete temperatures at the site of application in accordance with Parts 3, 9.3 (8) and 9.3 (9), the user shall set the maximum permissible fresh concrete temperatures at the transfer point.

(4) In the case of bulky components, the adiabatic temperature increase _xD835__xDEE5_$T_{adiab,7d}$ shall be determined as part of the initial test according to BAW-MATB. If the adiabatic temperature increase in the concrete is determined by testing, the heat of hydration of the cement batch used shall be determined in accordance with DIN EN 196-8 or DIN EN 196-11. On the basis of the cement manufacturer's factory production control (FPC), the production-related fluctuations of the heat of hydration of the cement shall be classified by means of a computational estimation in accordance with BAW-MATB, Section 5. If cements without FPC data are used for the heat of hydration, a safety surcharge of 30 J/g is to be applied to the tested heat of hydration of the batch for the calculation according to BAW-MATB, Section 5.

(5) The adiabatic temperature increase $\Delta T_{adiab,7d}$ of the concrete shall not exceed 36 K for bulky bottoms and comparable components, or 43 K for bulky walls and comparable components.

(6) For bulky components that are not classified as components comparable to bottoms or walls, the corresponding limit values are specified in the specification of works.

5.3 Requirements as a function of exposure classes (re DIN 1045-2, 5.3)

5.3.2 Limiting values for concrete composition (re DIN 1045-2, 5.3.2)

(Replacement of DIN 1045-2, 5.3.2 (5))
(5) DIN 1045-2, Annex F (normative), Table F.1 and Table F.2 and the following specifications apply to the requirements for the composition and properties of the concrete:

- Concrete for hydraulic structures shall not exceed a W/z value of 0.65.
- For exposure class XF3, the following applies:
    - Only category F1 aggregates in accordance with DIN EN 12620 may be used.

- Only the variant with a minimum air content in accordance with DIN 1045-2, 5.4.3 is permitted. Alternatively, hollow microspheres may be used under the boundary conditions (including compressive strength requirements, fresh concrete tests) specified in the general building inspectorate approvals.

- For exposure classes XD2 and XD3, the following applies:
  - For components with exposure classes XD2 and XD3, a durability assessment of concrete shall be carried out in accordance with BAW-MDCC (e.g. for transshipment quays in inland ports; components exposed to chloride from flowing waters, impounded waters or groundwater with a chloride content of over 2 000 mg/l).
    An assessment according to BAW-MDCC may be waived in the following cases:
    - For blinding concrete areas of locks and weirs in inland areas outside the area of influence of road structures.
    - Components in the area of influence of road structures (e.g. lock heads, blinding concrete areas or weir piers under road bridges), provided that the following binders are used:
      - CEM I and CEM II cements according to 5.2.2 (2) in combination with fly ash as a concrete additive, in which the eligible fly ash content must be at least 20% by mass of (z+f).
      - CEM I and CEM II cements according to 5.2.2 (2) in combination with silica dust as a concrete additive, in which the eligible silica dust content must be at least 8% by mass of (z+s).
      - CEM III/A in combination with fly ash as a concrete additive, in which the eligible fly ash content must be at least 10% by mass of (z+f).
      - CEM III/B.

    Comment: The eligibility of additives in accordance with DIN 1045-2, 5.2.5.2 shall be taken into account.

- Unless agreed upon otherwise in the specification of works, for components classified as exposure class XM2 due to hydroabrasion, only the variant with a maximum permissible water/cement ratio of ≤ 0.45 in accordance with DIN 1045-2, Table F.2, or DAfStb-RL MB, Table F.2.2, is permitted, and aggregates with a quartzite content of at least 70% or, alternatively, with a resistance to wear (Micro-Deval coefficient M_{DE} in accordance with DIN EN 1097-1) of category $M_{DE}10$ in accordance with DIN EN 12620 shall be used.
- The use of multiple cements in one concrete is not permitted.
- For bulky components where XF3 exposure prevails in combination with XC2 or XC4 and, where applicable, XM1 (e.g. internal lock chamber walls), in concrete whose freeze-thaw resistance is ensured by the addition of air-entraining agents, and in which cement CEM I, CEM II-A, CEM II/B-S or CEM III/A is used, contrary to DAfStb-RL MB,
  - the minimum compressive strength class, unless higher strength levels are required due to structural reasons or on account of other exposure classes, may be set at C20/25 (age at verification: 56 days), and
  - the minimum cement content in accordance with DAfStb-RL MB, Table F.2.2, line 3, may be set at 270 kg/m³

  . In this case, at least the difference between the actual cement content and the minimum cement content of 300 kg/m³ according to DAfStb-RL MB shall be compensated by adding fine grain from Type I or Type II concrete admixtures.
  This provision may also be applied to the area between the upstream water level and the lower edge of the blinding concrete.
- For concrete for blinding concrete areas of lock chamber walls and heads and similar components with XC4, XD3 and XF4 exposure (where applicable in combination with XM1), for whose classification into exposure classes XD3 and XF4 the use of de-icing agents primarily to ensure road safety for pedestrians and infrequent road traffic, the following provisions shall apply:

- The maximum permissible water/cement ratio (taking into account additives) is 0.50.
- By way of derogation from DIN 1045-2, Table F.2, line 3, the minimum cement content is 3 300 kg/m³.
- To reduce shrinkage, the total water content in the fresh concrete with a maximum grain size of 32 mm shall be limited to 160 dm³/m³ (with a maximum grain size of 16 mm, to 165 dm³/m³).
- The minimum strength class shall be C25/30 (age at verification: 28 or 56 days), unless higher strength levels are required due to structural reasons or on account of other exposure classes.
- Proof of adequate freeze-thaw with de-icing salt resistance by means of a frost test in accordance with 5.5.6 (1) shall also be furnished for exposure class XF4.

5.4 Requirements for fresh concrete (re DIN 1045-2, 5.4)

5.4.1 Consistency, viscosity, blocking resistance, sedimentation stability (re DIN 1045-2, 5.4.1)

(Addendum to DIN 1045-2, 5.4.1, (7))
(7) The consistency of concrete (other than self-compacting concrete) shall be set via the target value of the flow spread. Only concrete with a maximum target flow spread value of 480 mm may be used. For air-entrained concrete the target value shall not exceed 450 mm. Other target values for concrete are only permitted in narrow reinforced areas and secondary concrete according to BAW-MZB in consultation with the client. The permissible tolerance of the target value is ± 30 mm in deviation from DIN 1045-2, Table 26.

(Addendum to DIN 1045-2, 5.4.1)
(8) If the sedimentation sensitivity of concrete (other than self-compacting concrete) is to be determined, it shall be determined in accordance with BAW-MESB, Annex A.

5.4.2 Cement content and water-cement ratio (re DIN 1045-2, 5.4.2)

(Addendum to DIN 1045-2, 5.4.2, (4))
(4) Unless agreed upon otherwise in the specification of works, in order to determine the water/cement ratio in the fresh concrete by testing:
- the water content shall be determined in accordance with DBV-1, Section 3, and from this, the effective water content shall be ascertained, taking the core moisture (water absorption in accordance with DIN EN 1097-6) of the aggregate into account,
- the cement and additive content shall be taken from the actual data on the delivery note.

Permissible tolerances are given in DIN 1045-2, Table 25. For concrete with recycled aggregate, separate procedures shall be defined in the concrete construction concept.

5.4.3 Air content (re DIN 1045-2, 5.4.3)

The following regulation does not apply to structures according to Part 1000, Table 1, line 6b):

(Replacement of DIN 1045-2, 5.4.3, (3))
(3) Air content according to DIN 1045-2, 5.4.3 (2) is to be increased by 1% by volume when concrete plasticisers or super plasticisers are used.

(Addendum to DIN 1045-2, 5.4.3)
(7) The minimum air content to be complied with in the fresh concrete at the site of application corresponds to the air content that was set in the initial test during sampling to demonstrate the freeze or freeze-thaw with de-icing salt resistance. The air content referred to in Section 5.4.3 (3) shall not be lower than this.

(8) The upper limit of the air content to be complied with in fresh concrete at the site of application corresponds to the air content set during sampling to demonstrate compressive strength. The requirements for the upper limit of the air content in accordance with DIN 1045-2, Table 24, shall be complied with.

5.5 Requirements for hardened concrete (re DIN 1045-2, 5.5)

5.5.1 Stability (re DIN 1045-2, 5.5.1)

5.5.1.1 General (re DIN 1045-2, 5.5.1.1)

(Replacement of DIN 1045-2, 5.5.1.1 (2))
(2) Any boundary conditions other than those in DIN 1045-2, 5.5.1.1 (1) are not permitted.

5.5.1.2 Compressive strength (re DIN 1045-2, 5.5.1.2)

(Replacement of DIN 1045-2, 5.5.1.2 (2))
(2) In initial tests, the contractor in consultation with the client shall determine whether pressure resistance shall be demonstrated by cylinder or cube testing. The specified test specimen shapes and storage conditions shall be maintained consistently.

(Replacement of DIN 1045-2, 5.5.1.2 (3))
(3) Verification of the compressive strength class of the concrete shall be carried out when it is 28 days old. For concretes to which DAfStb-RL MB can apply, verification may also be carried out when it is 56 days old (see DIN 1045-2, Annex P (normative)). A verification age of more than 56 days is only permitted if agreed upon in the specification of works.

5.5.2 Bulk density (re DIN 1045-2, 5.5.2)

(Addendum to DIN 1045-2, 5.5.2 (3))
(3) The bulk density target value is defined on the basis of the density of the test specimens for the compressive strength test at the verification age.

5.5.3 Water penetration resistance (re DIN 1045-2, 5.5.3)

(Replacement of DIN 1045-2, 5.5.3, (1))
(1) Concretes for hydraulic structures shall have a high resistance to water penetration. The resistance to water penetration shall be determined for concrete with a water/cement ratio of > 0.55 and always for concrete with recycled aggregate based on the water penetration depth according to DIN EN 12390-8 and shall not exceed 30 mm. Deviating from the 28 days, the resis-

tance to water penetration may be verified at the same time as the compressive strength for the verification of the compressive strength class.

5.5.6 Freeze and freeze-thaw with de-icing salt resistance (re DIN 1045-2, 5.5)

(Addendum to DIN 1045-2, 5.5)
(1) Frost tests shall be carried out on hardened concrete for exposure classes XF3 and XF4, unless agreed upon otherwise in the specification of works. The BAW-MFB is authoritative for carrying out the test and the associated acceptance criteria. Unless agreed upon otherwise in the specification of works, the freeze resistance (for XF3) and freeze-thaw with de-icing salt resistance (for XF4) may, deviating from the 28 days, be verified at the same time as the compressive strength for the verification of the compressive strength class.

5.5.7 Chloride penetration resistance (re DIN 1045-2, 5.5)

(Addendum to DIN 1045-2, 5.5)
(1) If the chloride penetration resistance is to be ascertained using the RCM test, it shall be determined in accordance with BAW-MDCC, Annex B.

6 Specification of concrete (re DIN 1045-2, 6)

6.1 General (re DIN 1045-2, 6.1)

(Replacement of DIN 1045-2, 6.1 (3))
(3) Concrete shall be defined exclusively as designed concrete, generally taking into account the classification or target values set out in Section 4 and the requirements of Sections 5.3 to 5.5 (see 6.2). The basis for the design shall be the results of an initial test (see Annex 3).

(Addendum to DIN 1045-2, 6.1)
(5) No later than 2 weeks before the start of initial testing, the contractor shall supply the following information to the client for coordination:

- a proposal for concrete production (site-mixed or ready-mixed);
- in the case of ready-mixed concrete, details of the location of the concrete mixing facility/facilities for the ready-mixed concrete, including alternative mixing facility/facilities, as well as the distance and travel time between the mixing facility/facilities and the construction site;
- details of the type, properties, origin and availability of concrete starting materials;
- concrete formulas and, where applicable, their compatibility in the case of joint application (within a component or in the case of adjacent components);
- the planned construction.

(6) The client must be informed in good time of the start of the initial tests to allow the client to participate in the contractor’s initial testing.

(7) The results of the initial tests shall be made available to the client in good time prior to the initial placement of the concrete in question so that the client has sufficient time (unless agreed upon otherwise in the specification of works, at least the same time as the initial tests plus 3 weeks) to carry out monitoring tests to verify the initial tests. The contractor shall provide the necessary starting materials for the monitoring tests at the client’s test location in accordance with the information contained in the specification of works.

6.2 Specification for designed concrete (re DIN 1045-2, 6.2)

6.2.2 Basic requirements (re DIN 1045-2, 6.2.2)

(Addendum to DIN 1045-2, 6.2.2)
k) Joint mixtures shall be provided with $D_{max} \leq 16$ mm and shall comply with the same requirements as the remaining concrete of the relevant concreting section.

6.3 Specification for prescribed concrete (re DIN 1045-2, 6.3)

6.3.1 General (re DIN 1045-2, 6.3.1)

(Replacement of DIN 1045-2, 6.3.1 (1))
(1) Concrete by composition is not permitted.

7 Delivery of fresh concrete (re DIN 1045-2, 7)

7.2 Information from the concrete producer to the user (regarding DIN 1045-2, 7.2)

(Replacement of DIN 1045-2, 7.2 (3a) and (3b))
(3) The strength ratio $f_{cm,2}/f_{cm,x}$ (x = 28, 56, 91) to determine the curing period shall be determined from the corresponding strength values of the initial testing.

7.3 Delivery note for ready-mixed concrete (re DIN 1045-2, 7.3)

(Replacement of DIN 1045-2, 7.3 (1))
(1) Before the concrete is unloaded, the manufacturer shall give the user access to the delivery note for each load of concrete. After the concrete is unloaded, the manufacturer shall provide the user with a delivery note for each load of concrete. The delivery note shall contain at least the information set out in Table 2 in unencrypted form and, where required by Table 2, be automatically printed out. The delivery note shall include a comparison of the target weighed portion (target value of the manufacturer of the ready-mixed concrete for producing concrete based on the composition as per the initial test, taking into account the permissible variations for adjusting the properties of fresh and hardened concrete in accordance with ZTW-W LB 215 and the actual weighed portion, with the differences indicated. The surface moisture content of the aggregate (separated into the individual grain fractions) shall be presented in a comprehensible manner. Copies of the delivery notes must be handed over to the client at the time of delivery.

Table 2: Information on the delivery note for ready-mixed concrete in accordance with ZTV-W LB 215

Item No	Information on the delivery note	Automatic printout	Pre-printed or handwritten entries
1	Name, address and telephone number of the ready-mixed concrete plant		X
2	Delivery note number	X	
3	Date and time of loading	X	
4	Registration number of the transport vehicle	X	
5	Name of buyer	X	

Item No	Information on the delivery note	Automatic printout	Pre-printed or handwritten entries
6	Description and location of the construction site	X	
7	Details of, or references to, the specification, e.g. variety number or order number	X	
8	Declaration of conformity with reference to the specification and to DIN EN 206	X	
9	Conformity mark, stating DIN 1045-2 and ZTV-W LB 215	X	X
10	Name or mark of the certification agency		X
11	Time of arrival of the concrete at the construction site		X
12	Time of commencement of unloading		X
13	Time of completion of unloading		X
14	Indication of concrete class BK-N, BK-E or BK-S	X	
15	Indication of the proportion of recycled aggregate in relation to the total aggregate	X	
16	Compressive strength class (if applicable, different verification age of the compressive strength class from 28 days, see 5.5.1.2 and Annex P (normative))	X	
17	Exposure class(es) and humidity class	X	
18	Strength development	X	
19	Nature of the use of the concrete (non-reinforced, reinforced, prestressed concrete)	X	
20	Target value for consistency	X	
21	Origin, type and strength class of the cement	X	
22	Origin, active group (type designation) and name of the admixtures, origin and nature of the additives, origin and type of aggregate	X	X[1)]
23	Special properties, e.g. extended processing time	X	
24	D_{max}	X	
25	Bulk density class for lightweight concrete or bulk density target value for heavy concrete	X	
26	Actual weighed portion of aggregate, according to grain fraction	X	
27	Actual weighed portion of cement	X	
28	Actual weighed portion of additive	X	
29	Actual weighed portion per admixture	X	X[1)]
30	Actual weighed portion of mixing water	X	
31	Surface moisture content of the aggregate (separately for each fraction)	X	
32	Total water (mixing water + surface moisture + water from admixtures with > 3 l/m³ concrete) and water/cement ratio	X	
33	Nominal weight of all concrete starting materials in accordance with rows 26 to 30 and 32	X	
34	Difference between target and actual weighed portion for all concrete starting materials	X	
35	Quantity of concrete in m³	X	
36	Concrete- and plant-specific minimum mixing time in accordance with 9.5 (1b) (i) [2)]	X	X
37	Actual mixing time [2)]	X	X

[1)] Where super plasticisers are measured out on site. The time at which the super plasticiser is added and the estimated residual quantity in the mixer barrel before it is added shall be specified.

[2)] If the system is not yet equipped accordingly, the entry must be made by hand or by collective printout for multiple delivery notes.

7.4 Delivery information for site-mixed concrete (re DIN 1045-2, 7.4)

(Replacement of DIN 1045-2, 7.4 (1))
(1) The information required for ready-mixed concrete in accordance with Table 2 is also required for site-mixed concrete and shall be made available to the client.

7.5 Adjustment of the mix after main mixing and before discharge (re DIN 1045-2, 7.5)

(Addendum to DIN 1045-2, 7.5 (2))
(2) – At delivery, consistency may only be brought up to the specified value using super plasticisers. The later addition of water is not allowed, even under special circumstances. If liquefying admixtures are added later, the concrete shall not be so hardened that its value falls below the actual consistency measured on site before the initial dosage. If liquefying admixtures are added on site to achieve consistency, only a single subsequent dosing will be permitted.

7.6 Time of unloading (re DIN 1045-2, 7.6)

(Addendum to DIN 1045-2, 7.6)
(2) The concrete shall be transported to the construction site by means of a truck mixer, including the waiting time until unloading, with a slowly rotating drum. Immediately before unloading or before carrying out fresh concrete tests, the concrete shall be mixed again for at least 2 minutes.

8 Conformity control and conformity criteria (re DIN 1045-2, 8)

8.2 Conformity control for designed concrete (re DIN 1045-2, 8.2)

8.2.1 Conformity control for compressive strength (re DIN 1045-2, 8.2.1)

8.2.1.1 General (re DIN 1045-2, 8.2.1.1)

(Replacement of DIN 1045-2, 8.2.1.1 (1a))
(1a) For concrete according to ZTV-W LB 215, sampling and testing shall be carried out on individual concrete compositions. The concept of groups of concrete according to DIN 1045-2, 8.2.1.1 may not be applied.

8.4 Measures in case of non-conformity of the product (re DIN 1045-2, 8.4)

(Addendum to DIN 1045-2, 8.4 (1))
(1) If non-conformity with the specification is confirmed, the contractor must inform the client of this without delay.

9 Production control (re DIN 1045-2, 9)

9.5 Concrete composition and initial test (re DIN 1045-2, 9.5)

(Replacement of DIN 1045-2, 9.5 (1a))
(1a) In the case of a new concrete composition, an initial test shall be carried out (see Annex 3). Dispensing with an initial test is not permitted either in the event that long-term experience is available in connection with a similar concrete or a similar group of concretes. For all concretes, only the same starting materials (e.g. type, manufacturer, place of extraction, maximum grain size of the aggregate) may be used as those used in the initial test.

Prior to construction, the contractor shall demonstrate, by arranging initial tests and considering the site and structure-specific boundary conditions, that the concrete can be reliably processed with the anticipated starting materials and the intended consistency under the conditions of the particular construction site (climatic boundary conditions, production, transport, conveying, placement, curing, etc.), and that the required properties can be safely achieved.

To maintain the properties of the fresh concrete at the site of application, consideration shall be given to possible changes in the consistency of the fresh concrete and the air content therein as a result of the conveying process on site from the supply point to the site of application. Corresponding requirements for the consistency target value and the air content target value at the transfer point are to be ascertained as part of the initial test and regularly adjusted as part of the construction work.

(Addendum to DIN 1045-2, 9.5 (1b))
(1b) In addition to DIN 1045-2, 9.5 (1b), the initial test on the concrete shall include at least the following tests, unless agreed upon otherwise in the specification of works.

The following regulation does not apply to structures according to Part 1000, Table 1, line 6b):

(Addendum to DIN 1045-2, 9.5 (1b) i))
i) In the case of concretes without air-entraining agents, this is achieved if no further significant change in consistency occurs as a result of further mixing.
For air-entrained concrete, the concrete- and plant-specific minimum mixing time is reached if further mixing causes no further significant change in consistency and air content.

The following regulation does not apply to structures according to Part 1000, Table 1, line 6b):

(Replacement of DIN 1045-2, 9.5 (1b), ii))
ii) Visual evaluation of the fresh concrete properties (water secretion, cohesion, flow properties, settling behaviour, etc.) In the initial tests, the fresh concrete properties shall be determined prior to the addition of admixtures (starting concrete). After adding one or more admixtures, the fresh concrete properties of fresh concrete temperature, flow spread and air content shall be determined over a period of 90 minutes from the addition of water. Tests shall be conducted after 10, 45 and 90 minutes. In the case of longer processing times, additional tests shall be conducted accordingly. In the case of concrete with hollow microspheres, tests shall be conducted in accordance with ASTM C-173/C-173M-01 instead of the air content determination. For investigations in the mixing system at the ready-mixed concrete plant, the water/cement ratio of the concrete shall be ascertained in accordance with Section 5.4.2 (4).

Comment: Sedimentation sensitivities according to BAW-MESB may be ascertained for the purpose of collecting experience in check tests carried out by the client, for example.

(Addendum to DIN 1045-2, 9.5 (1b))

iv) If the compressive strength class is demonstrated at a higher age, compressive strength at 2, 7 and 28 days shall also be determined. For this purpose, three specimens shall be produced, stored and tested in accordance with DIN EN 12390-3 for each test date.

The fresh concrete bulk density according to DIN EN 12350-6 (compaction according to DIN EN 12350-6, 7.4.2.2) shall be determined during sampling.

The density of the samples at the test time shall be determined and specified according to DIN EN 12390-7. To demonstrate compressive strength class, air-entrained concrete should aim for the maximum permissible air content for sampling during construction. Section 5.4.3 (8) must be observed.

v) The water penetration resistance ($e \leq 30$ mm) shall be determined on the basis of the water penetration depth at the age of 28 days. For compressive strength testing at a higher age, the water penetration depth can be determined at that age in deviation from the aforementioned.

vi) Additional tests are required for the following concretes and exposure classes:

- For air-entrained concrete: FGSV-818, Sections 4.1 and 4.2, and DBC shall be taken into account when determining the scope of the initial test. The air content in fresh concrete according to DIN EN 12350-7, Section 6, including the fresh concrete bulk density according to DIN EN 12350-6 (compaction according to DIN EN 12350-6, 7.4.2.2), as well as the air-void stability, shall be determined, taking into account the transport and conveying route intended for construction to the site of application (at the end of the pump hose in the case of concrete pumps) with the relevant concrete mixing plant(s). In the case of concrete with hollow microspheres, tests shall be conducted in accordance with ASTM C-173/C-173M-01 instead of the air content determination.
- For bulky components: The adiabatic temperature increase shall be determined in accordance with BAW-MATB.
- In the case of special requirements concerning the deformation characteristics of sensitive structural parts (see Part 1, 7.4.1 (7)), as well as for concrete with recycled aggregate, the static modulus of elasticity shall be tested in accordance with DIN EN 12390-13, Method B. The hold time during the 1st and 2nd load cycle shall be set to 0 seconds. Before and after the 3rd cycle, the hold time shall be 20 seconds. If the compressive strength class is demonstrated at a higher age, testing is also carried out at 2, 7 and 28 days on every three test specimens.
- For XF3, XF4: The freeze resistance or freeze-thaw resistance with de-icing salts shall be determined according to BAW-MFB. Proof of freeze resistance or freeze-thaw resistance with de-icing salts shall be carried out on concrete whose air content in fresh concrete corresponds approximately to the minimum air content according to Section 5.4.3 (3). In order to prove freeze resistance and freeze-thaw resistance with de-icing salts, the minimum air content stipulated during construction shall be aimed at for sampling. Section 5.4.3 (7) must be observed. For concrete with hollow microspheres, the required hollow microsphere dosage shall be demonstrated by a passed test according to BAW-MFB. The Roll-A-Meter value according to ASTM C-173/C-173M-01 corresponding to the required dosage shall be determined as part of the initial test.
- For recycled aggregate, the expected variations in water absorption and bulk density shall be taken into account when determining the scope of the initial test.
- In the case of retarded concrete: The setting behaviour shall be determined via the flow spread, and for retarded air-entrained concrete, the air content for the intended processing period shall additionally be determined.

The following regulation does not apply to structures according to Part 1000, Table 1, line 6b):

- As a general rule, the end of the processing time shall be determined according to DAfStb-RL VZB, Section 4.3(1). As an alternative, the kneading bag method according to DIN 18218 may be used in consultation with the client.

(Addendum to DIN 1045-2, 9.5 (3))
(3) At the time concrete placement work starts, the initial test may not date back more than 12 months.

The following regulation does not apply to structures according to Part 1000, Table 1, line 6b):

9.6 Personnel and equipment (re DIN 1045-2, 9.6)

9.6.2 Equipment (re DIN 1045-2, 9.6.2)

9.6.2.2 Dosing equipment (re DIN 1045-2, 9.6.2.2)

(Addendum to DIN 1045-2, 9.6.2.2)
(3) For the production of concrete containing more than one admixture, the mixing plant shall have the facilities for separate dosing and addition of the admixtures.

The following regulation does not apply to structures according to Part 1000, Table 1, line 6b):

9.8 Mixing of concrete (re DIN 1045-2, 9.8)

(Addendum to DIN 1045-2, 9.8 (1))
(1) The concrete shall be mixed in compliance with the minimum concrete- and plant-specific mixing times and the mixing process selected in the initial test. The minimum mixing times shall be documented during production. The minimum mixing times shall be regularly checked to determine whether they need adjustment. Downward adjustments to the minimum mixing times shall be verified and communicated to the client. The absolute minimum mixing times referred to in Section 9.5 (1b) i) shall not be less than this.

Comment: Changes in the admixture dosage and in the temperature boundary conditions may necessitate a review of the concrete- and plant-specific minimum mixing times by the concrete manufacturer.

The following regulation does not apply to structures according to Part 1000, Table 1, line 6b):

9.9 Procedures for production control (re DIN 1045-2, 9.9)

(Addendum to DIN 1045-2, 9.9 (1))
(1) Except in the case of drinking water, the examination of water for components harmful to concrete shall be carried out at least twice a year in the context of the construction process.

(Replacement of DIN 1045-2, 9.9 (10b))
(10b) The measures provided for in DIN 1045-2, Table 31 and Table 32 shall not be modified.

Part 3
Construction

1 Scope (re DIN 1045-3, 1)

(Addendum to DIN 1045-3, 1 (2))
(2) In addition, Annex 2 must be observed.

(Addendum to DIN 1045-3, 1 (3))
(3) Unless agreed upon otherwise in ZTV-W LB 215 or on a project-specific basis, at least all regulations for execution class AK-E shall apply to structures and components of execution class AK-S.

(Replacement of DIN 1045-3, 1 (5))
(5) The concrete construction concept in accordance with Annex 2 is always part of the structural engineering documentation.

(Addendum to DIN 1045-3, 1)
(12) The regulations in DBV-3 must be observed.

3 Definitions (re DIN 1045-3, 3)

(Addendum to DIN 1045-3, 3)

3.24 Site of application (re DIN 1045-3, 3.24)

The site of application is the area of the concrete component where the fresh concrete is poured.

5 Quality assurance and supervision (re DIN 1045-3, 5)

5.3 Quality assurance (re DIN 1045-3, 5.3)

5.3.2 Supervision (re DIN 1045-3, 5.3.2)

(Addendum to DIN 1045-3, 5.3.2)
(3) Each concreting section requires prior consultation with the client. Prior to this, the contractor shall check the dimensions, formwork, reinforcement, prepared construction joints, concrete cover, cast-in items, positional stability and suitability for installation of the fresh concrete. The check must be recorded in a log. The log must be submitted to the client before the start of the concreting.

(4) Before carrying out work steps whereby parts of the performance are withdrawn from the inspection and determination, the client shall be given the opportunity in good time and in text form to request the joint determination of the condition in accordance with § 4 (10) VOB/B. In this context, the client shall carry out a construction supervision-related reinforcement inspection under public law.

5.3.3 Measures and requirements for construction execution and supervision (re DIN 1045-3, 5.3.3)

(Addendum to DIN 1045-3, 5.3.3, Table 2, line 15)
(2) Monitoring class 2 applies to the monitoring of hydraulic structures, unless agreed upon otherwise.

(3) If there are any doubts as to the uniformity of the concrete structure in accordance with Part 3, 9.5 (8), appropriate tests shall be carried out on cores from the relevant component at an early stage during construction, in accordance with Section 4.3 of the BAW-MESB. The number and sampling points of the cores are to be specified by the client for each specific project. To avoid damage as a result of extracting the cores, the contractor shall be involved in the selection of sampling points. The cores shall be removed by the contractor in the presence of the client, marked and inspected on behalf of the contractor by a laboratory to be agreed with the client. The drill holes shall be sealed professionally by the contractor. The samples shall be kept for any inspections until the final clarification of the facts.

5.4 Measures in case of deviations (re DIN 1045-3, 5.4)

(Replacement of DIN 1045-3, 5.4(1)(a))
(1) a) the impact of the deviation on the further execution and on the load-bearing capacity, serviceability and durability of the structure;

(Addendum to DIN 1045-3, 5.4 (3))
(3) ZTV-W LB 219 shall apply to repair measures. The measures to be taken must be agreed upon with the client in advance.

6 Falsework and formwork (re DIN 1045-3, 6)

6.1 General (re DIN 1045-3, 6.1)

(Addendum to DIN 1045-3, 6.1 (5))
(5) For bulky components and built-in steel components that are simultaneously used as lost formwork, the formwork pressure in accordance with DIN 19702 shall be taken into account.

(Addendum to DIN 1045-3, 6.1 (10))
(10) When testing formwork, the largest calculated deflection of the formwork and the supporting structure shall not exceed 5 mm in total, taking into account planned cambers.

6.2 Erection of falsework and formwork (re DIN 1045-3, 6.2)

(Addendum to DIN 1045-3, 6.2 (2))
(2) Fine mortar leaks shall be removed and gravel pockets shall be repaired in accordance with ZTV-W LB 219.

(Addendum to DIN 1045-3, 6.2 (3))
(3) New, untreated wooden formwork shall be treated with cement sludge before first use and then cleaned.

(Addendum to DIN 1045-3, 6.2)
(9) Formwork ties that leave behind hollows shall not be used in pressing water. Anchoring holes shall be completely closed in such a way that the required component characteristics are also provided in these areas. On areas of concrete that will remain visible, the colour and surface structure of the infilling shall match that of the building component. Remaining anchor parts shall end at least 50 mm below the surface of the concrete. In the case of pressurized water, an anchor with a centrally located water barrier shall be provided. The planned execution must be agreed upon with the client.

(10) On the surfaces exposed to water and air, a closed and low-porosity surface shall be present. With regard to porosity requirements, voids or imperfections with a diameter of 30 mm and/or a depth of 10 mm are not permitted.

(11) Unless agreed upon otherwise in the specification of works, the formwork facing shall be absorbent or slightly absorbent in accordance with DBV-2, Table 4.

The following regulation does not apply to structures according to Part 1000, Table 1, line 6b):

(Addendum to DIN 1045-3, 6.2)
(12) Unless agreed upon otherwise in the specification of works, for formwork surfaces of components exposed to water in exposure classes XF3, XF4 and XM2, as well as for formwork surfaces of components in exposure class XA2 and inclined surfaces with slab formwork, water-discharging formwork liners (CPF) shall be used. The formwork liners may be used no more than three times, provided that the criteria in 6.2 (10) are met.

(Addendum to DIN 1045-3, 6.2)
(13) Formwork boards shall be clean-edged, undamaged and, for level surfaces, at least 8 cm wide and shall comply at least with sorting category S 10 (according to DIN 4074-1). Unplaned boards must be at least 24 mm thick, and planed ones shall be at least 22 mm thick.

(14) The offsetting of the joints between formwork elements and between the first concrete surface and the second concrete surface shall not exceed 5 mm. The height of the ridges left in the concrete surface shall not exceed 5 mm.

(15) The contractor and the client shall agree on a formwork sample plan in good time. The layout and formation of the formwork, formwork anchors and cone closures (e.g. direction of formwork boards, joints, joint seals, formwork flaps and openings) as well as all other anchorage points (e.g. for climbing scaffold) shall be shown in a schematic. The formwork facing shall be such that the formwork looks neat and tidy. Formwork with formwork facings from different manufacturers shall not be used together within a component.

6.3 Release agents (re DIN 1045-3, 6.3)

(Addendum to DIN 1045-3, 6.3 (3))
(3) Release agents for areas in contact with water and soil must be biodegradable in accordance with DE-UZ 178. To avoid mould and mildew formation, biodegradable release agents are not permitted for interior spaces that are dry during use.

6.4 Cast-in items (re DIN 1045-3, 6.4)

(Addendum to DIN 1045-3, 6.4 (1d))
(1d) In the area of concrete embedment, suitable corrosion protection must be applied to the cast-in item at least up to the depth of the required concrete cover.

(Addendum to DIN 1045-3, 6.4)
(2) Measures for the sufficient sealing of the formwork and to prevent any damage to the corrosion protection shall be taken at the edges of the cast-in items.

(3) If cast-in items have been installed by third parties before concreting, the contractor shall ensure that these cast-in items are properly secured before concreting.

(4) To avoid rust strips on the concrete surfaces, untreated steel components located on the concrete surface shall be protected until they are preserved with suitable agents.

(5) Misalignment between the concrete surface and cast-in item in excess of 3 mm is not permitted.

(6) Samples of expansion joint tapes, if applicable also of the plant connection, test certificates (acceptance test certificate A according to DIN 7865-5, including tests according to DIN 7865-2, Tables 1, Sections 6.2 to 6.8, specific to the object, as appropriate, Sections 6.9 to 6.12) and information on the composition of the material with information on the base polymer according to DIN 7865-3, are to be presented to the client for a check test 6 weeks prior to placement and coordinated with them. For each type of waterstop used according to DIN 7865-1, an excess length of 0.4 m shall be included for the purposes of the check test. Samples for the check tests must be taken in the presence of the client and documented by the contractor. DIN 18197 shall apply to the linking of waterstops. Site documentation according to DIN 18197, Annex B and test reports according to DIN 18197, Annex E, shall be submitted to the client.

6.5 Removal of falsework and formwork (re DIN 1045-3, 6.5)

(Addendum to DIN 1045-3, 6.5)
(6) When using expanded metal, this shall be removed in its entirety from the construction joint prior to placement of the concrete in the next concreting section. The construction joint shall then be pre-treated in such a way that it satisfies the requirements in accordance with Section 9.3 (2) for unformed construction joints.

7 Reinforcement (re DIN 1045-3, 7)

7.1 General (re DIN 1045-3, 7.1)

(Addendum to DIN 1045-3, 7.1 (3))
(3) The origin and grade of the reinforcing steel shall be proven by the contractor in text form 4 weeks prior to placement.

7.2 Cutting, bending and welding of reinforcement (re DIN 1045-3, 7.2)

(Addendum to DIN 1045-3, 7.2 (4))
(4) The welding of reinforcing steel is only permitted in justified exceptional cases and requires the client’s approval.

7.3 Placement of reinforcement (re DIN 1045-3, 7.3)

(Addendum to DIN 1045-3, 7.3 (4))
(4) The concreting openings and vibration channels shown in accordance with DIN EN 1992-1-1/NA 2.8.2 (3) on the reinforcement plans shall be checked by the contractor with regard to the intended concrete technology, concrete placement and compaction, and any necessary adjustments must be coordinated with the client. Vibration channels and concreting openings shall be marked on site. DBV-3, Section 2.2, must be observed.

(Replacement of DIN 1045-3, 7.3 (5))
(5) Reinforcement shall be fixed and secured in such a way that its final position in the finished component remains within the tolerances laid down in this document. The positional securing of the reinforcement shall in principle be carried out using binding wire.

(Addendum to DIN 1045-3, 7.3 (7))
(7) Four spacers per square metre shall be installed, unless agreed upon otherwise in the specification of works. Spacers between the adjacent areas (e.g. formwork, subconcrete, construction pit support) must consist of cement-bound mortar or concrete. Their characteristics shall be at least equivalent to those of the surrounding concrete. Linear spacers must be arranged offset from one another.

(Addendum to DIN 1045-3, 7.3)
(11) S-hooks may only be used in combination with spacer brackets.

(12) The reinforcement shall be supported by suitable devices that must be dimensioned for the required work processes. The secure position of the reinforcement shall be demonstrated by static calculations.

9 Concreting (re DIN 1045-3, 9)

9.1 General (re DIN 1045-3, 9.1)

(Addendum to DIN 1045-3, 9.1 (2))
(2) The fresh concrete at the site of application and the hardened concrete in the component shall have the characteristics stipulated in the specification of works and the initial test.

(Addendum to DIN 1045-3, 9.1)
(4) For wall or column-type components with thicknesses < 0.3 m or very strongly reinforced components, a joint mixture with maximum grain size ≤ 16 mm shall be provided, see Part 2, 6.2.2 k).

(5) Immediately before the start of concreting and during concreting, formwork and its anchorages shall be checked by the contractor for their functionality.

(6) The use of surface retarders is not permitted in construction joints.

(7) The contractor shall ensure that, in the event mixing plants fail, the proposed concreting is still carried out.

9.2 Preparatory work (re DIN 1045-3, 9.2)

(Addendum to DIN 1045-3, 9.2 (3))
(3) In compliance with the concrete construction concept, the contractor shall submit a concreting plan to the client for coordination at least 3 working days prior to any concreting taking place. The concreting plan shall contain at least the information specified according to Annex 4. The concrete placement and compaction process shall be observed closely by hand. Where necessary, appropriate measures shall be envisaged for this purpose, such as lockable formwork openings and lighting devices.

9.3 Work before concreting (re DIN 1045-3, 9.3)

(Addendum to DIN 1045-3, 9.3 (1))
(1) The contractor shall check the arrangement of the construction joints (including all sealing elements) with regard to their intended construction process. In the event of changes, the effects on the planning in accordance with Parts 1, 9.1 (4) shall be taken into account. DBV-4 must be observed for the installation of injection hose systems. The injection hoses, as secondary sealing, shall always be grouted, and the latest possible grouting time shall be coordinated with the client. Injection hoses as a redundant seal are to be grouted where necessary after consultation with the client. The injection hoses shall be grouted using cement suspension, unless agreed upon otherwise in the specification of works. Polyurethane is only permitted in case of high water ingress and prior coordination with the client. Acrylate gels are not permitted as fillers.

(Addendum to DIN 1045-3, 9.3 (2))
(2) In order to achieve adequate bonding, the coarse grain framework of the concrete shall be exposed in the joint surfaces. The surface roughness and condition

- of unformed construction joints must, across the entire construction joint area, including the concrete cover to be applied subsequently, satisfy the requirements according to the 'interlocked' category as per DIN EN 1992-1-1, Section 6.2.5 (2), immediately prior to placement of the concrete. Assignment to the 'interlocked' requires a mean peak-to-valley height as per the sand patch method according to Kaufmann Rt ≥ 3.0 mm, or a maximum profile peak height Rp ≥ 2.2 mm, or at least 6 mm of the aggregate to be exposed when using an aggregate whose maximum grain size diameter ≥ 16 mm;
- of formed construction joints must, across the entire construction joint area, including the concrete cover to be applied subsequently, satisfy the requirements according to the 'coarse' category as per DIN EN 1992-1-1, Section 6.2.5 (2), immediately prior to placement of the concrete. Assignment to the 'coarse' category requires a mean peak-to-valley height as per the sand patch method according to Kaufmann Rt ≥ 1.5 mm, or a maximum profile peak height Rp ≥ 1.1 mm, or at least 3 mm of the aggregate to be exposed.
  Construction joint preparation to meet the specified requirements shall not start until the concrete has a minimum compressive strength of 5 N/mm².

(Replacement of DIN 1045-3, 9.3 (8), 1st indent)
(8) – For components where the smallest dimensions are < 0.8 m, the fresh concrete temperature at the site of application shall not exceed 30 °C and 25 °C for blinding concrete.

(Addendum to DIN 1045-3, 9.3 (9))
(9) The following applies to bulky components as well as to non-bulky components with surface-area constraints:

- Fresh concrete with a temperature > 25 °C at the site of application shall not be poured.

9.4 Acceptance and discharge of fresh concrete on site (re DIN 1045-3, 9.4)

(Replacement of DIN 1045-3, 9.4 (2))
(2) Mixer trucks or vehicles with agitators must be fully unloaded within 90 minutes, and vehicles without a mixer or agitator for the transport of concrete of a stiff consistency must be fully unloaded no later than 45 minutes, after water is first added to the cement. Measures for ensuring this shall be defined in the concrete construction concept.

(Addendum to DIN 1045-3, 9.4)
(5) Tests shall be carried out at the site of transfer and application in accordance with Table B.1 (new). If the tests according to Table B.1 (new) on fresh concrete do not yield satisfactory values, the concrete from this delivery shall be rejected or shall not be placed.

9.5 Conveying, placing and compacting (re DIN 1045-3, 9.5)

(Replacement of DIN 1045-3, 9.5 (7))
(7) The type and intensity of compaction shall be based on the consistency and, where appropriate, specific fresh concrete properties (e.g. air void content, segregation sensitivity).

Note: see, for example, BAW-MESB

(Addendum to DIN 1045-3, 9.5 (8))
(8) The structure of the hardened concrete in the component must be largely uniform. This requirement is fulfilled if the evaluation criteria set out in Section 4.3.5 of BAW-MESB are met.

(Addendum to DIN 1045-3, 9.5)
(18) The contractor shall ensure that, even in the event of failures (e.g. transport from the mixing plant to the construction site, or during transport from the delivery vehicle to the site of application, or during placement or compaction), the concreting section in question is completed in accordance with the requirements. If concrete pumps are used, it must be possible to use a replacement pump of the same capacity within 30 minutes in the event of a concrete pump failure.

(19) The concrete shall be placed in horizontal layers of equal thickness fresh-on-fresh; the thickness of the individual layers should generally not exceed 0.5 m.

(20) External shakers are only permitted when used simultaneously with internal shakers.

(21) During concreting work, a representative of the contractor with proven advanced concrete technology training (the so-called ‘E Certificate’) shall be present on site and supervise the concrete installation.

(22) Horizontal or slightly inclined surfaces of components shall be levelled off, as far as possible, with vibrating beams.

(23) Before surface treatment, the concrete shall always be re-compacted.

(24) If blinding concrete is placed ‘fresh-in-fresh’ according to ZTV-W LB 215, Part 1, 9.1 (5), suitable measures shall be taken to ensure that the blinding concrete of the top 0.2 m does not mix with the concrete below the blinding concrete.

9.6 Curing and protection (re DIN 1045-3, 9.6)

(Addendum to DIN 1045-3, 9.6 (4))
(4) Immediately after concreting, the surface of the construction joints shall be cured in accordance with Table 3.

(Replacement of DIN 1045-3, 9.6 (7) to (16))
(7) Table 3 shall apply to the determination of the duration of curing. Further curing beyond the minimum duration of remaining in the formwork in accordance with Table 3 is not required:
- when using water-discharging formwork liners;
- for formed concrete surfaces exclusively exposed to exposure classes XC1 or XC2 and covered with soil after completion of the component.

Table 3: Minimum duration of concrete curing

Strength development of the concrete [c] $r = f_{cm,2}/f_{cm,x}$ (x = 28, 56, 91)			
$r \geq 0.50$ (quick)	$r \geq 0.30$ (medium)	$r \geq 0.15$ (slow)	$r < 0.15$ (very slow)
Minimum total curing duration in days [a), b), d)]			
4	10	14	21
Of which minimum curing duration in the formwork for formed concrete surfaces [b)]			
2	5	7	10

[a)] For more than 5 h processing time, the curing duration shall be extended accordingly.
[b)] At temperatures below 5 °C, the curing duration shall be extended by the time during which the temperature was below 5 °C.
[c)] The strength development of the concrete is described by the ratio of the mean values of the compressive strengths $f_{cm,2}/f_{cm,x}$ (x = 28, 56, 91) determined during the initial test.
[d)] For concrete surfaces exposed to wear corresponding to exposure classes XM2 and XM3, the minimum total curing duration shall be doubled. The maximum value for the minimum duration is 30 days.

(Replacement of DIN 1045-3, 9.6 (17))
(17) Curing agents are not permissible:
- in construction joints;
- on surfaces to be further treated;
- on surfaces where a bond to other building materials is required,
- on surfaces with aesthetic requirements (exposed concrete and other visible surfaces),
- on surfaces exposed to water,
- on interior surfaces.

The application of curing agents in the spraying process is not permitted. The application of curing agents to the remaining concrete surfaces shall be coordinated with the client. The suitability of the curing agents and their compatibility with the substrate (separating agents) shall be demonstrated.

(Addendum to DIN 1045-3, 9.6 (20))
(20) In the case of bulky wall-like or similar components, the sum of the fresh concrete temperature $T_{concrete}$ and the adiabatic temperature increase $\Delta T_{adiab,7d}$ (see Part 2, 5.2.9 (5)) of the concrete shall not exceed 68 °C. For bulky bottoms or similar components, the sum shall not exceed 61 °C.

(Addendum to DIN 1045-3, 9.6 (22))
(22) For blinding concrete, provided that complete freezing of the concrete can be precluded, thermal insulation of the component surfaces is not permitted in the ‘fresh-on-firm’ execution variant. In both versions, the blinding surface shall be protected from evaporation immediately after the concreting has been completed. To reduce heating due to solar radiation, the blinding surface shall be covered with a light-coloured or reflective sheet.

(Addendum to DIN 1045-3, 9.6)
(23) If the daily average temperature is < 10 °C and there is a difference of > 10 K between the fresh concrete temperature and the ambient temperature during the first three days, as well as always in the case of a risk of frost exposure to the component surface, thermal curing of the free surfaces is required. The duration of the thermal curing shall be chosen analogously to the minimum formwork times set out in Table 3.

9.9 Verification of executed work (re DIN 1045-3, 9.9)

(Addendum to DIN 1045-3, 9)
(1) The hardened concrete surface area shall have a surface tensile strength of at least 1.5 N/mm². If there is any doubt as to compliance with this requirement, appropriate checks must be carried out by the contractor in the presence of the client. The location and number of tests shall be determined by the client.

11 Dimensional tolerances (re DIN 1045-3, 11)

11.1 General (re DIN 1045-3, 11.1)

(Addendum to DIN 1045-3, 11.1 (5))
(5) Unless agreed upon otherwise in the specification of works, the following requirements apply to the flatness tolerances:

- The flatness deviation of the top side of lock and weir bottoms shall comply with DIN 18202, Table 3, line 1.
- The flatness deviation of traffic areas (e.g. lock blinding, operating rooms, quay) shall comply with DIN 18202, Table 3, line 3.
- The flatness deviation of vertical surfaces and undersides of ceilings shall comply with DIN 18202, Table 3, line 6.

11.4 Cross-sectional deviations (re DIN 1045-3, 11.4)

(Addendum to DIN 1045-3, 11.4)
(4) The concrete cover on the finished component of formed and free component surfaces may exceed the nominal dimension c_{nom} by no more than 20 mm.

Annex B Tests for the relevant fresh and solid concrete properties (re DIN 1045-3, Annex B)

B.1 General (re DIN 1045-3, B.1)

(Replacement of DIN 1045-3, Annex B.1 (2))
(2) For designed concrete, the additional tests according to Table B.1 (new), columns 6 and 7 shall be carried out when using ready-mixed concrete and site-mixed concrete transported by ready-mixed concrete vehicles. For ready-mixed concrete and site-mixed concrete that is transported in other ways, rules that ensure a comparable level of quality shall be drawn up and coordinated with the client.

(Addendum to DIN 1045-3, Annex B.1)
(4) The principle of groups of concrete may not be applied.

Table B.1 (new): Scope and frequency of additional tests for designed concrete

	1	2	3	4	5	6	7
	Subject	Test procedures	Requirement	Frequency for monitoring class		Supplementary testing	
				ÜK1	ÜK2	Transfer Point	Site of application
Fresh[c] and solid concrete properties							
1	Delivery note	Visual inspection	Compliance with ZTV-W LB 215	Each delivery vehicle		-	-
2	Consistency[a]	Visual inspection	1)	1)	1)	-	Each delivery vehicle
		DIN EN 12350	As specified in ZTV-W LB 215	1)	1)	Air-entrained concrete: Each delivery vehicle Concrete without air entrainment: The first five delivery vehicles and for every subsequent fifth delivery vehicle	Air-entrained concrete: The first 10 delivery vehicles, then every 10th delivery vehicle and in cases of doubt Concrete without air entrainment: At the start of concreting and in cases of doubt
3	Fresh concrete temperature	Temperature measurement	As defined in ZTV-W LB 215, Part 3, 9.3 (8) and 9.3 (9)	1)	1)	For fresh concrete testing	For fresh concrete testing
4	Fresh concrete bulk density of lightweight and heavy concrete	DIN EN 12350-6 with the air pot	Analogous to the initial test	1)	1)	Also for normal concrete when determining the w/c ratio	Also for normal concrete when determining the air content with the air pot and when producing test specimens, and in cases of doubt
5a)	Air content of air-entrained concrete	DIN EN 12350-7, Section 6	As specified in ZTV-W LB 215, Part 2, 5.4.3 for the site of application and in accordance with ZTV-W LB 215, Part 2, 9.5 (1a) at the site of transfer	1)	1)	Each delivery vehicle	The first 10 delivery vehicles, then every 10th Delivery vehicle and in cases of doubt [a]
5b)	Hollow microsphere content	ASTM C173	As specified in the initial test	-	-	The first five delivery vehicles and for every subsequent fifth delivery vehicle	When concreting begins and twice during concreting and in cases of doubt
6	Uniformity of the concrete	Visual inspection	Homogeneous appearance	1)	1)	-	-
		Comparison of characteristics	Samples must have the same characteristics	1)	1)	-	-

	1	2	3	4	5	6	7
	Subject	Test procedures	Requirement	Frequency for monitoring class		Supplementary testing	
				ÜK1	ÜK2	Transfer Point	Site of application
7	Compressive strength [b)]	DIN EN 12390-3	As specified with the acceptance criteria according to DIN 1045-3, Section B.2	1)	1)	-	According to ZTV-W LB 215, Part 3, Section B.2
8a	Water/cement ratio	ZTV-W LB 215, Part 2, 5.4.2 (4)	As specified	-	-	The first two delivery vehicles, followed by every subsequent 10th delivery vehicle and in cases of doubt	-
8b	Water penetration depth	DIN EN 12390-8	As specified in ZTV-W LB 215, Part 2, 5.5.3 (1)	-	-	-	1 sample for a maximum of 300 m³ or 3 concreting days; the requirement with the largest number of samples shall be the decisive one; sampling is carried out in accordance with B.2 (4)
8c	Frost resistance XF3	BAW-MFB, CIF test		-	-	-	1 test series during the construction period
8d	Freeze-thaw resistance with de-icing salts XF4	BAW-MFB, CDF test		-	-	-	1 test series during the construction period
8e	Concrete structure segregation	BAW-MESB	BAW-MESB 4.3.5	-	-	-	In cases of doubt, core sampling on the component in accordance with 5.3.3 (3)
Technical equipment							
9	Compactors	Functional check	Flawless operation	1)	1)	-	-
10	Measurement and laboratory equipment	Functional check	Sufficient accuracy of measurements	1)	1)	-	-

1) as in DIN 1045-3, Table B.1
[a)] depending on the test method chosen
[b)] for the production, storage and testing of samples, DIN 1045-2:2023-08, 5.5.1.2 applies.
[c)] for each concreting section, each type of concrete and each supply plant

B.2 Acceptance test for concrete compressive strength (re DIN 1045-3, B.2)

(Replacement of DIN 1045-3, Annex B.2, Note 1)
Comment 1: Concretes with the same starting materials, the same water/cement ratio (including, where appropriate, additives) and observing the permissible tolerances for dosing the starting materials, but with a different maximum grain size or different consistency shall not be considered to be a single concrete.

(Replacement of DIN 1045-3, Annex B.2, (7))
(7) If proof according to DIN 1045-3, B.2, paragraph (6) cannot be furnished, the client must be notified immediately. The contractor shall take suitable measures agreed upon with the client on a case-by-case basis. An assessment of the concrete compressive strength on the structure or parts of the structure may then be carried out according to DIN EN 13791 in combination with

DIN EN 13791/A20. The use of non-destructive test methods (e.g. rebound hammer) is not permitted.

Annex C Monitoring class 2 – Monitoring of the placement of concrete by the construction company (self-monitoring) (re DIN 1045-3, Annex C)

C.2 Documentation (re DIN 1045-3, C.2)

(Addendum to DIN 1045-3, Annex C.2 (2))
(2) After completion of the concreting work, or upon special request, the client shall promptly be given a summary and evaluation of the tests that have been carried out, including statistics.

(Addendum to DIN 1045-3, Annex C.2)
(3) All supporting documents shall be kept separately for each concrete.

Part 4
Precast concrete products – General rules

The requirements for precast parts shall be defined on a project-specific basis. The requirements of ZTV-W LB 215 must be observed accordingly.

Compilation of regulations and documents cited

ASTM C-173/ C-173M	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
BAW-MAB	Code of Practice ‘Sealing expansion joints (MAB)’, Federal Institute for Hydraulic Engineering, Karlsruhe
BAW-MATB	Code of Practice ‘Determination of adiabatic temperature increase in concrete (MATB)’, Federal Institute for Hydraulic Engineering, Karlsruhe
BAW-MBM	Code of Practice ‘Construction and maintenance of solid hydraulic structures in marine environments (MBM)’, Federal Institute for Hydraulic Engineering, Karlsruhe
BAW-MDCC	Code of Practice ‘Durability design and evaluation of reinforced concrete structures in the case of carbonation and chloride exposure (MDCC)’, Federal Institute for Hydraulic Engineering, Karlsruhe
BAW-MESB	Code of Practice ‘Segregation sensitivity of concrete (MESB)’, Federal Institute for Hydraulic Engineering, Karlsruhe
BAW-MFB	Code of Practice ‘Frost resistance testing of concrete (MFB)’, Federal Institute for Hydraulic Engineering, Karlsruhe
BAW-MRZ	Code of Practice ‘Limitation of crack widths resulting from forces in massive hydraulic structures (MRZ)’, Federal Institute for Hydraulic Engineering, Karlsruhe
BAW-MBB	Code of Practice ‘Secondary concrete’, Federal Institute for Hydraulic Engineering, Karlsruhe
BMVI-AKR	BMVI Ordinance, Federal Waterways and Shipping Agency re: DAfStb-RL AKR, DAfStb Guideline ‘Measures to prevent harmful alkali reactions in concrete (Alkali Guideline)’ in its latest version, at the time of publication of ZTV-W LB 215, 2025: WS 12/5257.6/2, Bonn, 19 June 2015
DAfStb-RL MB	Guideline ‘Solid concrete structural elements’
DAfStb-RL AKR	Guideline ‘Measures to prevent harmful alkali reactions in concrete’
DAfStb-RL VZB	Guideline for concrete with extended processing time (slow setting concrete)
DBC	Information document ‘Manufacture of air-entrained concrete’ of Deutsche Bauchemie e.V.
DBV-1	DBV Code of Practice ‘Special methods for testing fresh concrete’
DBV-2	DBV/VDZ Code of Practice ‘Exposed concrete’
DBV-3	DBV Code of Practice ‘Constructibility of concrete and reinforced concrete structures’
DBV-4	DBV Code of Practice ‘Injection hose systems and deposits subject to swelling for construction joints’
DE-ZU 178	Biodegradable lubricants and hydraulic liquids – DE-ZU 178. RAL gGmbH, Bonn
DIN 1045-2	Concrete, reinforced and prestressed concrete structures – Part 2: Concrete
DIN 1045-3	Concrete, reinforced and prestressed concrete structures – Part 3: Construction work

DIN 488-1	Reinforcing steel: Grades, properties, marking
DIN 1164-10	Special cement – Part 10: Composition, requirements, proof of conformity
DIN 4074-1	Sorting of wood by load capacity – Part 1: Coniferous wood
DIN 7865-1:2022-08	Elastomer waterstops for sealing joints in concrete – Part 1: Shapes and dimensions
DIN 7865-2:2022-08	Elastomer waterstops for sealing joints in concrete – Part 2: Material specifications and testing
DIN 7865-3:2020-08	Elastomer waterstops for sealing joints in concrete – Part 3: Scope of use
DIN 7865-5:2022-08	Elastomer waterstops for sealing joints in concrete – Part 5: Conformity assessment
DIN 18197:2018-01	Sealing of joints in concrete with waterstops
DIN 18202	Tolerances in building construction - Buildings
DIN 18218	Pressure of fresh concrete on vertical formwork
DIN 18331	Construction tendering and contract regulations – Part C: General Technical Terms of Contract for Construction Works (ATV) – Concrete works
DIN 19700-13	Dams and weirs - Part 13: Barrages
DIN 19702	Solid structures in hydraulic engineering – Bearing capacity, serviceability and durability
DIN EN 196-8	Methods of testing cement – Part 8: Heat of hydration, solution method
DIN EN 196-11	Methods of testing cement – Part 11: Heat of hydration – Isothermal heat conduction calorimetry method; German version EN 196-11:2018
DIN EN 197-1	Cement – Part 1: Composition, specifications and conformity criteria for common cements
DIN EN 1097-1	Methods of testing the mechanical and physical properties of aggregates – Part 1: Determination of the resistance to wear (Micro-Deval)
DIN EN 1097-6	Methods of testing the mechanical and physical properties of aggregates – Part 6: Determination of particle density and water absorption
DIN EN 1990	Basis of structural design, including National Annex
DIN EN 1992-1-1+NA	Design of reinforced concrete and prestressed concrete structures, Part 1-1, General design rules and rules for buildings, including National Annex
DIN EN 12390-3	Testing hardened concrete – Part 3: Compressive strength of sample specimens
DIN EN 12390-7	Testing hardened concrete – Part 7: Density of hardened concrete
DIN EN 12390-8	Testing hardened concrete – Part 8: Depth of penetration of water under pressure
DIN EN 12390-13	Testing hardened concrete – Part 13: Determination of secant modulus of elasticity in compression
DIN EN 12620	Aggregates for concrete; German version EN 12620
DIN EN ISO 17660	Welding – welding of reinforcing steel
FGSV-818	Fact sheet for the production and processing of air-entrained concrete

ZTV-ING	Additional technical terms of contract and guidelines for civil engineering works
ZTV-W LB 219	Additional technical terms of contract – hydraulic engineering for the protection and repair of concrete components of hydraulic structures, performance category 219

Annex 1: Hydraulic engineering-specific examples of exposure classes

(Addendum to DIN EN 1992-1-1, Table 4.1 and DIN 1045-2, 4.1, Table 1)

Class designation	Description of the environment	Additional examples specific to hydraulic engineering[1)] For the assignment of exposure classes (informative)
1 No risk of corrosion or attack		
X0	Components without reinforcement or embedded metal in a non-concrete-aggressive environment	Unreinforced core concrete in zoned construction
2 Reinforcement corrosion, triggered by carbonisation		
XC1	Dry or constantly wet	Bottoms of lock chambers, water-saving chambers or weirs, lock chamber walls below tailwater, hydraulic filling and emptying systems
XC2	Wet, rarely dry	Lock chamber walls in the zone between tailwater and headwater (and, by analogy, water-saving chamber walls)
XC3	Moderate humidity	Surfaces not freely exposed to the weather (surrounding air, protected from precipitation)
XC4	Alternately wet and dry	Freeboard of lock chamber or water-saving chamber walls, weir piers above low water, external surfaces freely exposed to the weather, quays
3 Reinforcement corrosion caused by chloride, except for seawater		
XD1	Moderate humidity	Weir pillars in the spray-affected zone on road bridges
XD2[2)]	Wet, rarely dry	Watercourses with chloride exposure (e.g. due to industrial discharge)
XD3[2)]	Alternately wet and dry	Blinding layers of locks, traffic areas (e.g. transshipment quays of inland ports), steps next to weir piers
4 Reinforcement corrosion caused by chloride from seawater		
XS1	Salty air, but no direct contact with seawater	External components near the coast
XS2	Underwater	Bottoms of lock chambers, water-saving chambers or weirs, lock chamber walls below tailwater (e.g. MLWL), hydraulic filling and emptying systems
XS3	Tidal areas, water splash and spray zones	Quays, jetties and lock chamber walls in the area between tailwater and headwater (e.g. MLWL and MHWL)
5 Freeze-thaw attack with or without de-icing agents/seawater		
XF1	Moderate water saturation with fresh water without de-icing agents	Freeboard of water-saving chamber walls, weir piers above high water
XF2	Moderate water saturation with seawater and/or de-icing agents	Vertical components in the water splash zone and components in the direct spray zone of seawater

Class designation	Description of the environment	Additional examples specific to hydraulic engineering[1)] For the assignment of exposure classes (informative)
XF3	High water saturation with fresh water without de-icing agents	Lock chamber walls between tailwater-1.0 m and headwater+ 1.0 m (water-saving chamber walls by analogy), in- and outflow zones culverts between low water and high water, arrows between low water and high water
XF4	High water saturation with seawater and/or de-icing agents	Vertical surfaces of seawater components such as foundation piles, quays and jetties in the fluctuating water level zone, horizontal surfaces exposed to seawater, blinding layers of locks, traffic areas (e.g. port areas), steps next to weir piers
6 Concrete corrosion through chemical attack		
XA1	Slightly aggressive chemical environment	
XA2	Moderately aggressive chemical environment and marine structures	Concrete components that come into contact with seawater (tailwater, water level fluctuation zone, water splash zone)
XA3	Highly aggressive chemical environment	
7 Concrete corrosion through wear stress		
XM1	Moderate wear stress [3)]	Surfaces with stress caused by friction from ships (e.g. lock chamber walls above tailwater-1.0 m), components for converting energy with stress only from fine-grained sediment load (e.g. due to constructive measures such as the upstream installation of a sediment trap), ice drift
XM2	High wear stress	Components for converting energy with stress from coarse-grained sediment load such as weir sills, stilling basins, baffling structures, including the adjacent vertical components up to a height of at least 1 m
XM3	Very high wear stress	Components in mountain streams or sediment-load deflection tunnels
8 Concrete corrosion due to alkali silica reaction		
WO	Concrete that does not damp for an extended time after normal curing and remains mostly dry during use after drying out.	In general: Only for non-bulky components (smallest component dimension ≤ 0.80 m). Internal components of hydraulic structures that are not constantly exposed to a relative humidity of more than 80% (e.g. interior spaces of steering stations).
WF	Concrete that is frequently wet during use or for an extended period of time.	In general: Always for bulky components (smallest component dimension > 0.80 m) regardless of humidity exposure. Concrete components of hydraulic structures exposed to the effects of the weather or subjected to temporary or permanent water exposure in inland areas (e.g. entire height of lock chamber walls). Internal components of hydraulic structures where the relative humidity largely exceeds 80%.
WA	Concrete that, in addition to the exposure in class WF, is more frequently exposed or exposed for a longer period to the influx of alkalis from the outside.	Concrete components of hydraulic structures that come into contact with seawater (tailwater and water level fluctuation zone, water splash zone). Concrete components of hydraulic structures with de-icing salt (e.g. blinding concrete areas of lock chamber walls).

1) These examples apply to the predominant load state over the useful life.
2) Also applicable to exposure from flowing waters, impounded waters or groundwater with a chloride content exceeding 2 000 mg/l.
3) Lock chamber bottoms and filling systems that are not exposed to stress as a result of sediment loads (such as in navigation canals) are generally not subjected to concrete corrosion due to hydroabrasion.

Annex 2: Concrete construction concept

(Replacement of DIN 1045-1000, A.2.2.1) (4))

1 General points

a) definition of leads and contributors;

b) definition of responsibilities and contact persons;

c) reconciliation of planning assumptions with the intended construction (e.g. concreting section heights and lengths, compressive strength classes);

d) timelines for the creation and updating of the concrete construction concept (e.g. logistics concept for concrete transport, conveying and placement, boundary conditions for carrying out initial tests, submission of concreting plans).

2 Planning requirements

a) project-specific quality assurance plan/quality assurance measures;

b) joint design;

c) requirements for concrete surfaces, possibly sample areas for exposed concrete, if required;

d) concretability, information on trial concrete placements (e.g. mock-ups);

e) planned concreting sequences.

3 Information for concrete production and delivery

a) planned supply plants, including substitute suppliers; capacity of mixing installations (in normal operation and during heating/cooling), ensuring the required concreting capacity;

b) delivery periods; time-dependent delivery quantities, handling the 90-minute rule;

c) component-specific specifications of concrete;

d) proofs to be submitted (e.g. initial test), special proofs for additional tests (e.g. frost resistance, prestressed concrete, slipforming, cantilever construction), concept for ensuring compatibility when different types of concrete are used together (within a component or in adjacent components);

e) requirements for fresh concrete temperature at the transfer point to ensure compliance with fresh concrete temperature at the site of application (see Part 2, 5.2.9 (3));

f) measures to maintain fresh concrete temperatures in bulky components, e.g. shading of aggregate, cement temperature;

g) concept for determining the concrete acceptance test (type of test, acceptance criteria, including allowances to ensure the required fresh concrete properties at the site of application);

h) information on additional test and evaluation procedures for quality control of fresh and hardened concrete properties (e.g. air content in fresh concrete);

i) concrete transport, transport time, concrete handover;

distances and time required for the transport of concrete between mixing installations and construction sites and between substitute mixing installations and construction

sites, obstacles on the transport or substitute route, e.g. rail-level crossings, longer uphill sections, town passages, detours, ferries;
for on-site installations: supply and storage of starting materials (capacities, cement types/fly ash, mixing water, admixtures);

j) special building materials or concrete starting materials (e.g. with general building inspectorate approval);

k) special technologies;

l) list of concretes:
   - sorted by component/use;
   - concrete compositions, including the results of the initial test;
   - fresh and solid concrete properties;
   - exposure classes;
   - quantities of concrete required;

m) if necessary, further information, e.g. deformation-sensitive components;

n) a check of the starting materials
   The results of the monitoring of all starting materials by the recognised monitoring bodies, and, in the case of aggregates, the results of the in-house production control, are to be presented to the client on an ongoing basis.

o) measures in the case of component temperatures in the permissible limit range.

4 Information for concrete pouring

a) the formwork concept (this includes the formwork sample plan, formwork times, anchorage, anchor cone seals, release agents, formwork checks, cast-in items) shall be coordinated with the client before the start of formwork activities;

b) planned measures to comply with the agreed tolerances;

c) seasonally required measures (summer/winter concretes, special curing measures, special protective measures);

d) rules on joint mixtures;

e) concrete-relevant construction site logistics (performance of the tests in the context of concrete acceptance, conveying on the construction site, type of placement, concrete compaction, surface finishing);

f) construction joint preparation and formation;
   - curing of construction joints;
   - construction joint preparation (accessibility, procedures, timing, removal of water and excavated material, protection against further contamination);
   - sealing elements (type, number, installation location, positional securing, protection during construction, butt joint execution, etc.);
   - cleaning prior to concreting (accessibility, procedures, openings/pump sumps for removing water, waste, erosion material, etc.);

g) formwork removal time, curing of formed and unformed surfaces, including suitability and compatibility of the curing agents;

h) processing test, pump test, if applicable;

i) concreting plans in accordance with Annex 4;

j) type, number and arrangement of spacers and supports;

k) formation of expansion joints, waterstop system plan (for layout of expansion joints);

l) list of components;
   - sorted by type of component, e.g. diaphragm wall, bottom, walls, etc.;
   - static loading and construction sequence requirements (when will which characteristics be needed, 2/7/28/56 day values, pressure, water impermeability, frost resistance, other);
   - placement quantities, placement times (m^3 concrete per hour, number of plants, vehicles, concrete pumps, personnel, etc.);
   - concrete placement, compaction (consistency requirements, type of placement and compaction, concreting sections, concreting openings, vibration channels, climbing speed, reinforcement density);
   - requirements for concrete surfaces;
   - type of formwork, falsework, release agents;
   - use of precast or partially precast parts;
   - requirements for construction joints;
   - indication of the target value for consistency;

m) measures in the case of component temperatures in the permissible limit range.

Annex 3: Initial testing (re DIN 1045-2, Annex A)

A.1 General

(Replacement of A.1 (2))
(2) The initial test is to demonstrate that all requirements specified for fresh concrete and hardened concrete for a concrete composition are met. It is not permitted to dispense with initial testing due to the availability of existing test results or long-term experience.

A.3 Frequency of initial tests

(Replacement of A.3 (2))
(2) At the time concrete placement work starts, the initial test may not date back more than 12 months. If the concrete has not been used for the construction project in question within 12 months, the initial testing must be carried out again. The contractor is obliged to carry out new initial tests if the starting materials of the concrete (type, manufacturer, place of extraction) or the conditions on the construction site or the specified requirements are to be changed.

A.5 Criteria for the acceptance of initial tests

(Addendum to A.5 (1))
(1) If initial testing is conducted in a laboratory using a laboratory mixer, the fresh concrete tests in accordance with Parts 2, 9.5 (1b), ii) and vi) and the tests for proof of compressive strength (28 days and any agreed detection age) shall also be carried out with concrete samples taken at the supply plant. If concrete with the same starting materials and the same composition from multiple suppliers is used, the consistency and air content tests, as well as the test of the water/cement ratio in accordance with A.4, Part 2, 9.5 (1b), ii) and vi), and the tests for proof of compressive strength (28 days and any agreed detection age) shall also be carried out with concrete samples from each supply plant.

(Addendum to A.5)
(7) If concrete with different starting materials and composition from multiple supply plants is used, all tests according to A.5 (1) shall be carried out for each individual supplier. The compatibility of the concretes when used in a component shall be ensured. In particular, the compatibility of the concretes with regard to an alkaline-silica acid reaction in accordance with ZTV-W LB 215, Part 2, 5.2.3.5 (2) must be taken into account if the concretes are used in a component. The implementation must be described in the concrete construction concept.

Annex 4: Concreting plan

The concreting plan must contain at least the following information:

a) Timetable
   - concreting duration and time;
   - interruptions.

b) Component
   - installation location with height;
   - associated drawings;
   - requirements according to static loading and building sequence (when will which characteristics be needed, 2/7/28/56-day values, pressure, water impermeability, consistency, other);
   - installation quantities, installation times (capacity calculations, m³ concrete per hour, number of plants, vehicles, concrete pumps, personnel, etc.);
   - concrete placement, compaction (consistency requirements, type of placement and compaction, concreting sections, reinforcement content, 0-32 or 0-16, maximum climbing speed, maximum concrete layer height);
   - requirements for concrete surfaces, type of formwork, use of precast or partially precast parts;
   - manufacture of construction joints and expansion joints.

c) Concrete
   sorted by components/use/placement sequence;
   - requirements (strength, water impermeability, frost resistance, temperature, monitoring category);
   - fresh concrete properties, other characteristics.

d) Consideration of the effects of the weather
   - measures to comply with the admissible fresh concrete temperature;
   - concreting at low temperatures/frost (aggregates, concreting on frozen components, thin components, monitoring component temperature);
   - influence of weather conditions on concrete technology (consistency, hardening, air void space);
   - sufficient processing capability (addition of retarding agents).

e) Personnel plan (per layer of concrete)
   - concrete placement/concrete production;
   - supplying the concrete;
   - conveying the concrete;
   - concrete curing;
   - internal monitoring, concrete testing;
   - proof of special capacity for monitoring category 2;
   - documentation of concreting.

   The personnel deployment plan shall list the proposed personnel by name and show the various qualifications.

f) Concrete production
   - list of supply plants.

g) Concrete placement
   - specification of placement quantities, placement times, placement layers;
   - work instructions for placement and compaction, conveying and curing.

h) Concrete conveyance

- pumping plan;
- substitute equipment;
- spotters.

i) Monitoring of concreting
   - type and scope of fresh concrete tests;
   - type and scope of hardened concrete tests;
   - hardening tests (e.g. at low temperatures).

j) Development of heat, measurement monitoring
   - monitoring temperature differences, measurement programme, defining measurement points.

k) Curing plan
   - type of curing (formwork, mats, liquid curing) agents;
   - curing duration (depending on concrete formula, weather, etc.);
   - timing of curing measures;
   - timing of the work on the construction joints.

l) Measures in the event of problems
   - failure of machinery and equipment during concrete production, supply and conveyance (mixing installation, vehicles, concrete pump, compactors, etc.).