Bundesanstalt für Wasserbau

Kompetenz für die Wasserstraßen

BAW Code of Practice

Secondary concrete (MZB)

2025 Edition

EU Notification No 2025/0253/DE

Note:

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)

Kompetenz für die Wasserstraßen

BAW Codes of Practice, Recommendations and Guidelines

Publisher

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Amendments

Compared to the BAW code of practice on secondary concrete, 2012 edition, the following changes have been made:

(a) Adaptation to current regulatory situation (e.g. DIN 1045:2023, ZTV-W LB 215/219)

(b) Consideration of DBV Code of Practice 'Injection hose system' (DBV-2)

(c) Consideration of new BAW codes of practice (BAW-MBM, BAW-MDCC)

(d) Additions of the examples in Annex 1

Previous editions

BAW Code of practice on secondary concrete, 2007 edition, ISSN 2192-5380

BAW Code of practice on secondary concrete, 2012 edition, ISSN 2192-5380

Application instructions

This code of practice contains recommendations for the design, approval and execution planning and – insofar as the code is agreed as an integral part of the construction contract – contractual regulations for the execution planning and construction of secondary concrete.

Where this code of practice is referred to in the building contract, the paragraphs marked with a right-hand indent shall become an integral part of the building contract.

The standard texts provided in STLK LB 215 may be used for the tendering of secondary concrete works as part of new construction works. The standard texts contained in STLK LB 219 may be used for the tendering of secondary concrete works in the scope of maintenance works as per ZTV-W LB 219.

1 Notes

When deciding on the use of secondary concrete, fundamental aspects as well as component-specific boundary conditions must be taken into account.

The advantages of execution with primary concrete include:

- Elimination of the interface problem between primary and secondary concrete
- Avoidance of complex installation situations
- Elimination of the effort associated with joints between primary and secondary concrete
- simpler reinforcement configuration
- reduced formwork effort
- shorter construction time
- no offset problem in the component surface
- uniform concrete surface
- Manufacture of a homogeneous component

- As a rule, more economical, provided that the primary concrete solution is technically possible and the installation tolerances of the steel components required to ensure the proper functioning of the system are achievable

The advantages of using primary and secondary concrete include:

- difficult installation situations (installation, compaction, high built-in parts, potential separation with cathodic corrosion protection (CCP) of steel components, etc.) can be controlled in a targeted manner
- higher accuracy requirements are feasible
- less complex load-bearing scaffolding required for built-in parts
- fresh and solid concrete properties can be adapted to relevant requirements
- temporal decoupling of solid construction – hydraulic steel construction/mechanical engineering
- possibility of optimising the concrete properties in areas on the steel water component where force is applied

For very complex secondary concrete situations, the construction contract should stipulate that the contractor must demonstrate the suitability of the building materials and construction methods chosen through a suitability test at a scale of 1:1. For this purpose, items shall be provided in the specifications and appropriate assessment criteria shall be defined.

Special requirements for dimensional tolerances are to be agreed in the construction contract. The contract shall also indicate how the manufacturing tolerances of the different trades are combined. As part of the concrete construction concept, this information must be updated by the contractor and agreed with the client in accordance with the building technology requirement (see Section 4).

2 Scope

This code of practice applies to the addition of mortar or concrete to concrete components of hydraulic structures for the integration of steel components and for the connection of bearings and machines. Such additions to concrete components are hereinafter referred to as 'secondary concrete' regardless of the size of the aggregate.

This code of practice applies only to secondary concrete produced in conjunction with construction work in accordance with ZTV-W LB 215 or ZTV-W LB 219.

This code of practice does not regulate the requirements for steel components to be integrated. For this purpose, separate regulations (e.g. ZTV-W LB 216, ZTV-W LB 218, ZTV-W LB 220) must be observed.

3 Basic principles

Secondary concrete should only be provided if the production of a component in primary concrete is not possible from a technical point of view or is not reasonable from an economic point of view.

Secondary concrete must be dimensioned and constructed in such a way that the stresses from loads can be demonstrably absorbed.

Forced loads shall be minimised by appropriate concrete technology measures (in particular to reduce shrinkage of secondary concrete). With regard to crack width limitation, provision must be made, where appropriate, for design reinforcement.

Special attention must be paid to the sedimentation and blood behaviour of the secondary concrete, taking into account the installation situation.

The secondary concrete must be suitable for the component-relevant exposure classes. Secondary concrete must meet at least all the requirements imposed on the primary concrete.

An impermeable bond must be made between the primary and secondary concrete. The requirements in the specifications must be observed when using injection hose systems as additional joint sealing.

Only the following may be used as secondary concrete:

- concrete according to ZTV-W LB 215 or ZTV-W LB 219, Section 3, or
- self-compressing concrete in accordance with DIN 1045-2, or
- grouting concrete or grouting mortar according to DAfStb guideline ‘Production and use of cement-bound grouting concrete and grouting mortar’ (Grouting Concrete Guideline)

Products which do not comply with the aforementioned regulations must be approved on a case-by-case basis by the competent highest construction inspectorate.

Concrete should preferably be used according to ZTV-W LB 215 or according to ZTV-W LB 219, Section 3. Planning and execution must be based on this.

If, due to the special installation situation, it is not possible to pour concrete in accordance with ZTV-W LB 215 or ZTV-W LB 219 into the entire filling space and/or to achieve sufficient compaction, self-compacting concrete in accordance with DIN 1045-2 or potting concrete/potting mortar in accordance with the potting concrete directive must be used as secondary concrete. By way of derogation from the grouting concrete guideline, grouting concrete/grouting mortar may also be used for XF4 and XM exposures if suitability is proven on a project-specific basis.

The requirements of hydraulic steel construction (e.g. position accuracy, corrosion protection, potential separation of the reinforcement in cathodic corrosion protection systems) must be observed.

4 Concrete construction quality [CCQ] requirements

Secondary concrete according to this code of practice is generally to be classified in CCQ-S incl. all subclasses (PK-S, BK-S, AK-S). For CCQ tendering and implementation discussions, the information provided in the ZTV-W LB 215 applies.

In addition, the person responsible for construction site logistics must always be consulted for CCQ implementation discussions – initial discussions as well as discussions on CCQ implementation and on construction progress. This person is responsible for the provision of all necessary building materials and components at the installation site.

In the CCQ call for tenders according to ZTV-W LB 215, the installation distances between built-in part and secondary concrete must also be discussed. Furthermore, the necessary installation tolerances and the necessary measures must be discussed. The above points are to be included in the provisional concrete construction concept.

For CCQ implementation discussions and initial discussions, the contractor must check the feasibility of implementation, taking into account its installation technology, and update the concrete construction plan.

In CCQ implementation discussions and construction progress discussions, the persons responsible for the installation components must always be involved. In addition to the points mentioned in ZTV-W LB 215, the following topics are to be addressed:

- Coordination with the construction process
- Coordination of reinforcement installation and positioning of built-in parts
- Coordination of additional works (e.g. installation of CCP systems, installation and connection of earthing)
- Coordination regarding formwork and any necessary compaction
- Changes in access routes and transport options for concrete and built-in part(s)

5 Planning

5.1 General

In the case of a decision to use secondary concrete, the following planning principles must be observed:

- The planning for primary and secondary concrete and for steel components to be integrated must be continuously coordinated.
- Reinforcement connections must be provided in the primary concrete according to static and structural requirements. The relevant installation situations and intended reinforcement connections must be taken into account. The following information must be observed:

- In the case of rebending connections, there must be sufficient space for the bending process in the secondary concrete situation. The reverse bending process must not impede the further construction process. It must be possible to concrete casings without cavities. If this is not possible, rebending reinforcement must not be used.
- Screw connections must be planned according to the installation conditions. If necessary, screw connection combinations must be provided (e.g. standard and position sockets).
- In corner areas, note that, because reinforcement bending bars are generally large in diameter, longer reinforcement bars may be necessary on the rebending reinforcement in order to reach the required length for the overlapping joint.
- As part of the verification process, the material specifications for the selected reinforcement connections must be taken into account when demonstrating load-bearing capacity and durability (NB: rebending reinforcements entail significant reductions in normative terms; for mechanical reinforcing steel joints (screw connections, sleeves), the specifications derive from the relevant proofs of usability or applicability (abZ/aBG).

* When determining the required secondary concrete geometry, the following aspects in particular must be taken into account:

- Shape, size and installation of the built-in parts including anchorage

- Avoidance of horizontal surfaces as the upper boundary of the primary concrete recess
- Avoidance of non-permanent layer thicknesses and corners
- Formwork and anchoring construction are easily feasible
- Minimisation of tension from outgoing hydration heat
- Reinforcement in primary and secondary concrete including connections
- Secondary concrete maximum grain
- Installation technology secondary concrete (filling openings, flow paths, venting options, if necessary supply or venting by primary concrete or steel component, insertion method, compaction)
- Connection of earthing lugs
- Arrangement of injection hose systems in working joints in primary concrete and built-in parts (e.g. pressure covers, pipe feedthrough)
- Possibilities for cleaning and preparing work joints
  - In areas where water penetration cannot be accepted under any circumstances, injection hose systems shall be provided in the joint between the primary and secondary concrete and in the contact area between the secondary concrete and the steel component. This applies in particular to water-contaminated components adjacent to operating rooms or suchlike. Preferably cement-bound hose fillers shall be used. Further guidance on planning and tendering can be found in DBV-2.
  - The arrangement of joint belts or sheets in the working joint between primary and secondary-concrete should be dispensed with, because this reduces the installation cross-section and can initiate defects in concrete, especially in closed installation situations.
  - In order to ensure the tightness of the joint between secondary concrete and built-in part, appropriate requirements must be laid down for the built-in part (e.g. sealing collar, rough surface).
  - At least the same principles and requirements as for primary concrete apply to secondary concrete and working joint between primary and secondary concrete with regard to corrosion protection of the reinforcement and any cracks. With regard to XS exposure, the BAW code of practice 'Marine Structures (MBM)' (BAW-MBM) must be taken into account. Requirements for areas with XD exposure shall be defined on a project-specific basis. For levelled areas, the provisions of ZTV-W LB 215 apply.

5.2 Secondary concrete according to ZTV-W LB 215 or ZTV-W LB 219

The distance between steel component and primary concrete shall be at least 200 mm at each point (excluding anchorage points).

5.3 Secondary concrete as SCC

As a rule, self-compacting concrete (SCC) has greater shrinkage than concrete according to section 5.2. This must be taken into account when determining the secondary concrete geometry and the crack width limiting reinforcement.

5.4 Secondary concrete according to the grouting concrete guideline

As a rule, grouting concrete or grouting mortar has greater shrinkage than concrete in accordance with Section 5.2. This must be taken into account when determining the secondary concrete geometry, the crack width limiting reinforcement and the shrinkage class in accordance with the grouting concrete guideline.

Grouting concrete or grouting mortar may only be used in thin layers. Layer thicknesses exceeding 25 times the maximum grain size used are not permitted.

For grouting concrete the shrinkage class SKVB I is to be chosen, for grouting mortar the shrinkage class SKVM I.

For layer thicknesses of grouting concrete or mortar exceeding 15 times the maximum grit used, only grouting concretes of shrinkage class SKVB 0 or grouting mortar of shrinkage class SKVM 0 are permitted.

In the case of installation of grouting concrete or grouting mortar over a large area, flow paths must be minimised.
Appropriate measures for this include, for example:

- Application of grouting concrete or mortar from the centre of the grouting surface. For this purpose, a corresponding filling opening shall be provided, if necessary, in the primary concrete or the built-in component.
- Division of the total grouting area into distinctly defined sub-areas (possibly disadvantages due to further joints).

6 Construction materials

6.1 General information

For the assessment and use of aggregates containing harmful amounts of alkali soluble silicic acid or where these cannot be safely ruled out, and for the measures to be taken, if necessary, for concrete and mortar, account must be taken, in addition to the Alkali Guideline of the DAfStb (Alkali Guideline), of the associated Introduction Decree of the Federal Ministry of Transport (BMV) for the business of the Federal Waterways and Shipping Administration (WSV).

The largest possible maximum diameter of aggregate shall be chosen according to the particular installation situation.

If admixtures with swelling components (e.g. injection aids (EH)) are used, the requirements of the Grouting Concrete Guideline, Table 1 apply.

The contracting authority reserves the right to carry out control tests to confirm the agreed or required building material characteristics.

6.2 Secondary concrete according to ZTV-W LB 215 / ZTV-W LB 219

The provisions of ZTV-W LB 215 or ZTV-W LB 219, Section 3, shall apply. By way of derogation from ZTV-W LB 215 or ZTV-W LB 219, concrete with larger consistency target values may also be agreed.

In order to minimise shrinkage in secondary concrete, total water content in the fresh concrete shall be limited as follows:

Maximum grain size ≤ 8 mm: Total water content ≤ 170 dm^3/m^3

Maximum grain size ≤ 16 mm: Total water content ≤ 160 dm^3/m^3

Maximum grain size ≤ 32 mm: Total water content ≤ 155 dm^3/m^3

When testing water separation in accordance with DIN 1045-2, 9.5 (iii), additional attention must be paid to possible visual signs of segregation. The requirements of Table 1, line 2 of DBV-1 should not be exceeded.

6.3 Secondary concrete as SCC

The provisions of DIN 1045-2 apply. SCC shall correspond to sedimentation stability class SR 2 in accordance with DIN 1045-2, tab. 11.

In addition to the requirements of DIN 1045-2, the following evidence must be provided as part of the initial assessment:

- The shrinkage values determined at the age of 91 days in accordance with the Cast Concrete Directive, Annex B, Section B.6 at (20±2) °C and (65±5) % relative humidity shall meet the following requirements with regard to the mean value of 3 samples ($\varepsilon_{s,m,91}$) and individual values ($\varepsilon_{s,i,91}$):
  - for layer thicknesses ≤ 25 cm: $\varepsilon_{s,m,91} \leq 0.6$ ‰ and $\varepsilon_{s,i,91} \leq 0.8$ ‰
  - for layer thicknesses >25 cm: $\varepsilon_{s,m,91} \leq 0.4$ ‰ and $\varepsilon_{s,i,91} \leq 0.6$ ‰.
- Unless otherwise agreed, frost tests shall be carried out in accordance with the BAW code of practice on frost testing of concrete for secondary concrete subject to exposure classes XF3 and XF4, respectively. The acceptance criteria set out therein must be complied with.
- Only cements according to ZTV-W LB 215 are authorised.
- With regard to exposure classes XD2 and XD3, the provisions of ZTV-W LB 215, Part 2, 5.3.2, (5), 3rd indent, shall apply mutatis mutandis. The specifications of ZTV-W LB 215 Part 2, 5.3.2 (5), 7th indent, apply to levelled areas without limiting the total water content.
- With regard to exposure classes XS2 and XS3, the specifications of the BAW code of practice on marine construction (BAW-MBM) apply.

6.4 Secondary concrete according to the grouting concrete guideline

The provisions of the cast concrete directive apply, with the restrictions set out in Section 5.4 with regard to permissible coating thickness.

Grouting concretes or grouting mortars to be used in exposure class XF3 must comply with the requirements of BAW code of practice MFB.

For grouting concrete or mortar which are to be used in exposure class XF4 in deviation from the grouting concrete directive, compliance with the requirements in accordance with the BAW code of practice MFB must be demonstrated on a project-specific basis.

With regard to exposure classes XD2 and XD3, the provisions of ZTV-W LB 215, Part 2, 5.3.2, (5), 3rd indent, shall apply mutatis mutandis. The specifications of ZTV-W LB 215 Part 2, 5.3.2 (5), 7th indent, apply to levelled areas without limiting the total water content.

With regard to exposure classes XS2 and XS3, the specifications of the BAW code of practice on marine construction (BAW-MBM) apply.

7 Construction work

7.1 General

The contractor must coordinate the formwork concept for secondary concrete recesses with the client and update the concrete construction concept.

The use of permanent formwork (e.g. expanded metal, nozzle film) is not allowed.

The contractor is responsible for maintaining the correct position of installation components and reinforcement during formwork and concreting. Before concreting, the contractor shall verify the planned position and attachment of these built-in components and shall document this in a measurement report.

If separation of potential between reinforcement and steel components is required, the technical designer's requirements and, where appropriate, control procedures must be integrated into the planning.

The substrate must be prepared by mechanical processing in such a way that a solid and durable bond is achieved between the primary and secondary concrete. The requirements of ZTV-W LB 215, Part 3, 9.3. (1) and (2) 1st indent, shall apply regardless of the orientation of the composite surfaces.

The choice of suitable processes and equipment (e.g. blasting with solid blasting agents, high-pressure water blasting) must ensure that the primary concrete structure is not adversely altered.

Before concreting the secondary concrete, the primary concrete surface must have the minimum tear strengths (determined according to ZTV-W LB 219, Annex 1, Section 3.2) according to Table 0.3 of ZTV-W LB 219 for the corresponding old concrete class.

At the request of the contracting authority, the contractor must provide evidence that the required break-out strengths are being complied with.

The formwork for the secondary concrete installation shall not be fixed to the steel water components.

Primary concrete and built-in hydraulic steel components shall be protected against contamination and damage by appropriate protective measures.

Dirt and loose corrosion products on exposed reinforcement or exposed steel components must be removed.

The concrete substrate must be capillary saturated with water before installation. For this purpose, it must be pre-wet (initially generally at least 24 hours in advance). During concrete installation, it must be dried to such an extent that there is no water film and the concrete substrate appears matte moist.

The mixing and pumping of secondary concrete must be carried out in separate facilities in order to enable control of the fresh concrete properties including between mixer and pump.

Appropriate measures shall be taken to generate sufficient flow pressure (e.g. cant of filler opening, pumping from low point).

In order to avoid air inclusions, secondary concrete must be continuously poured from a filling point. Ventilation openings shall also be provided.

In difficult installation situations such as large secondary concrete height, small installation cross-sections, spatial formation and accessibility, a subdivision into concreting sections should be considered.

Concrete heights above 3 m must be approved by the contracting authority.

In the case of large concreting heights, filling and compaction openings in the formwork should be considered.

The free fall height of the secondary concrete shall not exceed 1.0 m.

It is generally not permitted to use external vibrators.

Unless otherwise specified, the effective water content shall be determined at least twice per concreting day by drying in accordance with DBV-1, Section 3. The cement and additive content for the determination of the water/binder value shall be taken from the actual information in the delivery note.

With regard to the post-treatment of secondary concretes, the requirements of ZTV-W LB 215 and ZTV-W LB 219, Section 3 apply.

Upon request, the contractor shall produce additional test specimens for control tests carried out by the contracting authority.

DBV-2, Sections 2.4 and 2.5, must be observed accordingly in the installation of injection hose systems.

The grouting of installed injection hoses must be agreed with the client. Pressing

- should only be carried out if this is necessary for sealing and/or corrosion protection,
- should be done as late as possible in order to take into account as large a proportion of the total shrinkage size,
- should be done at the lowest possible component temperatures taking into account the permissible application temperature of the hose filler.

7.2 Secondary concrete according to ZTV-W LB 215 or ZTV-W LB 219

No supplementary regulations.

7.3 Secondary concrete as SCC

The contractor must present the workability area of the SCC in accordance with DIN 1045-2, Table N.1 in a construction process discussion and incorporate it into the concrete construction concept.

7.4 Secondary concrete according to the grouting concrete guideline

The information provided by the product manufacturer on the coordinated grouting mortar in accordance with the grouting concrete guideline, Section 7, shall be incorporated into the concrete construction concept by the contractor. For exposure classes XF3 and XF4, frost-thaw (salt) resistance must also be stated.

The use of potting concrete or mortar filled in silos or large containers (e.g. big bags) is only permitted with the consent of the client.

When using sack products, the weight of the container must be checked at the beginning of concreting and then at least once per 1000 kg of dry mixture. The deviation shall not exceed ± 3% by weight.

The degree of consistency according to the grouting concrete guideline, Table A3, must be determined daily during initial production and then at least once per 1000 kg dry mixture both after mixing (before the conveying process) and at the installation site.

The fresh concrete or fresh mortar bulk density must be determined each time consistency is determined.

As part of the construction, sedimentation stability shall be checked once before the start of concreting and then once every five manufacturing days, in line with the procedure according to Tables D.1 and D.2 of the grouting concrete guideline. The test shall be carried out with the maximum water content used in the construction project.

8 List of cited documents

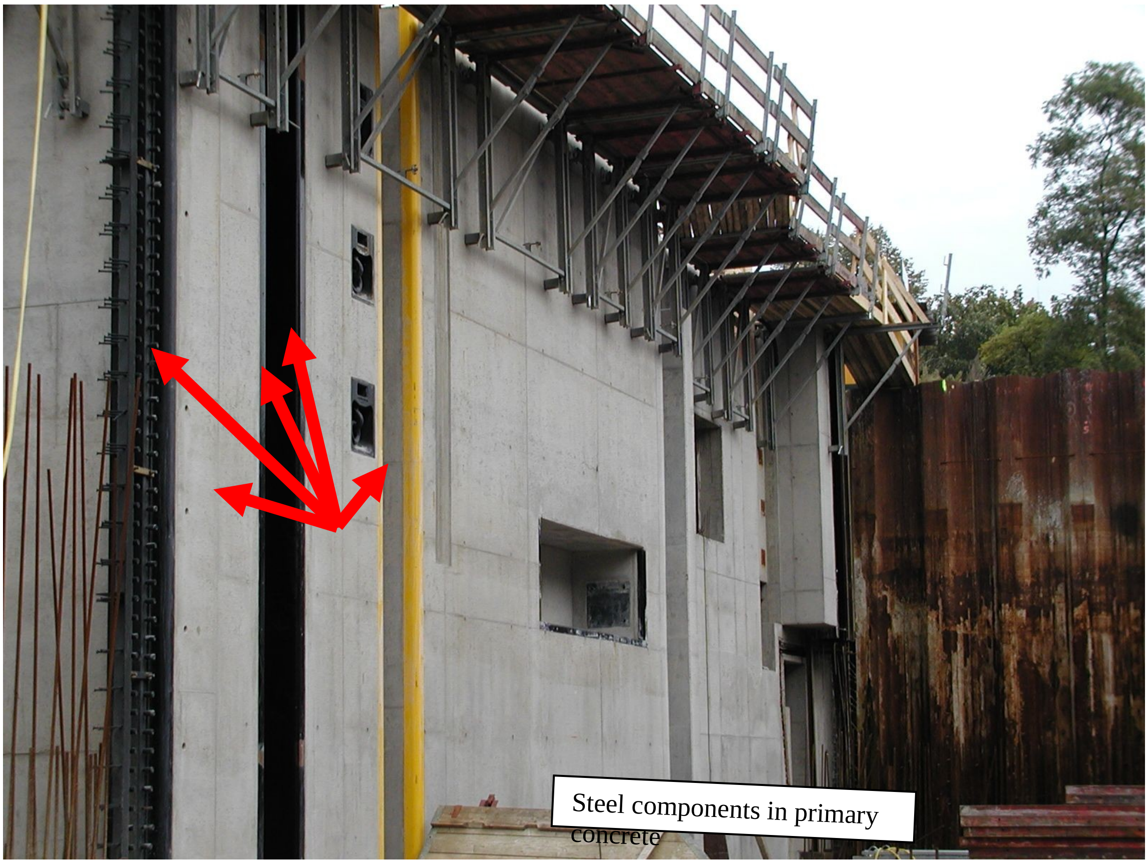
BAW-MBM	BAW Code of Practice 'Construction of solid hydraulic structures in marine environments (MBM)', Federal Institute for Hydraulic Engineering, Karlsruhe.
BAW-MDCC	Code of Practice on durability assessment and evaluation of reinforced concrete structures with carbonation and chloride exposure (MDCC). Federal Institute for Hydraulic Engineering Karlsruhe.
BAW-MFB	Code of Practice on frost testing of concrete (MFB). Federal Institute for Hydraulic Engineering Karlsruhe.
BAW-MESB	Code of Practice on de-miscibility of concrete (MESB). Federal Institute for Hydraulic Engineering Karlsruhe.
DBV-1	Deutscher Beton- und Bautechnik-Verein [German Concrete and Construction Technology Association] – Code of Practice on special procedures for testing fresh concrete.
DBV-2	Deutscher Beton- und Bautechnik-Verein – Code of Practice on injection hose systems and swellable joint inserts in working joints.
DIN 1045-2	Concrete, reinforced and prestressed concrete structures – Part 2: Concrete
Alkali Guideline	German Committee on Reinforced Concrete (DAfStb) – Guideline on precautions against harmful alkali reactions in concrete. DIN Media.

Grouting Concrete Guideline	German Committee on Reinforced Concrete (DAfStb) – Guideline on the manufacture and use of cement-bonded liquid concrete and grouting mortar. DIN Media.
ZTV-W LB 215	Additional technical terms of contract – hydraulic engineering (ZTV-W), concerned with concrete and reinforced concrete hydraulic structures, performance category 215.
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.

Annexes

Annex 1: Collection of examples

Example 1: Primary concrete upper gate
Contact name: Dipl.-Ing. Lühr, BAW Karlsruhe, stefan.luehr@baw.de



Source: WSV

Situation:
Steel components such as emergency locking guide, edge protection, bollards and joint construction in hollow walls in premixed concrete.

Secondary concrete dimensions:

- -

Secondary concrete:

- -

Outcome, problems:

- Flat-surface installation by mounting on primary concrete formwork (built-in parts were stripped out), homogeneous reinforced concrete body without disturbing working joints

Grounds:

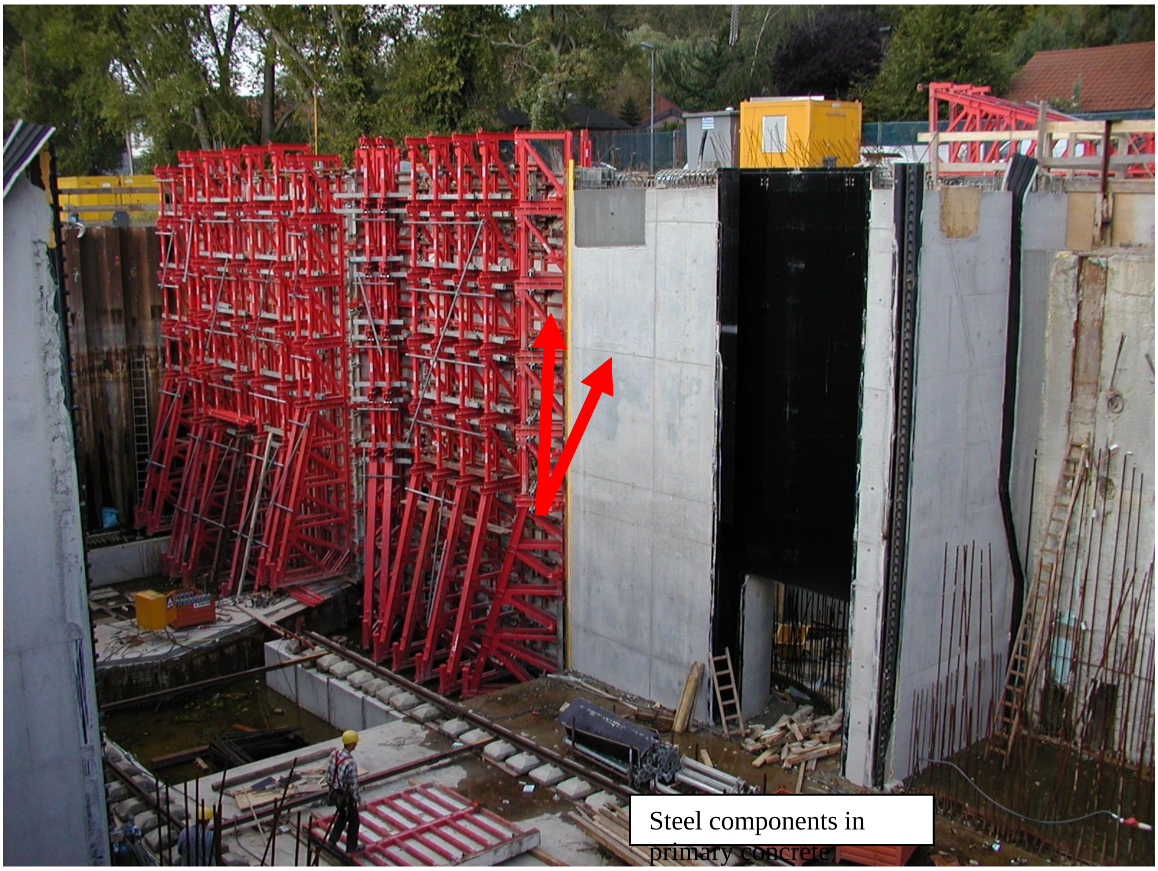
- Minimisation of secondary concrete situations

Opportunity for optimisation:

- -

Example 2: Primary concrete lower gate

Contact name: Dipl.-Ing. Lühr, BAW Karlsruhe, stefan.luehr@baw.de



Source: WSV

Situation:

Steel components such as emergency seal, edge protection, bollard and joint construction in upper wall executed in primary concrete (bollard and edge protection still stripped out)

Secondary concrete dimensions:

- -

Secondary concrete:

- -

Outcome, problems:

- Flat-surface installation by mounting on primary concrete formwork (built-in parts were stripped out), homogeneous reinforced concrete body without disturbing working joints

Grounds:

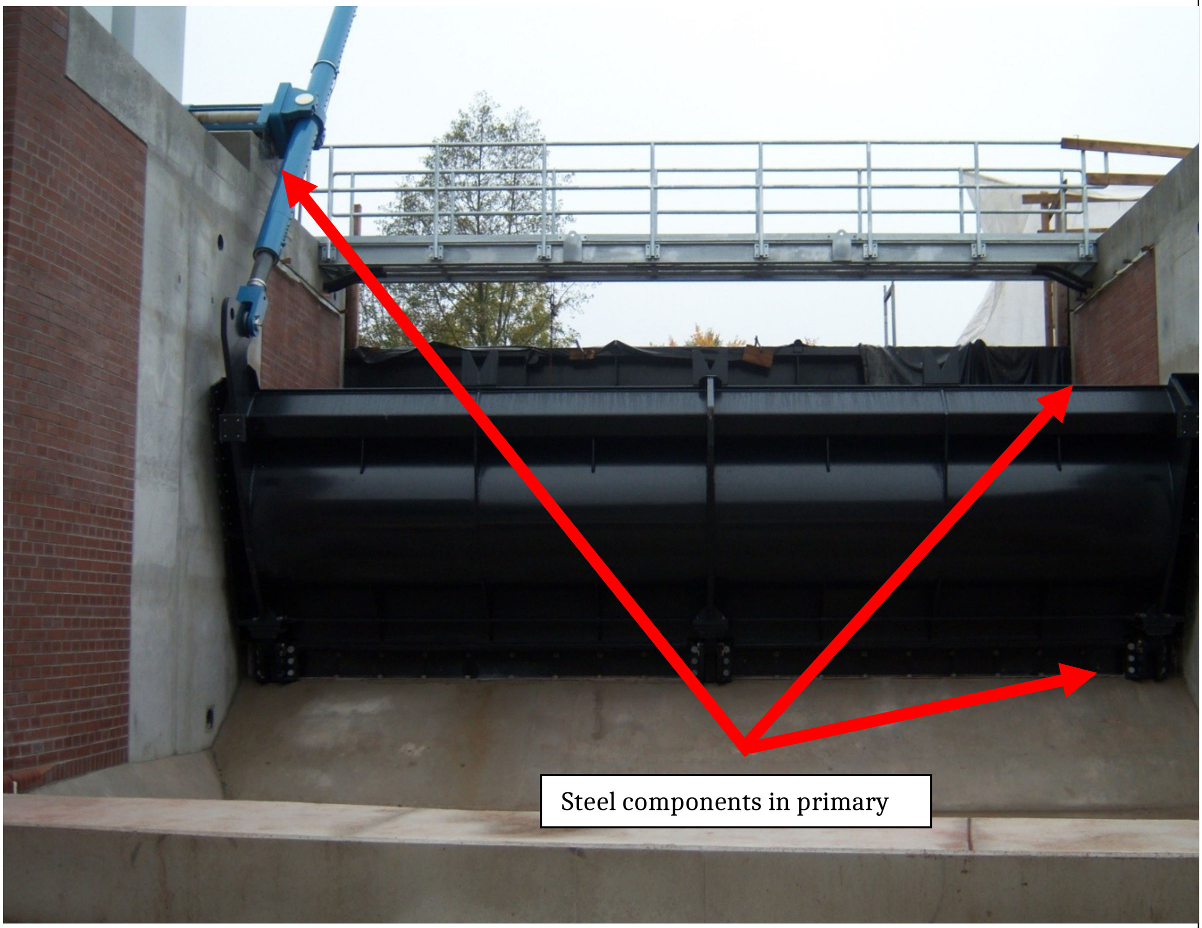
- Minimisation of secondary concrete situations

Opportunity for optimisation:

- -

Example 3: Primary concrete weir

Contact name: Dipl.-Ing. Lühr, BAW Karlsruhe, stefan.luehr@baw.de



Source: WSV

Situation:

Steel components such as base beams with flap hinges, emergency locking routing, edge protection at the back of weirs and retaining wall in primary concrete. Sealing system on the tilting weir with no additional side plates.

Secondary concrete dimensions:

- -

Secondary concrete:

- -

Outcome, problems:

- Homogeneous reinforced concrete body in concrete according to ZTV-W 215, no working joints on built-in parts. Steel construction accuracy in the base beam together with flap hinges manufactured at the factory. Compensation of tolerances through sealing system and cardanic bearing on drive cylinder.

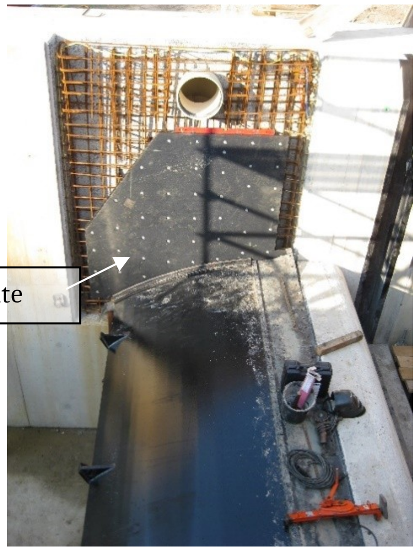
Grounds:

- Minimisation of secondary concrete situations

Opportunity for optimisation:

- -

Example 4: Weir system, side plates in secondary concrete
Contact name: Dipl.-Ing. Ralf Vorreyer, WNA Magdeburg, ralf.vorreyer@wsv.bund.de



Source: WSV

Situation:
Recess prepared for installation of side plates with side plate mounted, connected and finished condition. Steel road side plate with flat screwed PE-UHMW – Wear plate, screwed with brass countersunk head screws. The weir field width is 5 m.

Secondary concrete dimensions:
- a / b / t = 2.58 m / 3.35 m / 0.35 m

Secondary concrete:
- Concrete according to ZTV-W LB 215

Outcome, problems:
- Installation reinforcement and side plate support plate unproblematic, precise adjustment possible
- Formwork of secondary concrete areas to produce complicated side plate.

Grounds:
- Relatively complicated geometry and small size of formwork parts.

Opportunity for optimisation:
- Side plates no longer necessary, primary concrete with corresponding exposure and tolerance class.

Example 5: Ship lock, floating bollards in primary concrete
Contact name: Dipl.-Ing. Ralf Vorreyer, WNA Magdeburg, ralf.vorreyer@wsv.bund.de

Source: WSV

Situation:
Prefabricated steel formwork for the installation of floating bollards (permissible by derogation from the ZTV-W due to small area). The steel-coated area was completely stripped with the wall formwork. Installation situation, stripped and finished condition.

Secondary concrete dimensions: -

Outcome, problems:

- Installation of floating bollard guide problem-free, anchoring by tensioning in the first round necessary
- Formwork of secondary concrete areas only necessary in the head area.

Grounds: -

Opportunity for optimisation: -

Example 6: Floating bollard guide rails in secondary concrete

Contact name: Dipl.-Ing. Klemm, WSA M-S-L, gerrit.klemm@wsv.bund.de

Source: WSV

Situation:

Secondary concrete for bollard guide rails

Secondary concrete dimensions:

- External dimension wall recess: a / b / h = 125 cm / 230 cm / 1230 cm
- Dimensions of secondary concrete vary between approximately 24 and 40 cm

Secondary concrete:

- Concrete C 25/30 LP, XC4, XF3, XM1 according to ZTV-W LB 215 (maximum grain size 16 mm), reinforced
- Concreting sections 4 x approx. 3 m height

Outcome, problems:

- Rebending reinforcement can no longer be bent either along the route or after adjustment of the steel structural component, consider screw connections

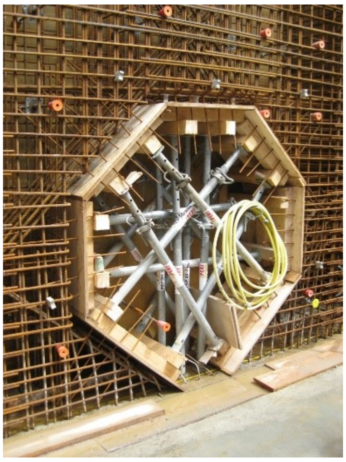
Grounds:

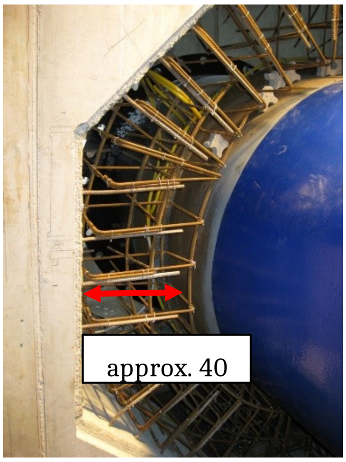
- large installation height

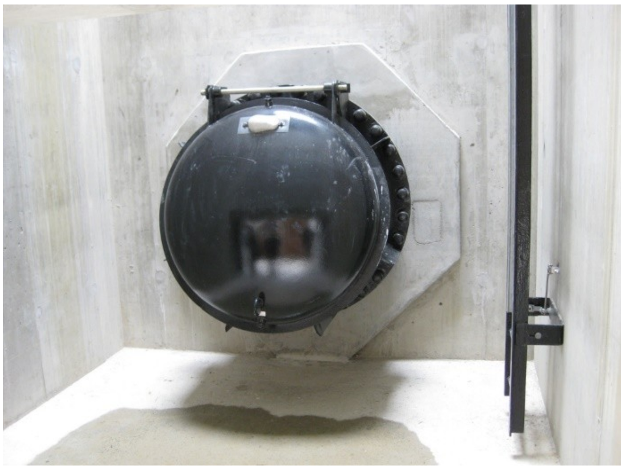
Opportunity for optimisation:

- Replace rebending reinforcement with screw connections
- Use of pouring pipes
- Consider installation in primary concrete

Example 7: Wall pipe feedthrough pumps on pressure side (in secondary concrete)
Contact name: Dipl.-Ing. Ralf Vorreyer, WNA Magdeburg, ralf.vorreyer@wsv.bund.de







Source: WSV

Situation:
Secondary concrete for water-exposed wall pipe, pumps on pressure side

Secondary concrete dimensions:

- External dimension wall recess: b / h / d = 2.00 m / 2.00 m / 0.80 m
- Dimensions of secondary concrete vary between approx. 0.40 m and 0.50 m
- Filling and ventilation opening (empty pipe) above the recess in primary concrete

Secondary concrete: • Concrete according to ZTV-W LB 215 (maximum grain size 16 mm), reinforced • Wrap-around compression hoses between primary and secondary concrete as well as between secondary concrete and steel component (along seepage path with nuts)
Outcome, problems: • Risk of formation of predominantly radial cracks minimised by constant secondary concrete width • Risk of detachment between primary and secondary concrete • Compaction problems as well as air inclusions in the upper secondary concrete area, especially due to overly dense formwork joint at the top horizontally • Connection reinforcement in the lower part of the example difficult to build, must be glued in afterwards, with e.g. opening for rotary bearings unproblematic
Grounds: • Settling and shrinking of the secondary concrete • Horizontal surface as upper boundary of the primary concrete recess
Opportunity for optimisation: • Use of low-shrinkage concretes (largest possible grain, low water content, etc.) • Potentially lockable ventilation openings on top of formwork or bores • Filling opening placed higher to increase hydrostatic pressure

Example 8: Warehouse rotary segment gate in secondary concrete
Contact name: Dipl.-Ing. Klemm, WSA M-S-L, gerrit.klemm@wsv.bund.de

Source: WSV

Situation:
Secondary concrete for wall bearings on water-impacted rotary segment gate

Secondary concrete dimensions:
- External dimensions of wall recess: 185 cm x 180 cm x 85 cm
- Dimensions of secondary concrete: 28.5 cm – 36 cm

Connection reinforcement:
- Screw sockets, type Lenton A12, casings with rebending reinforcement

Sealing elements:
- Wrap-around compression hoses between primary and secondary concrete and between secondary concrete and steel

Secondary concrete:
- Concrete C 25/30 LP, XC2, XF3, XM1, WF according to ZTV-W LB 215; maximum grain size 0/8; consistency F5

Outcome, problems:
- Chevron-shaped upper boundary: Ventilation works well
- Screw sockets for reinforcement connections: No “dead space” as for casings
- Vent pipes were levelled, concrete was installed via nozzles integrated into the formwork with overpressure from below.

Need for optimisation:
- Fill openings match reinforcement configuration so that the fill hose can be routed under the bearing.
- In addition to screw sockets, casings are also used. Difficult to ventilate casings in the roof. It would be better to use only screw sockets in the roof.
  For tidy installation of grouting hoses, the corners of the primary concrete recess and, if necessary, the built-in part could be manufactured below 45°.

Example 9: Levelling of lock repair in primary concrete
Contact name: Dipl.-Ing. (FH) Steinmetz, WNA HD, thomas.steinmetz@wsv.bund.de



Source: WSV

Situation:
Frame manhole cover (cover, vertical strand anchor) executed on the level in primary concrete.

Secondary concrete dimensions:
- -

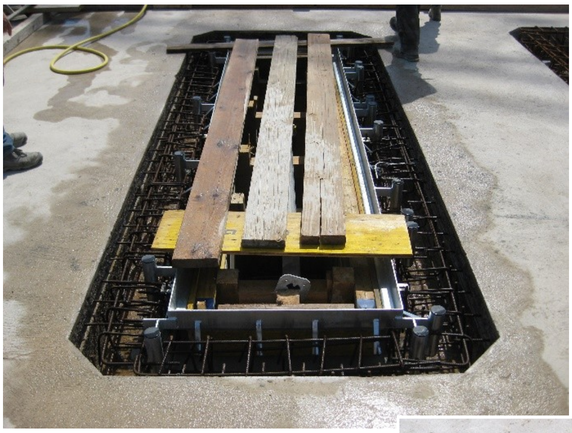
Secondary concrete:
- -

Outcome, problems:
- Homogeneous reinforced concrete body without disturbing working joints,
  small cracks partially occurring in the corner area are within the permissible range and are unproblematic

Grounds:
- Minimisation of secondary concrete situations

Opportunity for optimisation:
- -

Example 10: Longitudinal canal inspection cover (LKRV) in secondary concrete
Contact name: Dipl.-Ing. Ralf Vorreyer, WNA Magdeburg, Ralf.Vorreyer@wsv.bund.de



Source: WSV

Situation:
Recess and finished condition prepared for installation of LKRV grating frame and secondary concrete

Secondary concrete dimensions:

- a / b / h = 4.18 m / 1.60 m / 0.35 m, angled corner length 0.25 m, circumferential width 0.40 m

Secondary concrete:

- Concrete according to ZTV-W LB 215

Outcome, problems:

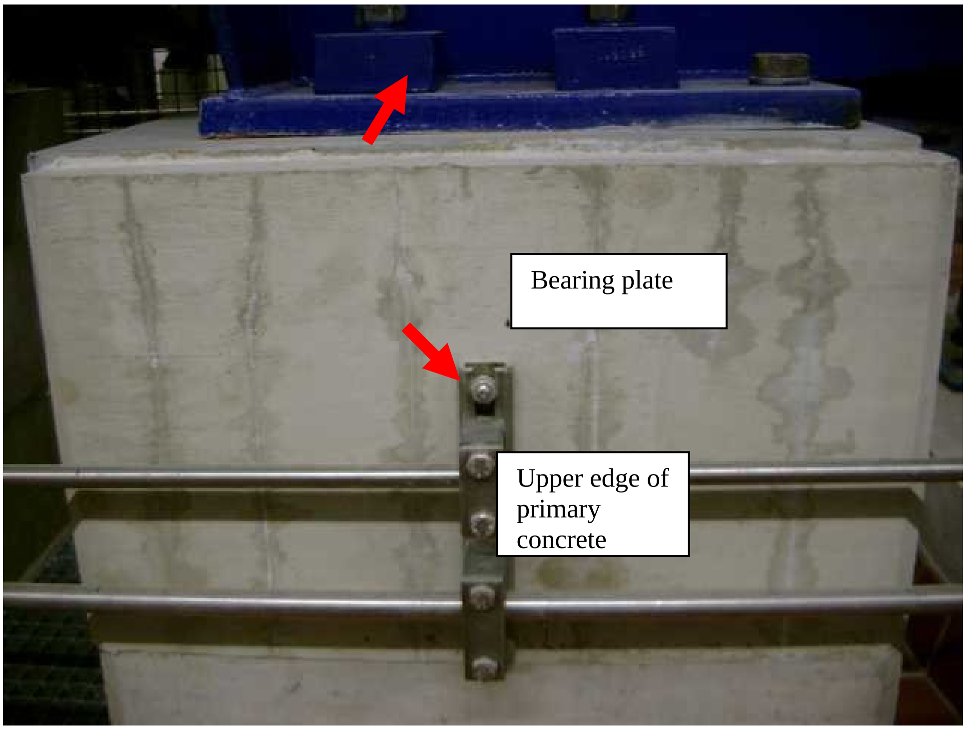
- Minimisation of crack formation through selected recess geometry
- Additional installation of structural slanted reinforcement in primary concrete in the corner area has also proven itself
- Installation of subsequent secondary concrete reinforcement and built-in frame possible due to larger recess width, modification compared to other projects led to success

Grounds:

- Separation width for secondary concrete in relation to length of reverse bending connections at 40 cm compared to 30 cm now sufficiently large otherwise

Opportunity for optimisation:

- Installation of pressure cover in primary concrete (due to fixation to formwork and support structure to the working joint) is possible.

Example 11: Horizontal bearing plate in secondary concrete Contact name: Dipl.-Ing. Ralf Vorreyer, WNA Magdeburg, ralf.vorreyer@wsv.bund.de
 Source: WSV
Situation: Grouting for horizontal bearing plate
Secondary concrete dimensions: • a / b / h = 50 cm / 50 cm / 40 cm
Secondary concrete: • Grouting concrete (maximum grain size 5 mm), unreinforced
Outcome, problems: • Numerous predominantly vertical cracks in the secondary concrete
Grounds: • Steel construction and concrete construction do not match, therefore unnecessarily high grouting height. • Material not suitable for installation, as casting height is significantly higher than permitted for secondary concrete under the cast concrete directive.
Opportunity for optimisation: • Early coordination to optimise the installation situation (provide an appropriate pouring height for poured concrete in accordance with the BAW code of practice) • If the grouting height for grouting concrete is already too large according to the BAW code of practice: First, the bearing pedestal is raised with reinforced concrete. Then grouting concrete is applied in accordance with the BAW code of practice.

Example 12: Lifting gate guide with edge protection in secondary concrete
Contact name: Dipl.-Ing. Ralf Vorreyer, WNA Magdeburg, Ralf.Vorreyer@wsv.bund.de




Source: WSV

Situation:
Secondary concrete for lifting gate guide with edge protection profile

Secondary concrete dimensions:
- External dimension wall recess: l / b / h = 1.24 m / 0.56 m / 20.00 m
- Dimensions of secondary concrete constant dimension

Secondary concrete:
- Concrete according to ZTV-W LB 215 (maximum grain size 16 mm), reinforced

Outcome, problems:
- Because there was plenty of space, tidy installation of secondary concrete reinforcement was possible
- additional measures (pouring pipes required) for filling
- due to the transverse mounting design of the built-in parts, accessibility difficult with compaction devices (small internal vibrators)

Grounds:
- Settling and shrinking of the secondary concrete
- Horizontal surface as the upper boundary of the primary concrete recess in the last concreting section (not visible in the picture)

Opportunity for optimisation:
- Use of low-shrinkage concretes (largest possible grain, low water content, etc.)
- Filling opening placed higher to increase hydrostatic pressure