Project Report/September 2021

Sewage plant Bonn-Beuel, Germany: Highly efficient special solution for low strength concrete substrates

The Bonn-Beuel municipal sewage treatment plant is located on the right bank of the river Rhine in Bonn's Siegaue, Germany. The Federal City of Bonn, as the investor and operator of the plant, had the existing structures of the plant refurbished in individual construction phases - the sand trap, the channel behind the sand trap, and the access road and its retaining wall around storm water overflow basin 3.

The construction work was carried out while the sewage treatment plant was in operation. Quick and convincing solutions were the key to the smooth and rapid realisation. The applied system solutions were specifically tailored according to the results of the analysis of the current state situation and to the expertise assessment by the planner. The tender from the investor required repair products and systems made by one manufacturer. In this way, the compatibility of the building materials in the system and thus the prerequisite for the warranty was ensured.

The investor and the specialised planner for concrete repair, IBE engineers from Hennef, Germany, relied on StoCretec products and systems tailored to concrete repair and concrete protection, as well as in our many years of experience and our specialist know-how. The decisive factor in selecting the appropriate concrete replacement system was compliance with the compatibility criteria: mechanical, thermal and hygric parameters had to be precisely tuned in the repair solution. In order to guarantee the durability of repair measures, special requirements had to be observed.

The repair of the sand trap at the Bonn-Beuel sewage treatment plant was a particular challenge. The planner's condition analysis had shown that the substrate was to be classified as low-modulus concrete of existing concrete class A3*. Due to the long-term strong impact of municipal wastewater and its chemical attacks of exposure classes XWW1 to XWW3, the concrete substrate was significantly affected.

The engineers of company IBE-Ingenieure, in collaboration with the experienced applicator Massenberg from Cologne, Germany, decided to refurbish the concrete with **StoCrete TS 136**, a polymer-modified dry-sprayed mortar. The special concrete repair product (SRC-A3) is ideal for restoring concrete of substrates with low strength and low modulus of elasticity, of the existing concrete class A3*. It combines the mechanical properties adapted to existing concrete with the high requirements for durability. The 20 GPa modulus of elasticity concrete repair product ensures a stable bond with the sub-surface and ensures the long-term functionality of the sand trap.

Properties of **StoCrete TS 136**

- Polymer-modified, cementitious dry-mix sprayed mortar
- Concrete repair product for the repair of concrete of substrates with low strength and low modulus of elasticity (Existing concrete class A3*)
- Modulus of elasticity: 20 GPa
- Shrinking: 0,54 ‰
- Low water absorption
- High resistance against effects of frost-de-icing salt immersion
- High resistance against penetration of chlorides
- Low carbonation progress
- Low rebound during spray application
- Very dense structure

On the restored areas of the sand trap, the concrete repair specialists additionally applied a protective coating made of **StoPox 452 EP**, the epoxy resin primer specifically for damp substrates, and the **StoPox WHG Deck 105** top coat as the main surface protection layer of the StoFloor Industry Elastic WHG Deck 105. The coating is highly chemically resistant and crack-bridging. It is also suitable for surfaces subject to mechanical stress. This prevents any cracks still present in the substrate of the existing concrete from breaking through and causing further damage from penetrating water or substances dissolved in the wastewater.

The StoCretec portfolio for the repair of sewage treatment plants offers exactly what investors, building owners, and planners need: system solutions and quality as well as high-performance special solutions from a single source.

Who & What

Project:	Municipal sewage plant, Bonn-Beuel, DE	
Investor:	Bundesstadt Bonn, DE	
Planner:	IBE-Ingenieure GmbH+Co. KG, Hennef, DE	
Applicator:	Massenberg GmbH, Köln, DE	
Realisation:	08/2021	
StoCretec Competence:	Sand trap	
	Dry-mix sprayed concrete	StoCrete TS 136
	Primer	StoPox 452 EP
	Coating	StoPox WHG Deck 105

Aerial view: municipal sewage treatment plant Bonn-Beuel, courtesy of Bundesstadt Bonn, G. Zucca

Photo: IBE-Ingenieure GmbH +Co. KG

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*)Existing concrete: In its Technical Rule on the repair of concrete structures (German original: Technische Regel „Instandhaltung von Betonbauwerken“, version: May 2020), the Deutsches Institut für Bautechnik (German institute for structural engineering) has defined 5 categories of existing concrete (A1 to A5). The term ‘existing concrete’ refers to concrete that has already been installed in buildings and structures as opposed to concrete material yet to be installed. In German, these categories are called ‘Altbetonklassen’ which translates to ‘classes of existing concrete’. Existing concrete is categorised according to its compressive strength and surface tensile strength. Before repairing existing concrete, its ‘Altbetonklasse’ needs to be determined in order to select a suitable mortar or concrete.