Presentation on Rehabilitation Of Structures, Water Proofing and Quality Control During Execution

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QUALITY CONTROL DURING EXECUTION

BACKGROUND

- RCC
- CEMENT (RAW MATERIAL SOURCE AND QUALITY OF FLY ASH)
- COARSE AGGREGATE
- FINE AGGREGAE (SAND)
- WATER
- ADMIXTURES

QUALITY OF WATER

- **POTABLE WATER**
- **SEASONAL CHANGES (BORE WATER)**
- **PH SHALL NOT BE LESS THAN 6**
- **To neutralize 100 ml sample of water, using phenolphthalein as an indicator, it should not require more than 5 ml of 0.02 normal NaOH.**
- **To neutralize 100 ml sample of water, using mixed indicator, it should not require more than 25 ml of 0.02 normal H_2SO_4.**

QUALITY OF WATER

Table 1 Permissible Limit for Solids

(*Clause* 5.4)

Sl No.		Tested as per	Permissible Limit, *Max*
i)	Organic	IS 3025 (Part 18)	200 mg/l
ii)	Inorganic	IS 3025 (Part 18)	3 000 mg/l
iii)	Sulphates (as SO_3)	IS 3025 (Part 24)	400 mg/l
iv)	Chlorides (as Cl)	IS 3025 (Part 32)	2 000 mg/l for concrete not containing embedded steel and 500 mg/l for reinforced concrete work
v)	Suspended matter	IS 3025 (Part 17)	2 000 mg/l

IS 383: 2016
Coarse and Fine Aggregate for Concrete - Specification
(Third Revision)

BACKGROUND

- **TERMINOLOGY AS PER IS 383 :2016**

- SCARCITY IN AVAILABILITY OF AGGREGATES FROM NATURAL SOURCES .
- SUPPLEMENTING THE SAME WITH THE USE OF AGGREGATES FROM OTHER THAN NATURAL SOURCES.

FINE AGGREGATE/COARSE AGGREGATE FROM NATURAL SOURCES

FINE AGGREGATE	COARSE AGGREGATE
NATURAL SAND/UNCRUSHED SAND: FINE AGGREGATE RESULTING FROM THE NATURAL DISINTEGRATION OF ROCK	(a) **UNCRUSHED GRAVEL OR STONE** -WHICH RESULTS FROM NATURAL DISINTEGRATION OF ROCK;
CRUSHED SAND i. CRUSHED STONE SAND-FINE AGGREGATE PRODUCED BY CRUSHING HARD STONE. ii. CRUSHED GRAVEL SAND-FINE AGGREGATE PRODUCED BY CRUSHING NATURAL GRAVEL. iii. MIXED SAND-FINE AGGREGATE PRODUCED BY BLENDING NATURAL SAND AND CRUSHED STONE SAND OR CRUSHED GRAVEL SAND IN SUITABLE PROPORTIONS	(**b)CRUSHED GRAVEL OR STONE** -WHEN IT RESULTS FROM CRUSHING OF GRAVEL OR HARD STONE (c) **MIXED**- PARTIALLY CRUSHED GRAVEL OR STONE WHEN IT IS A PRODUCT OF THE BLENDING OF (a) and (b)

FINE AGGREGATE/COARSE AGGREGATE FROM OTHER THAN NATURAL SOURCES

BY PROCESSING MATERIALS, USING THERMAL OR OTHER PROCESSES SUCH AS SEPARATION, WASHING, CRUSHING AND SCRUBBING.

MANUFACTURED FINE AGGREGATE (MANUFACTURED SAND)	MANUFACTURED COARSE AGGREGATE
(a) IRON AND STEEL SLAG AGGREGATES IRON SLAG IS OBTAINED AS A BYPRODUCT, WHILE PRODUCING IRON IN BLAST FURNACES OR BASIC OXYGEN FURNACES IN INTEGRATED IRON AND STEEL PLANTS **(b) COPPER SLAG AS AGGREGATES** COPPER SLAG IS PRODUCED AS A BYPRODUCT FROM COPPER SMELTER, WHILE PRODUCING COPPER FROM COPPER CONCENTRATE (COPPER PYRITE) THROUGH PYRO METALLURGICAL PROCESS **(c) CONSTRUCTION AND DEMOLITION (C&D) WASTE** (I) RECYCLED CONCRETE AGGREGATE (RCA)- DERIVED FROM CONCRETE AFTER REQUISITE PROCESSING.	**(a) IRON AND STEEL SLAG AGGREGATES** **(b) CONSTRUCTION AND DEMOLITION (C&D) WASTE** **(I) RECYCLED AGGREGATE (RA)** RA IS MADE FROM C&D WASTE WHICH MAY COMPRISE CONCRETE, BRICK, TILES, STONE, ETC, **(II) RECYCLED CONCRETE AGGREGATE (RCA)** IS DERIVED FROM CONCRETE AFTER REQUISITE PROCESSING.

ADDITIONAL REQUIREMENTS FOR USING MANUFACTURED AGGREGATES

Table 3 Additional Requirements for all Manufactured Aggregates
(Clause 5.7)

Sl No. (1)	Characteristic (2)	Requirement (3)
i)	Total alkali content as Na_2O equivalent, percent, *Max*	0.3
ii)	Total sulphate content as SO_3, percent, *Max*	0.5
iii)	Acid soluble chloride content, percent, *Max*	0.04
iv)	Water absorption, percent, *Max*	5 (*see* Note 1)
v)	Specific gravity	2.1 to 3.2 (*see* Notes 2 and 3)

Table 4 Additional Requirements for Iron and Steel Slag Aggregates
(Clause 5.7)

Sl No. (1)	Characteristic (2)	Requirement (3)
i)	Calcium oxide as CaO, percent, *Max*	45.0
ii)	Total sulphur as S, percent, *Max*	2.0
iii)	Total iron as FeO, percent, *Max*	3.0

NOTE — Stockpiling of slag aggregate: Crushed slag aggregate should be stockpiled in moist condition at or near the saturated surface dry (SSD) condition before use, with the moisture condition being maintained by sprinkling with water.

Table 5 Additional Requirements for Electric Furnace Oxidation Slag Coarse Aggregate
(Clause 5.7)

Sl No. (1)	Characteristic (2)	Requirement (3)
i)	Calcium oxide as CaO, percent, *Max*	40
ii)	Magnesium oxide as MgO, percent, *Max*	10
iii)	Total iron as FeO, percent, *Max*	50
iv)	Basicity as CaO/SiO_2, percent, *Max*	2

Table 6 Additional Requirements for Copper Slag Aggregate
(Clause 5.7)

Sl No. (1)	Characteristic (2)	Requirement (3)
i)	Calcium oxide as CaO , percent, *Max*	12.0
ii)	Total sulphur as S, percent, *Max*	2.0
iii)	Total iron as FeO, percent, *Max*	70
iv)	Chlorine as NaCl, percent, *Max*	0.03

MANUFACTURED AGGREGATES AND EXTENT OF UTILIZATION

Table 1 Extent of Utilization
(*Clause* 4.2.1)

Sl No.	Type of Aggregate	Maximum Utilization		
		Plain Concrete Percent	Reinforced Concrete Percent	Lean Concrete (Less than M15 Grade) Percent
(1)	(2)	(3)	(4)	(5)
i) Coarse aggregate:				
a)	Iron slag aggregate	50	25	100
b)	Steel slag aggregate	25	Nil	100
c)	Recycled concrete aggregate[1)] (RCA) (*See* Note 1)	25	20 (Only upto M25 Grade)	100
d)	Recycled aggregate[1)] (RA)	Nil	Nil	100
e)	Bottom ash from Thermal Power Plants	Nil	Nil	25
ii) Fine aggregate:				
a)	Iron slag aggregate	50	25	100
b)	Steel slag aggregate	25	Nil	100
c)	Copper slag aggregate	40	35	50
d)	Recycled concrete aggregate[1)] (RCA) (*See* Note 1)	25	20 (Only upto M25 Grade)	100

SAND FOR PLASTERING

- **IS 1542: 1992 : SPECIFIES FOR USE OF EITHER NATURAL SAND OR CRUSHED SAND**
- SUBJECT TO FULLFILLMENT OF GRADATION/DELETERIOUS METERIAL SUCH AS CLAY, SILT/DUST AND ORGANIC IMPURITIES
- 600 MICRON SIEVE LIMITS HAVE NO TOLERENCE. SHALL BE BETWEEN 80-100 PERCENTAGE PASSING
- CRUSHED STONE SAND PERCENTAGE PASSING ON 150 MICRON SIEVE IS 0-20.

MISCONCEPTIONS

- STONE DUST IS SAME AS CRUSHED SAND
- STONE DUST IS WASTE BY PRODUCT WHILE CRUSHING &WASHING OF AGGREGATES TO SPECIFIC SIZES,
- DOES NOT COMPLY GRADATION REQUIREMENTS
- CONTAINS VERY FINE PARTICLES AND SPECIFIC SURFACE AREA IS VERY HIGH
- LEAD TO HIGHER REQUIREMENTS OF CEMENT/WATER
- DOES NOT ACHIEVE THE DESIRED STRENGTH.
- SHALL BE AVOIDED FOR RCC/PCC INCLUDING PLASTERING .

MISCONCEPTIONS

- MIXING FLYASH ETC
- CAN BE USED FOR LAND FILLS

CRUSHED SAND VS RIVER SAND

CRUSHED SAND	RIVER SAND
ANGULAR AND CUBICAL IN SHAPE, WHICH PROVIDES A ROUGHER TEXTURE	**ROUNDED AND SMOOTH PARTICLES**
ANGULAR SHAPE IMPROVES THE BONDING WITH CEMENT AND OTHER AGGREGATES, CONTRIBUTING TO **HIGHER STRENGTH AND DURABILITY** IN CONSTRUCTION.	LOW STRENGTH
LESS MOISTURE CONTENT	HIGH MOISTURE CONTENT
UNIFORMITY IN SIZE AND QUALITY	NON UNIFORMITY IN SIZE AND QUALITY
FASTER SETTING	SLOW SETTING
NO DELETERIOUS METERIAL (SINCE WASHING IS INVOLVED)	DELETERIOUS METERIAL SUCH AS CLAY, SILT, ORGANIC IMPURITIES
IF USED IN PLASTERING /SURFACE WILL BE PORUS	LESS PORUS

CRUSHED SAND VS RIVER SAND

CRUSHED SAND	RIVER SAND
HIGH REQUIREMENT OF WATER AND CEMENT DUE TO ANGULAR SHAPE	LESS REQUIREMENT OF WATER AND CEMENT DUE TO ROUND SHAPE
SLOW CONSTRUCTION	FASTER CONSTRUCTION
ENVIRONMENT FRIENDLY	NOT ENVIRONMENT FRIENDLY
LOW COST	HIGH COST
USE FOR RCC/PCC- INCLUDING PLASTERING WHERE RIVER SAND NOT AVAILABLE	USE FOR PLASTERING

REPAIR/REHABILITATION OF VINTAGE BUILDINGS

STRUCTURAL AUDIT/ASSESSMENT OF BUILDINGS

- Visual Inspection of the building
- UPV test
- Core drilling Test
- Carbonation test
- Half-cell potential test
- Evaluation of chlorides and pH through concrete powder samples
- Processing the NDT measured data, preparation and submission of detailed report on NDT including condition assessment
- Suggesting suitable Rehabilitation methodology with detailed BOQ to undertake the rehabilitation of the distressed RC structural elements

VISUAL INSPECTION OF THE BUILDING

- Cracking of RC elements
- Cracking and spalling of concrete
- Spalling of concrete and exposure of rebars
- Cracking of the masonry wall
- Water leakage, Dampness in RC Slab/column/beams/masonary

VISUAL INSPECTION OF THE BUILDING

Photo 2 A view of the cracking and spalling of concrete in the RC drop panel at the front side of the building

VISUAL INSPECTION OF THE BUILDING

Photo 3 A view of the cracking and spalling of concrete in the RC column D7 at the exterior face of the building

VISUAL INSPECTION OF THE BUILDING

Photo 4 A view of the cracking in the RC beams at the exterior face on the North-west side of the building

VISUAL INSPECTION OF THE BUILDING

Photo 10 A view of the cracking in the RC slab of the passage area in the first floor

VISUAL INSPECTION OF THE BUILDING

Photo 5 A view of the cracking in the masonry wall at the reception area at the interior of the building

VISUAL INSPECTION OF THE BUILDING

Photo 2 A view of the cracking in a RC column A3 at the front side of the garage

VISUAL INSPECTION OF THE BUILDING

Photo 4 A view of the spalling of concrete and exposure of rebars in the RC columns A6 & A7 at the front side of the garage

VISUAL INSPECTION OF THE BUILDING

- Cracking of RC elements
- Cracking and spalling of concrete
- Spalling of concrete and exposure of rebars
- Cracking of the masonry wall
- Water leakage, Dampness in RC Slab/column/beams/masonary

UPV TEST (ULTRASONIC PULSE VELOCITY TEST)

- This technique measures the velocity of the ultrasonic pulse of a particular frequency (54 KHz or 24 KHz for concrete) through the concrete medium.
- This method consists, basically, of measuring the transit time of ultrasonic pulse transmitted through the concrete medium and calculating the pulse velocity by dividing the path length by time of transit.

UPV TEST (ULTRASONIC PULSE VELOCITY TEST)

- The pulse velocity measurements can be used to establish the following characteristics of the concrete structure.

- Homogeneity
- the presence of cracks, voids, and other imperfections
- changes in the structure of the concrete which occur with time
- the quality of the concrete in relation to the standard requirements
- the quality of one element of concrete in relation to another
- the values of elastic moduli of concrete.

UPV TEST (ULTRASONIC PULSE VELOCITY TEST)

Photo 13 A view of the UPV test in progress in the RC Slab of the ground floor by indirect method of measurement

UPV TEST (ULTRASONIC PULSE VELOCITY TEST)

Sl. No.	Average Values of Pulse Velocity by Cross Probing/direct method of measurement	Concrete Quality Grading
i	For Concrete (≤ M 25)	
	Above 4.50 km/s	Excellent
	Between 3.50 - 4.50 km/s	Good
	Below 3.5 km/s	Doubtful[1)]
ii	For Concrete (> M 25)	
	Above 4.50 km/s	Excellent
	Between 3.75 - 4.50 km/s	Good
	Below 3.75 km/s	Doubtful[1)]
[1)]In case of 'Doubtful quality', it shall be necessary to carry out additional tests		

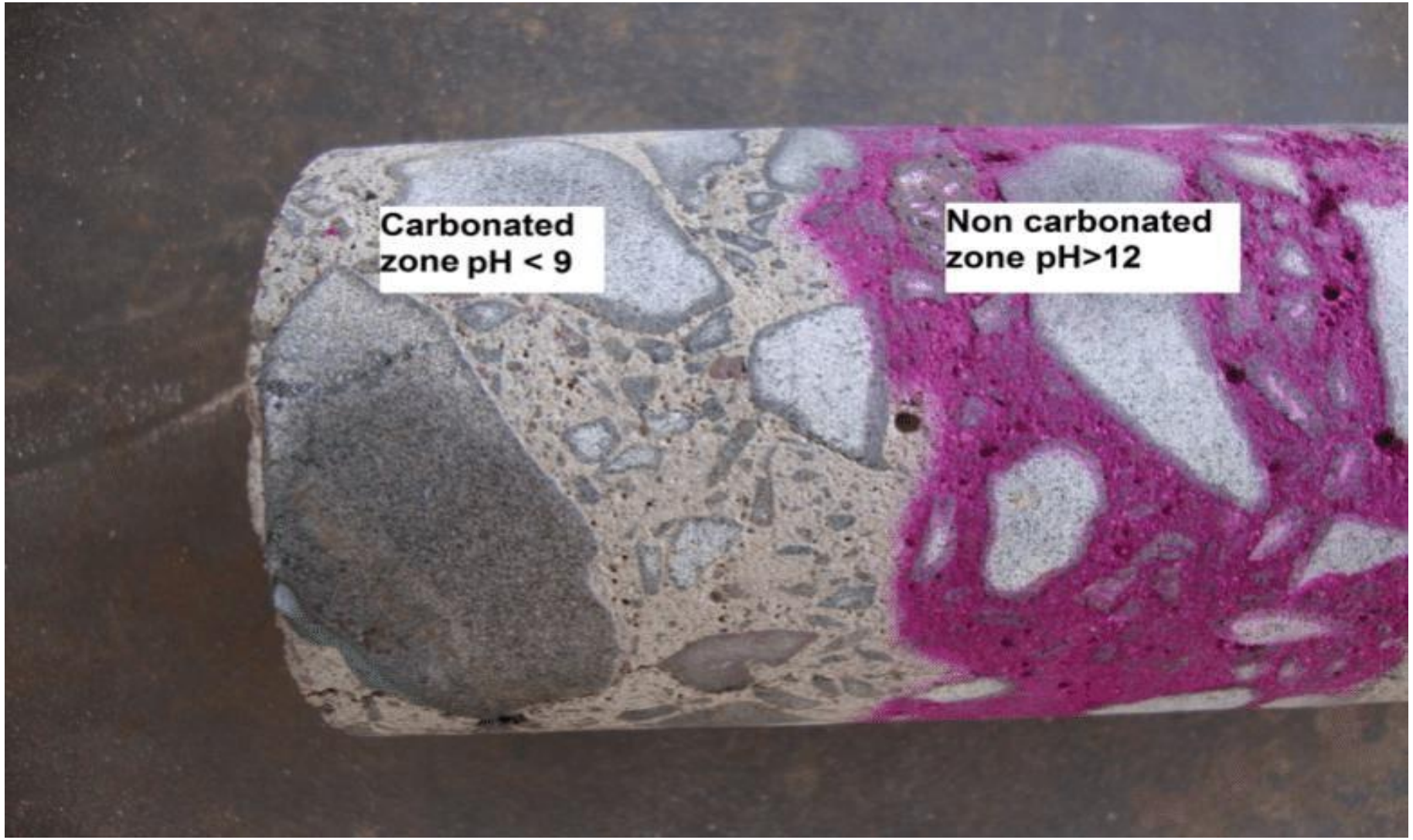
CORE DRILLING TEST & CARBONATION TEST

- Profoscope can be used to identify the locations of the reinforcement in the RC structural elements
- 69mm Dia core samples without cutting the reinforcement
- The cylindrical concrete core samples were sprayed with 1% solution of phenolphthalein in alcohol indicator. If the sprayed portion results in colourless surface, it indicates the extent of carbonation.
- UPV tests can be conducted on the core samples.
- compressive strength.

CORE DRILLING TEST & CARBONATION TEST

Photo 14 A view of the core drilling test in progress in a RC Column of the First Floor

CORE DRILLING TEST & CARBONATION TEST



HALF-CELL POTENTIAL TEST

- Determining the corrosion activity of the reinforcing steel
- Half-cell potentiometer works on the principle of measuring voltage in the circuit of reinforcement and cover concrete using Copper Sulphate Half-Cell.

EVALUATION OF CHLORIDES AND PH THROUGH CONCRETE POWDER SAMPLES

- Conrete Powder samples are chemically analysed to check for the presence of aggressive chemical agents, such as, chlorides and pH
- Maximum chloride content in concrete shall not exceed 0.6 kg/m3 by weight of concrete at the time of placing as per IS: 456-2000
- Range of PH??

REPAIR REHABILITATION OF VINTAGE BUILDINGS

- **Cracking noticed in the RC structural elements due to corrosion of the rebars shall be rehabilitated using Polymer Modified Mortar (PMM)**
- **Cracking and spalling** of concrete noticed in the **RC drop panels and RC sunshades** shall be rehabilitated using Polymer Modified Mortar
- **Spalling of concrete and exposure of rebars** noticed in the RC structural elements shall be rehabilitated using Micro Concrete Jacketing
- Repair of cracks in the Brick Walls

REHABILITATION METHODOLOGY FOR CRACKING OBSERVED IN THE RC STRUCTURAL ELEMENTS USING POLYMER MODIFIED MORTAR

- **Stage 1**

Remove the cover concrete portion in the cracked RC structural elements carefully with mechanical arrangements and hand chiseling. Clean the surface to remove loose dust/particles.

- Stage 2

Application of anti-corrosive coating and providing Galvanic Protection

Clean the reinforcement and apply the anticorrosive coating like Nitozinc primer manufactured by M/s Fosroc Chemicals or equivalent. Before the application of anti-corrosive coating, provide the sacrificial Zinc anode as per the standard manufacturer's specification. Product like Galvashield XPI can be used.

REHABILITATION METHODOLOGY FOR CRACKING OBSERVED IN THE RC STRUCTURAL ELEMENTS USING POLYMER MODIFIED MORTAR

➢ **Stage 3**
Provision of epoxy jointing compound
Prepare the surface suitably using an epoxy-based bond coat like Nitobond EP, manufactured by M/s Fosroc Chemicals or equivalent.
➢ Stage 4
After the application of the bond coat, Polymer Modified Mortar (Nitobond SBR manufactured by M/s Fosroc chemicals or equivalent) may be prepared as follows:
Cement and sand (sieved) shall be mixed in the ratio of 1:3 and 3 litres of Nitobond SBR (manufactured by M/s Fosroc Chemicals or equivalent) per bag of cement or any equivalent shall be added to the above mortar mix and applied to the primed concrete surface using a trowel. The dosage of SBR shall be 3 lit per bag of cement.

REHABILITATION METHODOLOGY FOR CRACKING OBSERVED IN THE RC STRUCTURAL ELEMENTS USING POLYMER MODIFIED MORTAR

➢ Stage 5

The surface shall be finished neatly to the required line and length. Membrane curing (Concure WB manufactured by M/s Fosroc Chemicals or equivalent) shall be used for curing the finished surface.

REHABILITATION METHODOLOGY FOR THE SPALLING OF CONCRETE AS WELL AS EXPOSURE OF REBARS OBSERVED IN THE RC COLUMNS USING MICRO CONCRETE JACKETING

➢ Micro concrete jacketing for RC columns

1. Strengthening is to be done using micro concrete

2. Support the slab & beam which is contributing the load for the column under rehabilitation.

➢ Stages of repair Stage 1

Remove the damaged concrete portions completely till the reinforcement is exposed from the member carefully with mechanical arrangements and hand chiselling. Clean the surface to remove loose dust/particles.

REHABILITATION METHODOLOGY FOR THE SPALLING OF CONCRETE AS WELL AS EXPOSURE OF REBARS OBSERVED IN THE RC COLUMNS USING MICRO CONCRETE JACKETING

➢ Stage 2 Anchoring shear connectors into existing column

- Shear connectors in the form of ‘L-shaped’ bars has to be anchored into the existing concrete to ensure integral action of the reinforced concrete jacket portion with the hardened core concrete of the existing column.
- Drill holes not less than 75 mm depth (long) into the members from the surface (Perpendicular to the surface) taking care not to damage the existing steel reinforcements in the column. The positioning of the holes has to be staggered along the perimeter and height of the column. The vertical spacing of shear connectors should be less than 300 mm for all the sides of the member.
- Clean the holes with a jet of compressed air and remove the loose dust particles thoroughly.

REHABILITATION METHODOLOGY FOR THE SPALLING OF CONCRETE AS WELL AS EXPOSURE OF REBARS OBSERVED IN THE RC COLUMNS USING MICRO CONCRETE JACKETING

- **Use chemical resin type capsules marketed by reputed firms. (example - Fosroc Chemicals (I) Pvt. Ltd. or equivalent) for anchoring/fixing dowel bars into the holes to serve as shear connectors.**
- Adopt at least 10-mm dia. HSD bars as shear connectors for which 12-mm dia holes may be needed.
- The additional reinforcement shall be connected to the shear connectors already provided in case the rebars have undergone more than 30% loss in diameter.

REHABILITATION METHODOLOGY FOR THE SPALLING OF CONCRETE AS WELL AS EXPOSURE OF REBARS OBSERVED IN THE RC COLUMNS USING MICRO CONCRETE JACKETING

➢ **Stage 3 Application of anti-corrosive coating and providing Galvanic Protection**

- Clean the reinforcement and apply the anticorrosive coating like Nitozinc primer manufactured by M/s Fosroc Chemicals or equivalent. Before the application of 20 anti-corrosive coating, provide the sacrificial Zinc anode as per the standard manufacturer's specification. Product like Galvashield XPI can be used.

➢ Stage 4 Provision of watertight shuttering

- Suitable shuttering (leak proof) system has to be placed in position for the jacket portion of the members in stages and micro concrete as per specifications has to be placed into the form work of the jacket portion. Care has to be taken so that the micro-concrete used does not flow out of the shuttering.

REHABILITATION METHODOLOGY FOR THE SPALLING OF CONCRETE AS WELL AS EXPOSURE OF REBARS OBSERVED IN THE RC COLUMNS USING MICRO CONCRETE JACKETING

➢ **Stage 5**

- The preparation of the micro concrete (Rendroc RG manufactured by M/s Fosroc Chemicals or equivalent), placing, compaction and curing for the same should be as per manufacturers specification. The micro concrete used for jacketing should have a minimum characteristic compressive strength of 45 MPa at 28 days.

➢ Stage 6

- After the concrete in the jacket portion of the columns in the particular stage has attained its strength, the props placed for supporting the corresponding beams are to be removed.

MICRO CONCRETE JACKETING FOR THE SPALLING OF CONCRETE AND EXPOSURE OF REBARS OBSERVED IN THE RC SLAB CONCRETE JACKETING FOR THE SLAB

- **Micro concrete jacketing for the spalling of concrete and exposure of rebars observed in the RC Slab Concrete jacketing for the slab**
- 1. Strengthening is to be done using micro concrete.
- 2. Provide cores from the slab of about 77 mm diameter to facilitate the pouring of micro concrete

REPAIR OF CRACKS IN THE BRICK WALLS

- **Mark 75 mm on either side of the crack**
- Cut the same using handheld cutting machine fitted with a diamond abrasive wing
- Chip off the plaster and expose the brickwork
- Make groove at every 150-mm c/c in the brick masonry wall perpendicular to the direction of crack
- Provide 20 mm diameter nozzle for the grouting
- Provide 8 mm diameter reinforcement perpendicular to the direction of the crack
- Prepare AR mortar in the ratio of 1:3. Add 1 litre of Nitobond AR (manufactured by M/s Fosroc Chemicals or equivalent) per bag of cement to the above mortar mix and apply to the primed concrete surface using a trowel.

REPAIR OF CRACKS IN THE BRICK WALLS

- **The dosage of AR shall be 1 lit per bag of cement.**
- Grout the same using cement grout mixed with copolymer (SBR) of 1 lit per bag of cement and cut the nozzle after completing.

ESTIMATION AND DESCRIPTION ITEMS FOR REHABILITATION

SAMPLE ESTIMATION AND DESCRIPTION OF THESE AS PER REPORT OF IIT MADRAS

WATER PROOFING OF BUILDINGS

WATER PROOFING OF BUILDINGS

- ROOF/SUNSHADES
- SUNKEN PORTIONS OF BATHROOMS/WC and KITCHENS
- BEHIND WALL TILES (DADO)
- **AROUND TRAPS/PIPELINE OUTLETS/RAIN WATER PIPES**
- **BASEMENTS/UG SUMPS/WATER RETAINING/TUNNELS/RETAINING WALLS**

WATER PROOFING OF ROOF WITH APP MEMBRANE

- APP MODIFIED POLYMERIC WATER PROOFING MEMBRANE IS MANUFACTURED IN 3/5/7 LAYER in 2,3,4MM THICKNESS
- CENTRE CORE CAN BE
- (i) 100 Micron HMHDPE FILM
- (ii) NON WOVEN POLYSTER MATT
- (iii) FIBRE GLASS MATT
- CENTRE CORE IS PROTECTED ON EITHER SIDE USING POLYMERIC ASPHALTIC MIX
- **AFTER PREPARING THE SURFACE, PRIMER SHALL BE APPLIED Aprox 0.4 KG/SQM**
- **(i) APP MEMBRANE IS EITHER BONDED TO THE SURFACE WITH TORCH, OVERLAPS SHALL BE MIN 100MM AND SEALED WITH TORCH**
- **(ii) OR APP MEMBRANE IS BONDED WITH BLOWN BITUMEN 85/25 1.2KG/SQM**
- **INACCESSIBLE ROOFS TO BE TOPPED WITH BITUMEN COATING AND ALUMINIUM PAINT**

WATER PROOFING OF BUILDINGS

5 LAYER APP MEMBRANE

- THERMO FUSIBLE 20 Micron HMHDPE FILM
- POLYMERIC ASPHALTIC MIX
- 100 Micron HMHDPE FILM
- POLYMERIC ASPHALTIC MIX
- THERMO FUSIBLE 20 Micron HMHDPE FILM

3 LAYER APP MEMBRANE

- POLYMERIC ASPHALTIC MIX
- NON WOVEN POLYSTER MATT/ FIBRE GLASS MATT
- POLYMERIC ASPHALTIC MIX

WATER PROOFING OF ROOF WITH APP MEMBRANE

- AFTER CASTING OF RCC ROOF SLAB, GRADING OF SLAB SHALL BE CARRIED OUT USING PCC(1:2:4) OR USING 1:3 CEMENT SAND MORTAR (WHEN THE SLAB CONCRETE IS GREEN)
- PONDING TEST
- SEEPAGE IF OBSERVED SHALL BE ARRESTED USING GROUTING
- **AFTER PREPARING THE SURFACE, PRIMER SHALL BE APPLIED Aprox 0.4 KG/SQM**
- **(i) APP MEMBRANE IS EITHER BONDED TO THE SURFACE WITH TORCH, OVERLAPS SHALL BE MIN 100MM AND SEALED WITH TORCH**
- **(ii) OR APP MEMBRANE IS BONDED WITH BLOWN BITUMEN 85/25 1.2KG/SQM**
- **ACCESSIBLE ROOFS TO BE TOPPED WITH BITUMEN COATING, 15 MM SCREED in CM 1:3 and BRICK TILES/CEMENT CONCRETE TILES**

WATER PROOFING OF ROOF WITH APP MEMBRANE

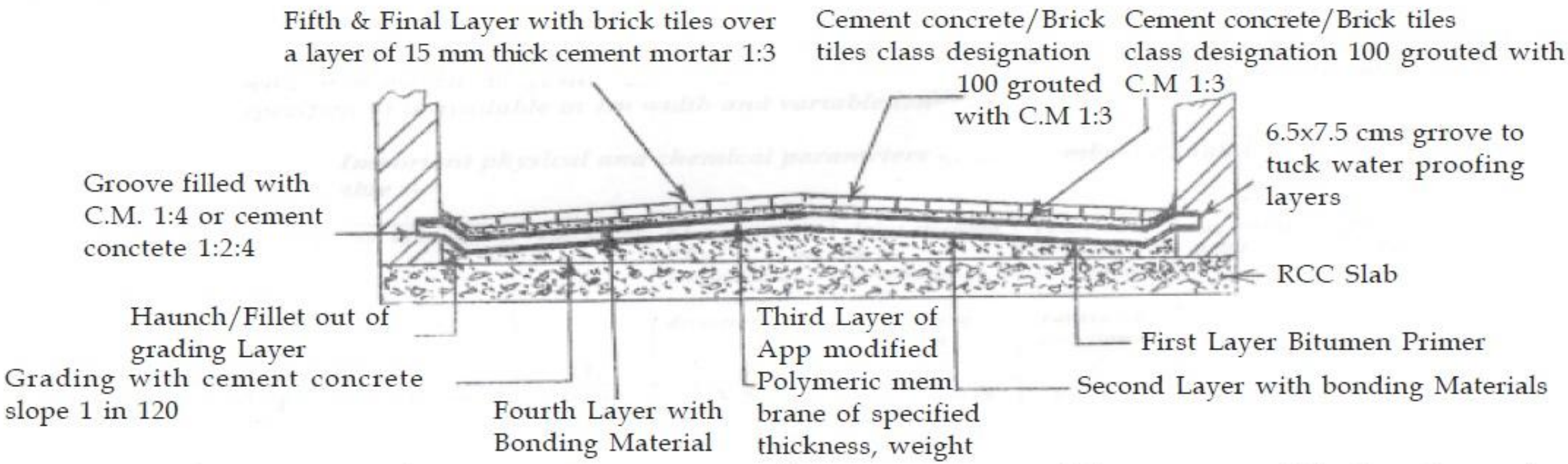


Fig : 11.11 : Five course water proofing treatment with APP modified polymeric membrane of specified weight, thickness

WATER PROOFING OF SUNKEN SLABS

- Providing and laying water proofing treatment to vertical and horizontal surfaces of depressed portions of W.C., kitchen and the like consisting of:
- Ist course of applying cement slurry @ 4.4 kg/sqm mixed with water proofing compound conforming to IS 2645 in recommended proportions including rounding off junction of vertical and horizontal surface.
- IInd course of 20 mm cement plaster 1:3 (1 cement : 3 coarsesand) mixed with water proofing compound in recommended proportion including rounding off junction of vertical and horizontal surface.
- IIIrd course of applying blown or residual bitumen applied hot at 1.7 kg. per sqm of area
- **IVth course of 400 micron thick PVC sheet. (Overlaps at joints of PVC sheet should be 100 mm wide and pasted to each other with bitumen @ 1.7 kg/sqm).**

SUNKEN SLAB TREATMENT AS PER MES CONTRACTS

(a) RCC Sunken Slabs

(i) The top surface of the sunken RCC slab shall be laid with cross slope as indicated in drgs towards the spouts. The min thickness of the RCC slab shall be as specified in the drg.

Contd...

PARTICULAR SPECIFICATIONS SECTION-II (Contd)

(ii) PCC (1:1½:3) fillets of 75mm radius at corners with 12.5mm graded agg shall be provided.

(iii) Plastering in cement mortar (1:3), 15mm thick with WPC on walls as well as on sunken floor finished even and smooth using extra cement.

(iv) GI pipe 40mm dia medium grade be inserted at the end of lateral slope projecting at least 15cm beyond the outer most projected part of the building below the drain pipe up to two storey construction and 25cm beyond two storey const.

(v) After doing the plaster, testing be carried out by ponding (for 72hours) the sunken portion before further treatment to the sunken slabs. Any leakage seepage observed shall be rectified.

(vi) All horizontal, vertical and slanted surfaces of sunken portion shall be provided with APP modified polymeric waterproofing membrane as under:-

(aa) Apply a coat of bitumen primer @ 0.30 lit per sqm.

(ab) Apply a coat of hot 85/25 penetration gde bitumen @ 1.20kg/Sqm.

(ac) Apply standard quality APP modified polymeric membrane 3mm thick over the bitumen coat. Joints to be touched hot and width of overlaps not to be less than 150mm. Other jointing details shall be same as specified in para 11.13 of MES SSR Part-I

(vii) All the joints of pipes and traps within the sunken portion shall be sealed properly by epoxy sealant.

(viii) All traps in sunken slabs to be enclosed with PCC (1:1½:3) minimum 15cm all around.

(ix) The sunken portion shall be filled with a layer of 75mm thick PCC (1:5:10) type E-2 using 40mm graded stone aggregate over brick aggregate layer after carrying out the required tests for CI pipes/ joints/ waterproofing treatment.

BASEMENTS/UG SUMPS/WATER RETAINING/TUNNELS/RETAINING WALLS

- CRYSTALINE ADMIXURE (WHICH HAS SELF HEALING OF CRACKS UPTO 0.5MM AND REDUCING PERMEABILITY OF CONCRETE UPTO 90%)
- INTERGRAL CRYSTALINE SLURRY HYDROPHILIC IN NATURE
- CRYSTALINE DRY SHAKE
- CRYSTALINE MORTAR (FOR CONSTRUCTION JOINTS/CRACKS

POLYURETHANE BASED LIQUID WATER PROOFING

- COLD APPLIED AND CRACK BRIDGING
- EASY REPAIR AND MAINTENANCE
- PRIME COAT
- BASE COAT
- REINFORCEMENT (FABRIC) (OPTIONAL)
- TOP COAT
- PROTECTIVE COAT (PROTECT TOP COAT WITH UV PROTECTION COAT OR TILES &PROTECTION SCREED OVER GEO TEXTILE LAYER OR PROTECTION SCREED OVER GEO TEXTILE LAYER)

JAIHIND