# Corrosion Engineering Specifications for Reinforced Concrete Structures and Cement-Bound Surfaces

Design and construction of structures to be protected against acids shall correspond to special requirements. Therefore, statical calculations, drawings for shuttering and reinforcement and execution of structures must meet some particular specifications.

The Seller offers his services of elaborating the statical calculations and drawings for formwork and reinforcement at usual fees.

For that purpose, the Buyer will give the Seller binding information about the thermal, chemical, and mechanical conditions of the structure as well as about subsoil conditions, subsoil water, location etc.

The Seller shall be informed as well of prestressed concrete or prefabricated parts being used for the structure.

Basis for the requirements to be met by reinforced concrete structures and cement-bound surfaces for surface protection with acid resistant materials is DIN 28052, part 2, and AGI VWork Sheets S 10, part 1, and S 20, part 1, resp.

Inevitable cracks caused for example by shrinkage or bending have to be reduced to a minimum extent by statical and constructional measures as well as by appropriate workmanship, applying DIN 28052, part 2, and DIN 1045, see paragraph 17.6, for the various types of impervious membranes.

Cement-bound structures for impervious membranes, which shall comply with the "German construction work regulations for the prevention of water pollution", part 1, have to be designed and constructed according to the Directive "Information regarding stability and utility of coated reinforced concrete collecting basins for water-polluting liquids", 1989 edition, published in "Mitteilungen des Instituts für Bautechnik", dated March 31, 1989.

As a rule, the concrete or cement floor, should present, even at its surface, an average compressive strength of 30 N/mm² for plaster work, the compressive strength should be 20 N/mm².

Position and execution of expansion joints, inevitable working joints, pipe openings, floor drains, as well as other structural peculiarities have to be made known to the Seller in time for calculating and mutual technical planning.

Care has to be taken to insulate concrete floors against ascending moisture.

The effect of water or steam pressure at the rear of the acid resistant lining must be prevented. If necessary, an external insulation of buried tanks against ground and surface water must be provided. This insulation must reliably prevent the penetration of water into the concrete (DIN 18195). In the case of permanent or long-term presence of water, a coating of bituminous paint is generally not sufficient. The use of watertight concrete, too, is not enough on its own to prevent the penetration of moisture into the structure of the building.

Particular attention must also be paid to the watertight construction of structural joints, e. g. between concrete floors and rising walls.

The determination of tolerances on evenness is based on DIN 18202, table 3, line 3.

Tolerances in mm at distance of check points:

| 0,1 m | 1 m | 4 m | 10 m | 15 m |
|---|---|---|---|---|
| 2 | 4 | 10 | 12 | 15 |

Greater tolerances are not permissible in the screed or in the concrete or reinforced concrete surface prepared in one operation for carrying the acid protection layer. If other tolerances exist for base surface irregularities or if other tolerances are demanded for the evenness of the acid protection layer, this must be agreed separately.

To guarantee the proper drainage of liquids slopes should at least be 1,5 %.

Cement floors and plasters must have a good bond (bonding agent) to the supporting concrete surface and be well compacted. The surface should be timber-floated to obtain the necessary adhesion to the subsequent impervious membrane.

To obtain the necessary strength particularly at the surface and to prevent shrinkage cracks caused by drying, adequate measures to keep the surface moist, preferably by tight covering with a plastic sheeting immediately on completion , will be essential. The use of evaporation-inhibiting spray coating with a post treatment agent or similar is not permissible.

Particular importance must be attached to the surface characteristics of concrete structures, screed and plaster demanded in DIN 28052, part 2, and in AGI Work Sheets S 10, part 1 and S 20, part 2, resp. for the purpose of acid-protection.

Concrete surfaces require in most of the cases a post-treatment preferably by slight sandblasting, possibly milling or grinding, in detail

- to remove Iaitance, residues of form oil, badly adhering and blistering layers and contaminations
- to open cavities caused by air inclusions (bubbles, pores) and to reveal the extent of honey combs
- to roughen smooth surfaces after the use of planed wood, plywood or steel in order to obtain the necessary grip.

Recesses of the concrete surface must not exceed 2 mm. The edges should be ground off smoothly.

Generally, a levelling of the surface by the Buyer may be necesssary using a compensating compound compatible with the acid protection.

The concrete, cement floor or plaster must not contain any foreign matters which may impair adhesion of the acid resistent material.

Plaster must be made of pure cement mortar.

Spacers must end at least 25 mm below the concrete surface. Wooden spacers must not be used. The holes in front of the spacers shall be filled with a suitable cement mortar. Special care must be taken to obtain a solid tight bond with the concrete.

The surfaces must be presented suitable for acid protection work and in cleaned condition.

The humidity of the base must not exceed 4 %.

Tanks, pits, etc. made of masonry are only to a Iimited extent suitable for acid protection work.

A concrete acceptance test only covers faults visible from the outside. The smoothness and slope have to be checked by the Customer.

Prior to starting acid protection work, the measures to be taken by the Buyer such as sand blasting, levelling of surfaces with a suitable compensating compound etc. should be determined between the Buyer and the Seller. The compensating compound may be applied by the Seller at the cost of the Buyer.

Unless the above Specifications are observed, the cost of repairing any resulting deficiencies in the acid protection work shall be born by the Buyer.

**Sources:**
DIN-norms: Beuth Verlag GmbH, D - Berlin
AGI-Work-Sheets: Curt R. Vincentz Verlag, D - Hannover

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