

SECTION – IX
WATERPROOFING WORK

1.0 GENERAL

1.1 Standards

Indian and other International Standards followed for this section shall be as listed below. Any discrepancies or ambiguities seen shall be brought to the notice of the PM and clarification / confirmation sought. His decision shall be final. However, as a general rule, more stringent specifications shall be followed.

1. IS 269 Specification for 33 grade ordinary Portland cement.
2. IS 383 Specification for coarse and fine aggregates from natural sources for concrete.
3. IS 2645 Specification for integral cement waterproofing compound.
4. IS 6494 Code of practice for waterproofing of underground reservoirs and swimming pool.
5. IS 8112 Specification for 43 grade ordinary Portland cement.
6. IS 12118 Specification for two part polysulphide based sealant :
Part – I general requirements.
7. IS 13826 Method of Test.

1.2 Quality Assurance

1.2.1 Manufacturer's Qualification

- a) Not less than five years' experience in manufacturing of membrane roofing.
 1. Obtain primary materials from single manufacturer. Manufacturer's name shall appear on containers and accessories.
 2. Provide secondary materials as required by manufacturer of primary materials.

1.2.2 Applicators Qualification

- a) Approved by manufacturer prior to execution of this Contract, with experience on at least five projects.
- b) Foreman of Field Crew: Minimum five years' experience with system of waterproofing being installed.

1.2.3 Certifications

Manufacturer's certifications on manufacturer's letterhead:

1. Certify system design; penetration, transition, and perimeter details; and system specifications are appropriate and satisfactory for this particular project.
2. Certify products proposed for use comply with standards.

3. Certify materials ordered and supplied are compatible with each other, suited for local and purpose intended and shipped in sufficient quantity to ensure proper timely installation.
4. Certify materials have express warranty of merchantability and fitness for particular purposes of this Project.
5. Certify manufacturer has reviewed Project and will issue warranty upon successful completion of installation.
6. Certify materials shipped to site meet membrane manufacturer's published performance standards and requirements of this Specification.
7. Membrane manufacturer's approval of insulation type and method of installation.
8. Manufacturer's approval of installer.

1.3 Submittals

1.3.1 Product Data

Contractor to submit along with his proposal product data for material he proposes to use.

1.3.2 Informational Submittals

- a) Certifications specified in quality assurances
- b) Manufacturer's instructions

1.4 Waterproofing compounds

1.4.1 Waterproofing compounds shall be cementitious (cement based) non-shrinking, self-curing mixtures. These shall be

- ☐ Free from sodium and chlorides
- ☐ Free from material detrimental to concrete and reinforcement.
- ☐ Able to create a membrane in one or multiple coats as per manufacturer's instruction.
- ☐ Membrane capable to prevent infiltration when applied to interior faces and ponded.
- ☐ Permeability, shear bond strength, compressive strength, volume changes meets minimum requirements of codes.

1.4.2 Accessories

All other accessories materials such as primers, bonding agents, polymers etc. shall be as recommended by waterproofing manufacturer.

1.5. Warranty

A. Special Warranty:

1. Warranty with attachments for full replacement value of completed installation signed by manufacturer, applicator and Contractor warranting against water infiltration and defects of materials and workmanship for period of ten years.

2. Provide warranty that covers labour and workmanship, including labour for access to waterproofing, for watertight warranty.
 - a. Warrant penetrations, terminations, changes of direction, and membrane.
 - b. Warranty shall include removing and reinstalling superimposed work covering waterproofing.

2.0 MATERIALS

2.1 Cement

- 2.1.1 Cement shall be ordinary Portland Cement conforming to IS and shall be of grade 43 or 33.

It shall be received in bags of 50 kg and each batch shall be accompanied with a test certificate of the factory. Also it shall be tested before use to ascertain its strength, setting time, etc. In case cement has been stored for over 6 months or for any reasons the stored cement shows signs of deterioration or contamination, it shall be tested as per the direction of the PM prior to use in the works.

- 2.1.2 Cement shall be stored in such locations so as to prevent deterioration due to moisture dampness. A dry and waterproof shed shall be provided. Bags shall be stacked on rigid waterproof platforms about 15 to 20 cm clear above the floors and 25 to 35 cm clear or away from the surrounding walls. A maximum high stack of 12 bags is permitted. Stacks shall be so arranged that the first batches are used first (FIFO), and that they permit easy access for inspection and handling.

2.2 Sand

- 2.2.1 Natural sand deposited by stream or glacial agencies as a result of disintegration of rock is the best form of sand and shall be used.

- 2.2.1.1 Sometimes it is obtained from crushed stone screenings but often contains a high percentage of dust and clay. It tends to be flaky and angular. This type produces harsh concrete and should be avoided.

- 2.2.2 Sand shall be hard, durable, clean and free from adherent coatings and organic matter and shall not contain any appreciable amount of clay. Sand shall not contain harmful impurities such as iron, pyrites, coal particles, lignite, mica shale or similar laminated material, alkali, and organic impurities in such form or quantities as to affect the strength or durability of concrete or mortar.

- 2.2.2.1 When tested as per IS 2386 Part I and Part II, sand shall not exceed permissible quantities of deleterious materials as given in table 1 of IS 383.

- 2.2.3 Grading of sand shall conform to IS and shall fall within limits.

- 2.2.4 Sand shall be stored in such a way that it does not get mixed with mud, grass, vegetables and other foreign matter. The best way is to have a hard surface platform made out of concrete, bricks or planks. It should be to the approval of the PM.

- 2.3 Water
- 2.3.1 Water used for mixing and curing shall be clean, reasonably clear and free from objectionable quantities of silt, oils, alkalies, acids, salts so as not to weaken mortar or concrete or cause efflorescence or attack the steel in RCC while curing. It shall be free of elements, which significantly affects the hydration reaction. Potable water is generally satisfactory, but it shall be tested prior to use in the works.
- 2.3.2 Water tested shall be in accordance with IS 3025. Maximum permissible limits of deleterious materials in water should be as given in IS 456.
- 2.3.3 Water storage tanks shall be such as to prevent any deleterious materials getting mixed with it.
- 2.3.4 Water shall be tested and approved in writing by the PM prior to use in the works.
- 2.4 Accessories
- Primers, bonding agents, water stops or plugs etc. as per recommendations of the manufacturer.
- 2.5 Mixes
- a) Mix materials in accordance with manufacturer's instructions
 - b) Mix in clear containers
 - c) Do not re-temper mix after initial set.
- 2.6 Light weight concrete blocks
- Blocks should have minimum crushing strength 15 Kg/Sqcm for 100mm thick blocks and 30 Kg/Sqm for 150mm and 200mm thick blocks
- Block shall be manufactured conforming to IS 2185 Part-III.
- All blocks shall be sound and free of cracks or other defects. For exposed construction face or faces shall be free of chips, or other imperfections, and the overall dimensions of the blocks shall be in accordance to tolerance as specified.
- 2.7 Delivery / Storage.
- All materials shall be delivered and stored at site conforming to following minimum requirements.
- ☐ Material received is approved by PM,
 - ☐ Material is in unopened container and labelled with manufacturer's name, brand name and instructions for use.
 - ☐ Material received shall be along with manufacturer's certificate for quality and period of manufacture.
 - ☐ Material shall be stored in dry, well ventilated and covered storage if so desired by manufacturer.
 - ☐ Primers, adhesives etc. shall be as recommended by the membrane manufacturer.

3.0 SCOPE OF WORK

- 3.1 Work shall include design, supply, install and test proprietary waterproofing systems to underground structure, terraces, toilets, UG and Overhead water

tanks etc. This shall be guaranteed for 10 years on Rs.100/- stamp paper in proforma to be approved by the PM.

- a) Waterproofing of basement including sealing of services junctions, drain points, sumps shall be as per approved box type proprietary treatment.
- b) Waterproofing of terrace inclusive of grouting, sealing rainwater down takes outlets, other services outlets, junctions of walls, slab, beam, columns, parapet wall etc., where required expansion joints all as per approved terrace proprietary treatment.

3.2 Waterproofing of toilet sunk portions and water tanks inclusive of grouting, sealing, outlet pipes of services, junctions of slab, beams, walls and covering with protective cement sand plaster coat / screed.

3.3 Work shall include design, supply, install and test proprietary systems for basement, terrace sloped/flat roofs as approved by the PM. This shall be guaranteed for 10 years on Rs.100/- Stamp paper in proforma to be approved by the PM.

Work shall conform to minimum standards specified. Systems detailed hereunder are to clarify type of water proofing system expected. Contractor is at liberty to suggest and submit equivalent system with products meeting / exceeding standards.

3.4 Sub-Contractor / Specialist shall be from the approved list and shall be approved by the PM in writing before being employed by the Contractor.

3.5 The Contractor shall submit

- 1. Statement giving detailed brief of work he proposes to carry out.
 - a) Name of agency with his experience certificate and quantum of work carried out.
 - b) Technical Specifications
 - c) Product data sheets of material to be used
 - d) Shop drawing detailing
 - o Sections co-ordinated with typical installation details
 - o Vertical termination and sealing
 - o Laps needed if any
 - o Typical expansion, construction and control jointing details with minimum requirement.
 - o Horizontal fixing and laying details.
 - o Typical finishing arrangement.
 - o Flashings if required.
 - e) Protective measures to be taken.
 - f) Installation guidance
 - g) Samples of each product in duplicate fixed over plywood boards or similar to enable proper cross sections.

- h) Manufacturer's certificate that product and material to be used is correct and shall give intended results when applied through authorized agency.

4.0 WORKMANSHIP

4.1 Preparation of Surfaces

- a) The surfaces to receive the treatment shall be thoroughly cleaned of
- ☐ Laitance, scales, loose material on surface.
 - ☐ Grease, oil or other contaminants by etching with 10-15% of solution of muriatic acid using commercial grade alkaline cleaner, flushing with clean water drying and vacuuming.
- b) Surfaces shall be examined, and well-defined cracks grouted by making 'V' groove / notches with cement slurry, shall be cured and dried well before treatment.
- c) Any honeycombs shall be carefully cut and plugged and cured well before treatment.
- d) Examination of surface shall account for the fact that,
- ☐ Surfaces are cured for 14 days and no condensation has taken place.
 - ☐ Horizontal and vertical surfaces have smooth finish, free from defects.
 - ☐ Surfaces are dry, clean, free of grease, oil, dirt, rust, corrosion, other coatings and contaminants which could affect bond of water proofing system.

4.2 Basement Waterproofing

Membrane method

FLOOR

- 1) Clean the PCC concrete surface thoroughly. Ensure that the surface is free of loose material, dirt, dust, oil, grease or other foreign matter prior to start of treatment.
- 2) Supplying and laying composite minimum 1.2mm thick, pre-applied, fully bonded, pure HDPE membrane, over P.C.C. The HDPE membrane shall be fully bonded to the Raft bottom and shall consist of 3 layers - highly resilient HDPE film of minimum 0.9mm Thick, pressure sensitive adhesive and a granular protective layer. The membrane shall have minimum of 75mm side and end laps which shall be sealed with double sided tape. The membrane shall be loosely laid onto the PCC surface and shall be capable of receiving the structural steel & concrete directly over the membrane. The membrane shall be laid as per the manufacturer's specification and shall be turned up on the vertical surfaces upto 50mm depth from the top of the raft / foundation within the shutter of the raft / foundation sides to ensure no joint/overlap in the membrane at the corner, this shall include cleaning & removal of all the dust, dirt, oil, grease, cement laitance, loose particle & prepare the P.C.C. Substrate

for laying of HDPE membrane, all as per manufacturer's instructions, etc, complete.

The membrane shall have minimum following properties:

1. Tensile Strength > 25 MPa as per ASTM D 412,
2. Elongation at Break > 500 % as per ASTM D 412,
3. Peel Adhesion to Concrete > 1500 N/m as per ASTM D903,
4. Puncture Resistance > 1000 N as per ASTM E 154,
5. Resistance to Hydrostatic Head > 70m as per ASTM D 5385,
6. Low Temperature Flexibility < (-)25 degC as per ASTM D1970,
7. Lap Peel Adhesion > 1500 N/m as per ASTM D1876,
8. Lateral Water Migration Resistance > 70m as per ASTM D5385.

- 3) The membrane shall have minimum of 100mm side and end laps which shall be sealed with heat welding with leister machine of all the joints and electrical spark testing of joints for water-tightness. The size of the membrane should not be less than 3 Mtr. x 20 Mtr. to minimise the joints.

This membrane shall be continued over the vertical surface up to minimum 300mm height above the Raft bottom and fixed as per recommendation. This membrane shall be continued over the vertical surface and fixed by PVC roundels / shot guns.

WALL

- 1) RCC Retaining Wall / footings shall be allowed to set for at least 48 hours.
- 2) After de-shuttering, clean the retaining wall / footing vertical surface thoroughly. Ensure that the surface is free of loose material, dirt, dust, oil, grease or other foreign matter, prior to starting treatment.
- 3) Providing & applying 1.5mm THK SBS modified self-adhesive, cross laminated HDPE lining waterproofing membrane, having chemical resistance pH 2 to 13, to be applied on the external surface of the retaining wall post construction, over the solvent based bituminous primer @ 4 sqm/litre. The SBS membrane shall have an overlap with HDPE membrane of minimum 100mm, treated with double sided tape & shall be extended on the wall upto 300mm above FGL, terminated as per manufacturers recommendation. This shall include Surface Preparation by cleaning work, removal of loose concrete and filling cracks with polymer modified mortar & treatment of tie rod holes, bracing angle etc with polymer modified plugging mortar, which are anchored in shuttering for holding the same and other projections as per manufacturers' recommendation, after DE shuttering & curing is done, corner detailing of Raft & Retaining Wall shall be done with 150mm wide SBS flashing tape in L-shape, etc, complete.

- 4) The SBS modified self-adhesive membrane shall have minimum following properties:
 1. Elongation > 300% as per ASTM D 5147,
 2. Puncture resistance > 220 N as per ASTM E 154,
 3. Tensile Strength (Film) > 48 N/mm² as per ASTM D 638,
 4. Tear Resistance (Film) > 330 N/mm as per ASTM D 1004,
 5. Bond Strength (to Primed Concrete) > 2 N/mm as per ASTM D1000,
 6. Lap Adhesion > 2 N/mm as per ASTM D 1000,
 7. Water Vapor Transmission ≤ 0.30 g/m²/day,
 8. Hydrostatic Head resistance > 50m,
 9. crack bridging upto 1.5mm,
 10. Low Temperature flexibility < (-) 15 degC.
 - 5) The membrane shall have minimum of 100mm side and end laps which shall be sealed with heat welding with leister machine of all the joints and electrical spark testing of joints for water-tightness. The size of the membrane shall not be less than 3 m x 20 m to minimise the joints. The membrane shall be fixed over the vertical surface by PVC roundels / shot guns and shall continue minimum 200mm above the FGL and terminated as per manufacturers specification, etc, complete.
 - 4) Providing & installation of aluminum termination bar minimum 200 mm above finished floor level & shall be fixed with non-corrosive fastener @ 4 nos per rm. Sealing of termination bar with PU Sealant.
 - 5) Membrane protection: Provide & installation of 8mm thick high density polyethylene (HDPE) brown nodular protection board, with CE marking, having Air volume between nodules > 5.5 l/m², over the waterproofing membrane for vertical surface, stuck to the membrane by spot bonding method, using synthetic adhesive with overlaps of 100mm minimum, to protect the membrane from damages from back-filling materials, etc, complete.
- The protection board shall have following minimum properties:
1. Tensile strength (L/T) > 600 / 500 N/50mm as per EN 12311-2,
 2. Elongation > 30% as per EN 12311-2,
 3. Impact resistance > 300mm as per EN 12691,
 4. Shear resistance > 140 N/50mm
 5. Compressive strength > 250 KN/m² as per UNE-EN-ISO 604.

4.3 Terrace waterproofing

- 4.3.1 Various experienced waterproofing specialists shall carry out the following or similar types of water proofing treatments. The treatment shall be taken over

vertical surfaces as required / specified. Final finished surfaces may be laid with paving tiles, stones or finished smooth in cement and marked with false chequered marking. Points given below are just for guidelines. The actual steps and details shall be submitted by the contractor for approval of the PM. Work shall be carried out as per approved method by the PM.

4.3.2 Surface preparation

The surface to be treated shall be cleaned and inspected thoroughly

- a) Removing all laitance, foreign matter, dirt, oil, grease and loose particles using conventional methods. Treating all the construction joints using polymer modified mortar of approved make, by cutting 25mm x 25mm "V" shape groove along the joint. Providing 75mm x 75 mm coving at H-V junctions using polymer modified mortar modified. Also cutting the groove at height of 300mm on parapet wall for the purpose of terminating the extended waterproofing.
- b) Roof areas shall be well marked with spot datum to create ridge, lines, slopes and drain points for easy draining of water (Nominal slopes shall be about 1:100).
- c) Chemical injection treatment in the form of pressure grouting to leakage points, cold joints by injecting cement slurry mixed with approved expansive grout admixture @ 225 gms. per bag of cement, through the pre fixed PVC nozzles in the 18 mm dia holes, fixing of PVC nozzles with Renderoc Plug and final cutting the projected nozzles and sealing off the PVC nozzles after the injection operation is over with Renderoc plug, non-shrink rapid setting mortar compound, finishing, curing etc.
- d) Providing and applying single component approved elastomeric, seamless Polyurethane based membrane in two coats with spray / roller / brush application to achieve thickness of 1.3mm, having an elongation capacity over 600% and with solid content more than 85% applied on the RCC surface, as per approved manufacturer's specification. Properties Typical cured membrane properties (at 28 days), Elongation (ASTM D412) : 620 %, Specific gravity : 1.5 to 1.55 g/cc, Modulus @ 100% elongation (ASTM D412) : 0.62 N/mm², Tear resistance (ASTM D624) : 15 N, Water vapour transmission (ASTM E96) : 9.7 g/m²/24 hrs.
- g) Further, it shall be protected with minimum 50mm thick M20 grade concrete screed laid in slope 1:100 or as per site requirement with adding of integral waterproofing compound (at the dosage of 125ml/bag of cement) of approved manufacturer, 4% by weight of cement ready to receive floor finish protective layer of approved tiles with spacers. The screed shall be cured by ponding it for a minimum of 7 days. System to be carried over parapet wall about 300mm high from finished floor level.
- h) Vertical surface shall be protected by providing and applying 12mm thick plastering with CM 1:4 mixed with integral waterproofing compound (at the dosage of 125ml/bag of cement) over waterproofing layer to a minimum thickness of 12mm or as directed by PM and

terminating the same by making 10mm x 10mm chase/rebate on the vertical wall at a height of 300mm from FFL (Final Finish Level) for termination of the liquid membrane. The chase/rebate shall be sealed with approved PU sealant. Testing by ponding of water about 200 mm high for 72 hrs., protecting till handover, testing for heat insulation etc. all complete shall be done as per specifications and as directed by the PM; Contractor has to provide guarantee for 10 years on a approved stamp paper in approved proforma.

- i) Watas and rounding of corners, junctions with walls and floors and finished smooth and cured.
- j) All expansion joints shall be cleaned, primed and finished with sealant as specified by manufacturer of sealant and approved by PM.

4.3.3 Testing

Treatment shall be tested again by ponding water about 250 mm high for 72 hours. Surfaces shall be examined for leakage seepage, dampness, sweating etc.

- 4.3.4 Measurements shall be in square metre for finished surface area. Rates shall include all items right from cleaning of surface to completion and testing required against defects such as leakage, seepage, dampness, sweating etc.

4.4 Waterproofing by Chemical coating

- 4.4.1 Various reputed and experienced chemical companies' offers waterproof coatings through their approved applicator or under their direction. RCC slab shall be treated with approved chemical integral cement based waterproof coating. Slopes to RCC slabs are achieved by laying the same while concreting or by laying screed / light weight concrete. Treatment is carried over to watta and on parapet at least 300 mm above finished surfaces. Chemical coated areas are further finished with 40 mm thick IPS or by laying paving stone, tiles, china mosaic etc. The actual steps shall be as directed by manufacturer chemical and approved by the PM. For guidance following steps shall be followed.

4.4.2 Surface Preparation

- a) All minor, medium cracks shall be marked.
- b) All cracks shall be well defined and 'V' groove made. These shall be cleaned with compressed air, grouted with cement sand mortar 1:4 (1 cement : 4 sand) slurry mixed with non-shrinking and waterproofing compound. Areas well cured.
- c) Then again surfaces shall be well cleaned of all loose particles, laitance, moss, oil/greasy material, cement etc.
- d) Prepared surface shall be finished smooth with cement sand mortar mixed in ratio CM 1:4 and applied about 8 - 10 mm and finished smooth by trowel. (This is basically to get smooth surface) for application of cement based chemical coating.
- e) Smooth surface cured and moistened
- f) Chemical added with cement as per direction of approved manufacturer shall be mixed, stirred and applied in one, two or three

- coats allowing required curing (minimum time gap between two consecutive coats).
- g) Surfaces cured as per direction.
 - h) Surfaces shall be finished with screed about 15-20 mm if to be left long as protective coarse to receive further specified finish.
- 4.4.3 Measurements shall be in square metre for finished surface area. Rates shall include all items right from cleaning of surface to completion and testing required against defects such as leakage, seepage, dampness, sweating etc.
- 4.4.4 Filling sunken portion with light weight block bats
- 4.4.4.1 Filling light weight block bats (40-60 mm) with cement mortar mixed in ratio 1:3:6 (1 cement : 3 sand : 6 brick bats) including mixing of water proofing compound 4 % by weight of cement. Further surfaces shall be screeded with (1:1.5:3) cement concrete mix with 4% by weight of cement approved waterproofing compound about 20-30mm thick and finished smooth or ready to receive finish material as specified. Care shall be taken prior to filling all pipes passing through sunk portion are pressure tested by maintaining pressure for 24 hours and junctions of pipes passing through walls, slabs are well grouted and sealed.
- 4.4.4.2 This shall be tested by ponding water for 100mm thickness and maintaining for 72 hours.
- 4.4.4.3 Measurement shall be in volume in Cum of filled sunk portion.
- 4.5 Waterproofing for Water Retaining structures
- 4.5.1 Providing and applying two component acrylic cementitious coating system reinforced shall be applied to water retaining structures.
- 4.5.2 Steps followed shall be as per the directions of the manufacturers and approval of the PM. For guideline following steps may be followed.
1. Surface preparation

Clean up the surface, removing dust, oil, greases or efflorescence. Cleaning can be done by mechanical grinders/scarifiers and with compressed air blowers without washing the surface with water. Fill the cracks and fissures with a solvent free epoxy putty, remove old existing waterproofing paints/coatings.
 2. Providing and applying three coats of 2 component acrylic polymer modified cementitious waterproof coating of approved make onto the walls and floor of internal area of Water retaining structures (UG Sump, OHT, Fire water tanks). The cementitious waterproof coating supplied in two components - Component A (Grey Powder) & Component B (White Liq Polymer) shall be mixed at site at ratio of 2:1(A:B). The substrate shall be water primed to maintain SSD condition prior waterproofing membrane application. The waterproof coating then shall be applied in 3 coats to form a total thickness of upto 1.5 mm including reinforcing layer, the reinforcing layer of 40 gsm polyester scrim of approved make embedded between first and second coat. Once cured, Polymer modified cementitious coating

shall possess excellent adhesion to Concrete @ 28 days $\geq 1\text{N/mm}^2$, Elongation (28 days - 1mm dft) - $100 \pm 15\%$ & exhibits good resistance to diffusion of CO_2 , SO_2 , Chlorides and Sulphates.

3. Allow the coating to dry before laying protection screed, and complete. Shall be supplied by the same waterproofing manufacturer and the complete system should be installed as per manufacturer's recommendations, etc. complete and as directed by PM.
 4. Providing and applying 12-15mm thick Protective Screed / Plaster in cement mortar of 1:4 including integral waterproofing admixture @ 100 ml per bag of cement with wattas at the junctions applied on the floor & treated vertical surfaces, broom finished/ smooth finished as directed at site, including curing & testing for watertightness for 7 days etc. complete in all aspects as directed by PM.
 5. Providing and applying two components, epoxy based solvent free food grade coating of approved make having a mixing ratio of pigmented resin and hardener 100:20, for concrete tanks containing portable water. The scope of work includes surface preparation, surface to be treated must be primed with solvent free epoxy primer followed by mixing the two components in suggested proportion using low speed mechanical stirrer and apply two coats to build 200 microns DFT while maintaining over-coating interval of minimum 18 hrs to maximum 24 hrs. Once the coating is cured it provides excellent chemical resistance, resistance to bacterial growth, provides Tensile strength of 19-20 N/mm^2 and complete. Products shall be supplied by the same waterproofing manufacturer and the complete system should be installed as per manufacturer's recommendations, etc. complete and as directed by PM.
 6. Curing shall be done for 7 days.
- 4.5.3 Treatment shall be tested by ponding water about 250 mm high for 72 hours. Surfaces shall be examined for leakage seepage, dampness, sweating etc.
- 4.5.4 Measurements shall be in square metre for finished surface area. Rates shall include all items right from cleaning of surface to completion and testing required against defects such as leakage, seepage, dampness, sweating etc.
- 4.6 Waterproofing to Internal surface of lift pit area
- 4.6.1 Clean up the surface, removing dust, oil, greases or efflorescence. Cleaning can be done by mechanical grinders/scarifiers and with compressed air blowers without washing the surface with water. Fill the cracks and fissures with a solvent free epoxy putty.
- 4.6.2 Providing and applying in depth penetrating type crystalline slurry waterproofing system (Mix Ratio of Water : powder = 0.4), to be applied as a slurry application in 2 coats at a total consumption of approx. 1.6 Kg / sqm as per manufacturer's recommendation applied on the internal wall & floor surface of the Liftpit, to be done post construction, including cleaning of the surface as per manufacturers specification, treating the construction joints

with crystalline plugging mortar, treating the honeycombs, & cracks with cementitious injections admixing expansive additive @ 225 gms per bag of cement, etc. complete.

The crystalline slurry coating shall have following minimum properties:

1. Water head resistance > 70m as per DIN 1048,
2. Bulk Density > 1150 kg/m³,
3. Crack sealing capacity upto 0.5mm

5.0 TESTING

5.5.1 On completion of installation and prior to next operation or as directed by PM work shall be tested by the Contractor. Required water shall be arranged and disposed of by the contractor at his cost.

- a) All openings, drains etc. shall be plugged.
- b) Water shall be flooded about 200 mm over the Sunk portion. Water shall be kept for 72 hours.
- c) Surfaces shall be observed critically and in case any leakage is observed areas shall be treated again and tests to be carried out again to the satisfaction of the PM.

5.5.2 Approval of water test does not relieve the contractor of his obligation of providing installed waterproofing guaranteed for 10 years as per contract.

5.5.3 All arrangement of material, labour etc. required including preserving and maintaining areas flooded shall be carried out by the Contractor at his cost.

6.0 GUARANTEE

6.1 All waterproofing systems described above are to be referred as guidelines only. The contractor shall propose the system before starting waterproofing work giving full description for approval of PM.

6.2 The system shall be guaranteed for 10 years against all defects and liabilities thereof from the date of completion of project. The guarantee shall be on Stamp Paper of Rs.100/- in proforma to be approved by Employer/ PM. (The Contractor shall submit proforma for approval of Employer/ PM before being written on Stamp Paper.) The cost of Stamp Paper shall be to the contractor's account.

6.3 Work shall be carried through approved specialist agency as per method of working approved in writing by the PM.

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