

Evolving the well-established

vdz

Service Offer

Structural
Diagnostics and
Service Life Design

High-quality services from a single source

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Know-how for high quality concrete structures

VDZ is an internationally renowned technical and scientific institute known for its practical industrial research work and its extensive range of services relating to cement, concrete, plant engineering and environmental protection. For more than 140 years now we have been setting exacting standards for the production and quality of building materials.

Our activities extend along the entire value chain of cement and concrete, from the starting materials right through to the finished structure. The durability of reinforced concrete structures can be impaired by environmental influences. In this connection we can offer you help with the diagnosis of existing structures, assessment of the inspection results and the planning of any repair work required.

Our experienced interdisciplinary team of engineers, chemists, mineralogists, geologists and physicists will also gladly advise on the clarification of damage issues, such as crack formation or surface discoloration on structures and elements made of mortar and concrete.

Structural diagnostics

Structural diagnostics

Structural diagnostics involves determining and documenting the condition of a reinforced concrete or pre-stressed concrete structure in the context of a structural inspection. Our team of experts inspects the structure on site, employing largely non-destructive test methods. In the course of the structural inspection, we also take samples for more in-depth analysis at our accredited laboratories.

The objective of the structural inspection is to obtain information on the overall condition of the structure. In the process, we identify possible damage mechanisms and then together with you we plan the further course of action required to maintain and repair the structure.

We are pleased to provide assistance in the following areas:

- Recording of damaged and non-damaged parts of concrete constructions
- Identification and assessment of damage mechanisms, e.g. crack formation and loss of strength
- Damage prediction, e.g. ASR residual expansion potential
- Clarification of the causes of efflorescence and discoloration
- Estimation of the residual service life of the structure
- Determination of the repair work required for the structure

Following structural diagnosis, we also perform BIM-based repair planning for you if required (Page 14), allowing you to benefit from this integrated approach and our sound expertise.

Structural diagnostics services

Service	Method
Taking of samples from the structure, e.g. drill cores for testing compressive strength	DIN EN 12504-1
Drill dust sampling, e.g. to determine the chloride content of concrete	German Committee for Structural Concrete (DAfStb), Handbook 401
Non-destructive testing of compressive strength (rebound number)	DIN EN 12504-2
Crack recording, use of gypsum marks	
Analysis of the composition of hardened concrete	
Non-destructive determination of concrete cover	electromagnetic
Leaching tests (tank test/shaking test)	CEN/TS 16637-2 / DIN EN 12457
Determination of asbestos	VDZ
Qualitative and quantitative x-ray phase analysis	VDZ
Structural analysis of thin sections by means of light microscopy	VDZ
Structural analysis by means of scanning electron microscopy	VDZ
Thermal phase analysis	VDZ

Structural diagnostics services (Part II)

Service	Method
Surface tensile strength, pull-off strength, tensile adhesion strength	
Water absorption at atmospheric pressure/ at 15 MPa	German Committee for Structural Concrete (DAfStb), Handbook 422 DIN EN 480-5
Capillary water absorption	DAfStb, Heft 422 DIN EN 480-5
Pore content and pore distribution in concrete, mortar and hardened cement paste using mercury intrusion porosimetry	
Permeability measurement	German Committee for Structural Concrete (DAfStb), Handbook 422
60°C concrete test or 40°C fog chamber test on drill cores (with or without alkali supply): Determination of residual expansion potential due to ASR	VDZ
Post-cracking flexural strength on steel fibre concrete beams, e.g. taken from an industrial concrete floor	Based on German Committee for Structural Concrete (DAfStb) Guideline
Determination of content and orientation of steel fibres (CT)	Computer tomography (on sub-contract basis)
Ultrasonic time-of-flight nondestructive test method	VDZ

Service life design

Service life design

The probability of the occurrence of reinforcement corrosion arising from the carbonation of the concrete cover or the penetration of chlorides into the concrete can be estimated by way of probabilistic serviceability limit state studies. The conclusions drawn from this with regard to the durability of reinforced concrete elements can provide you with a basis for planning new construction work and remedial measures.

We would be pleased to assist you with the following activities:

- Serviceability limit state studies for reinforced concrete elements
- Serviceability limit state studies for repair measures (concrete substitution)
- Estimation of the residual service life of existing reinforced concrete elements
- Performance-related concrete design for specified service life or durability requirements

Typical applications include:

- Usage of new materials (concretes, concrete substitution systems), the durability of which has to be ensured prior to use in the structure
- Analysis of the consequences of irregularities or shortcomings during the construction phase for the reliability of the structure
- Design of elements subject to exceptional requirements in terms of durability
- Verification of a sufficiently low risk of corrosion for structures with a particularly long service life (> 50 years)
- Determination of layer thicknesses for concrete substitution in maintenance planning
- Assessment of the effects of changes to exposure (e.g. due to different usage or different environmental impact) as a basis for the production of maintenance concepts

**The digital twin of
existing structures**

The digital twin of existing structures

We can generate a digital twin of your existing structures. This will provide you with a powerful and innovative tool for the management and maintenance of your existing structures. The 3D model enables operators of structures to efficiently analyse all the structural data collected.

The more complex and challenging the geometry of a structure, the more valuable the BIM method is as a planning tool for building owners and designers. Section views can be easily created through the models. Conflicts between jobs on site (including repair work) can be clearly identified in the 3D model.

As an additional benefit, the results of the structural diagnostics can be stored as information in the 3D models. This also applies to the results of service life design (see Page 11) and the updated versions of this resulting from regular inspection of the structure.

Structures can be modelled to differing degrees of detail, from LOD100 (rough planning) to LOD300 (detailed planning) and LOD500 (model of existing structure).

Once we have created the digital twin of your existing structures, the 3D models can also be used for BIM-based repair planning.

BIM-based repair planning

BIM-based repair planning

For the purposes of repair planning, we can present your structure as a 3D model or BIM file. This involves modelling the structure in a virtual space based on existing plans and the results of structural examinations. Modelling of the structure using a digital point cloud is another possibility.

The results of the structure examination, e.g. test locations, drill core sampling locations, chloride profiles and the results of the reinforcement scanner, can be incorporated into the BIM model. The actual state is recorded in digital form. This permits planned/actual state comparison. The material properties established during the structure examination are stored in the 3D model as element-specific information. Repair planning is also performed on the 3D model. You will receive the structure model in the form of an IFC file.

We therefore provide you with two services at the same time:

- Creating the digital twin of the existing structure
- Repair planning and repair of the structure with the aid of a 3D model

Further advantages of the model-based approach include:

- Contractors can use the 3D model as a basis for calculating quantities.
- BIM-based planning and execution reveal conflicts between trades at an early stage.
- The entire planning and construction process is highly transparent.
- Building work is still performed on the basis of drawings, but these are derived from the model.
- On the construction site, the 3D model is a source of additional information and a basis for discussion.

Other VDZ services

Other VDZ services

Testing, expert reports, consultation and training programmes:

As an internationally operating technical and scientific service provider in the fields of cement, concrete, plant engineering and environmental protection, VDZ has for decades enjoyed an excellent reputation for the expertise it has consolidated through research work and successfully applied in practice.

Our services portfolio includes:

- Technical reviews
- Process optimisation
- Energy efficiency
- Chemical/mineralogical analyses
- Production and testing of concrete, starting materials and mortar
- Accreditation
- Certification
- Environmental expert reports
- Environmental measurements
- Training programmes

Detailed information on the services we provide and technical experts to contact can be found on our website at www.vdz-online.de/en.

We are accredited in accordance with DIN EN ISO 9001, DIN EN ISO/IEC 17025, ISO 17065 and DIN EN ISO/IEC 17021.

Contact



Service life design

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