

Special Conditions

Maintenance Norms for Bridge / C.D. Works :

APPENDIX -2

SELECTION OF TECHNIQUES AND MATERIALS

Adoption of a particular technique will be governed basically by the end requirements of structural repairs. Choice of materials shall also depend on various factors such as compatibility with the structure, availability of the equipment etc. While tackling structural repairs, several situations may be encountered. Choice of different techniques and materials as given in the table below is after considering such situations. The list given in the table is not exhaustive but only indicative of some commonly adopted techniques and it is possible to use these techniques/materials in combination with other methods.

of SP:40

Detailed description will be found in earlier chapters. In this, only summary is attempted.

Sr. No.	Type of Material of the Bridge	Component of the Bridge	Type of distress of damage	Suggested Remedial Measures	
				Repairs/Rehabilitation	Strengthening
I	Masonry Bridges	(A) Foundations	Undermining, Scouring	River Training Protection by Sheet Piling	—
			Settlement	—	Modification of the foundation, jacking etc.

Sr. No.	Type of Material of the Bridge	Component of the Bridge	Type of distress of damage	Suggested Remedial Measures	
				Repair/Rehabilitation	Strengthening
II	RCC Bridges	(B) Sub-structure	Leaching of mortar in joints surface deterioration	Epoxy mortar painting and injection of epoxy surface protection.	Grouting, Jacketing
		(C) Super-structure	Cracking, loosening of Stones/bricks	Treatment by epoxy resin and mortar	Bonding of steel plates, Grouting
			Leaching of joints, surface deterioration	Protective coating	Adding material to the intrados or extrados in case of Arch Bridges
		(A) Foundation	Deterioration, Structural Damage, Sinking of foundation, Erosion	Protection and replacement of material. River Training by sheet piling, garlanding etc.	Modification of the foundation, Jacketing etc.
		(B) Sub structure	Spalling, Cracking, Disintegration, Sealing, Corrosion of reinforcement	Repair to concrete surface by cement mortar or resin systems. Injection of epoxy, Surface protection, Replacement of reinforcement.	Grouting with treatment to reinforcement and using bonding agent, Jacketing.
		(C) Superstructure	Surface deterioration spalling honey combs cracks disintegration, corrosion of reinforcement	Surface preparation by mechanical or chemical means with the use of sand blasting. Demolition of concrete by jack hammers, chisels explosives etc.	Strengthening by external reinforcement such as bars or epoxy bonded plates

Sr. No.	Type of Material of the Bridge	Component of the Bridge	Type of distress of damage	Suggested Remedial Measures	
				Repairs/Rehabilitation	Strengthening
				<p>Bonding agent such as cement mortar/paste Impregnation with silicon, organic solutions, resins or oils</p> <p>Replacement of concrete section - careful pretreatment of surface and building up the section by resin system or cement mortar with plastic modification.</p> <p>Repair of cracks by proper selection of epoxy polyurethane resins. Acryl resins etc. and with suitable injection equipment.</p> <p>Shotcrete Gunite</p> <p>Protective coating. Removal of Chloride contamination - physical removal of affected concrete (wherever possible) and rebuilding the section</p>	Strengthening by post-tensioning - Using external prestressing cables suitably anchored at the end of the girder.

Sr. No.	Type of Material of the Bridge	Component of the bridge	Type of distress of damage	Suggested Remedial Measures	
				Repairs / Rehabilitation	Strengthening
			Corrosion, pitting Fatigue, Loosening of Bolts and rivets etc.	Protective coating, Replacement of bolts and rivets.	Addition of Stiffeners to flanges webs and diaphragms.
			Abnormal deflections, Bucking, working or kinking of element necking, yielding.		
V	Composite Bridges	(A) Foundation (B) Sub-structure (C) Super structure	Details given in I to IV be applicable in pertinent particulars. Not many references are available. Defects in concrete or steel shall be dealt as per manner described under S.No. II to IV.	I to III above shall be applicable in pertinent particulars.	-
VI		Bearing	Manufacture, defective materials, improper installation corrosion, cracked or broken rollers, plates accumulation of dirt / debris at the bearing point, failure of anchorage system.	-	Appropriate corrective action shall be taken after detailed investigation of defect. If required Bearing shall be replaced.

Note :- If any damage is observed / noticed during maintenance period, agency has to repaired as stated above (Sp. 40 : Guide lines on techniques for strengthening & rehabilitation of Bridges).

Special Clause - I

CONSTRUCTION EQUIPMENT :

- 1.1 The methodology and equipment to be used on the project shall be furnished by the contractor to the Engineer well in advance of commencement of work and approval of the Engineer obtained prior to its adoption and use.
- 1.2 The contractor shall give a trial run of the equipment for establishing its capability to achieve the laid down specifications and tolerance to the satisfaction of the Engineer before commencement of work, if so desired by the Engineer.
- 1.3 All equipment provided shall be of present efficiency and shall be operated and maintained at all times in a manner acceptable to the Engineer.
- 1.4 No equipment or : personnel will be removed from site without permission of the Engineer.

Special Clause - II

WORK PROGRAMME AND METHODOLOGY OF CONSTRUCTION :

The contractor shall furnish his programme of construction for execution of the work in within the stipulated time schedule together with methodology of construction of each time of work and obtain the approval of the Engineer prior to actual commencement of work.

Special Clause - III

ACTION IN CASE OF DISPROPORTIONATE PROGRESS :

In case of extremely poor progress of the work or any item at any stage of work which in the opinion of the, Engineer can not be made good by the contractor considering his available resources, the Engineer will get it accelerated to make up the lost time through any other agency and recover the additional cost incurred, if any, in getting the work done from the contractor after informing him in writing about the action envisaged by him.

Special Clause - IV

SETTING OUT :

Setting out the work as spelt out in clause – 109 of Ministry's Specifications for Road and Bridge work (5th Revision) will be carried out by the contractor.

Special Clause - V

PUBLIC UTILITIES :

Action in respect of public utilities will be taken by the contractor as envisaged in 110 of Ministry's Specification for Road and Bridge work (5th Revision)

Special Clause - VI

ARRANGEMENT FOR TRAFFIC DURING CONSTRUCTION :

Action for arrangement for traffic during construction will be taken by the Contractor as envisaged in the contract documents and spelt out in Clause-112 of Ministry's Specifications for road and Bridge works (5th Revision).

Special Clause - VII

QUALITY CONTROL :

The norms of achieving quality of work will be on the contractor who will take as stipulated in section-900 of Ministry's Specifications for Road and Bridge works. (5th Revision).

Special Clause - VIII

MINISTRY'S SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (5th REVISION) :

The Ministry's specifications for Road and Bridge works (5th Revision) will form part of the contract documents and the contractor will be legally bound to the various stipulations made therein unless and otherwise specifically relaxed or waived partly through a special clause in the contract document.

Special Clause – IX

DOCUMENTATION :

The contractor will prepare drawing(s) of the work as constructed and will supply original with three copies to the Engineer who will verify and certify these drawings. Final as constructed drawing(s) shall then be prepared by the contractor and supplied in triplicate along with a micro film of the same to the Engineer for record and reference purpose.

**Executive Engineer
Bharuch R & B Division
Bharuch**

Special Conditions

The contractor shall design, construct, maintain, repair the required coffer dam including dewatering for safe execution of bridge foundation/substructure works throughout the construction period. The cofferdam shall be capable of negotiating the river flow, seepage, scour, under all flood conditions, and other site circumstances during execution.

The contractor shall also ensure that the natural flow of water is not adversely affected, and necessary precautions are taken to avoid obstruction, flooding, or environmental damage during execution.

No extra payment shall be made for maintenance, repair, dewatering, strengthening, required if necessary, including dismantling/removal of cofferdam including disposal at a suitable location. The rates quoted by the contractor shall be deemed to have included all such incidental works etc. complete.

LETTER OF BINDING

If any materials in special case is not available as per specification then in that case we will bring in good quality of materials as approved by the department from the other sources of supply and will not claim for any compensation thereof.

Signature of Contractor

**Executive Engineer
Bharuch (R & B) Division
Bharuch**