

In continuation of our efforts to create awareness on waterproofing for the durability of concrete structures, this issue of ReBuild is devoted to waterproofing of water retaining structures. Achieving a high durability of reinforced concrete in water retaining structures is not often planned and designed properly. This issue covers various aspects of durability in construction of water retaining structures pertaining to water and sewage treatment.

Water retaining structures can be below or above grade structures. In case of below grade water retaining structures, the raft and vertical members are subjected to different kinds of stresses with hydrostatic pressure from inside and earth / ground water pressure from outside when the tank is in full, half-full or in empty condition. Comparatively, in case of above grade water retaining structures, the members are subjected to internal pressure only. Based on functional requirements, the members are made as watertight structures and waterproofing is done for additional protection for durability of the structures.

When it comes to the waterproofing of water retaining structures, constant hydrostatic pressure combined with the rigid and porous structure of concrete pose serious challenges for an effective and durable waterproofing system. The Indian code, which is referred to for this purpose is IS : 6494-1988, R-2010, 'Code of Practice for Waterproofing of Underground Water Reservoirs and Swimming Pools', but it has not yet been updated with present materials and systems.

The first step for achieving a watertight structure is good design along with the selection of suitable constituents of concrete mix with a superplasticizer. In addition, it is important to take care of all expansion, contraction, construction joints with suitable materials and treatment at fixtures like pipes and conduits with waterbars etc. Thereafter, waterproofing of the structure should be done with an integral waterproofing compound and protection with a film-forming membrane or a preformed membrane. The modern system of crystalline is most suitable in any kind of water retaining structure for various purposes such as integral water proofing compound, injection grouts and surface applied coating materials. While choosing a preformed membrane on PCC below a raft slab or on the external surface of a retaining wall in case of

below grade structures, preformed membranes such as APP (Atactic Poly Propylene) / SBS (Styrene Butadiene Styrene) or EPDM (Ethylene Propylene Diene Monomer) membrane will be more suitable, but requires skilled application. Cementitious coatings are more suitable for waterproofing of internal surfaces of water retaining structures of below or above grade. Surface preparation is one of the most important factors for any durable coating system along with a good quality of primer and application. Wherever tiling works need to be carried out, the tiles should be laid with tile adhesives and tile joints need to be filled with tile grouts. For protection of internal areas of sewage tanks; water-based thixotropic epoxy-based coating is more suitable and care should be taken to ensure that no infiltration takes place from the sewage tank to the adjoining soil and ground water.

All the waterproofing materials to be used inside water tanks, reservoirs and swimming pools need to be tested and certified by Central Food Technological Research Institute (CFTRI) for safety purposes.

Sometimes remedial treatment of water retaining structures may be difficult and needs to be carefully planned and executed at the site so that it can be in operational condition at the earliest. The usual remedial treatment of corrosion, cracks and spalling can be made with polymer repair materials. Wherever injection is needed on the positive side, micro-fine cementitious material, with or without the addition of admixtures, can be used to produce injection grouts for crack filling. If the injection is needed on the negative side with water inside to stop the dampness and leakages, then PU Plain or PU Foam materials may be injected depending on the severity of water leakages. Where spalling of concrete has taken place in larger areas, a ferrocement concrete lining or micro concreting can be adopted after completing all corrosion treatments.

Apart from the broad aspects of waterproofing, this issue of ReBuild also covers some case studies on remedial treatment. We hope it will be beneficial for our readers for designing, waterproofing and remedial treatment of different kinds of water retaining structures. We shall focus on water proofing of internal wet areas of buildings in the next issue of ReBuild.