

NORTHERN RAILWAY

Special conditions for Casting and supply of PSC/RCC slabs and retainers for replacement of existing girder bridges in PTK casting yard under Dy.CE/BL/JAT.

1. Scope of work:-

- i. Casting of PSC slabs up to 12.2m span.
- ii. Leading of slabs to different bridges site including loading & unloading over JAT/FZR division.
- iii. Structural design of non-standard PSC slabs & RCC ballast retainer as per approved GAD.

2. General Instructions

Instructions contained in this special condition are general instructions for casting of PSC slabs and RCC ballast retainer, most of these instructions are as per IRS Concrete Bridge code. However, in case of any contradiction, differences, discrepancy or doubt in any of the provisions of Special conditions of contract, Concrete bridge code and Instruction contained in approved drawing for casting of slabs/Retainers.

Then following will be the order of precedence for consideration of Provisions—

- i. Instructions contained in approved drawing for casting of slabs/Retainer.
- ii. IRS Concrete Bridge code.
- iii. Special condition of contract.

These special conditions shall be read in conjunction with IRS Concrete bridge code (Latest version). All provisions of concrete bridge code apply to this contract. Contractor should be completely aware of all provisions of concrete bridge code before starting of work.

3. GENERAL CONDITIONS

- i. The work shall be carried out in accordance with instructions contained in the drawing and/or as per the directions of engineer-in-charge.
- ii. Contractor shall arrange for all the testing of the material as per Quality Assurance Plan (QAP) attached with this tender and the complete cost of testing shall be borne by contractor only.
- iii. All Material except green concrete will be used for casting only after passing tests as per QAP.

iv. Concrete to be provided shall be machine batched, machine mixed and machine vibrated Cement Concrete of specified grade as per approved Design Mix (mixed in Mobile Concrete Batching/Mixing Plant at site or from approved RMC plant by contractor).

v. Contractor should carefully bid this tender because cost of testing as per QAP shall be borne by the contractor.

vi. Contractor should invariably arrange a vehicle for Railway Engineer while doing concreting for inspection of RMC plant.

vii. Concrete cubes will be casted and kept inside facility approved by Railway Engineer, testing of cubes shall be done in presence of Railway Engineer.

viii. The arrangement for water & electric supply shall be done by contractor at his own cost.

ix. Concrete and un-tensioned steel for the construction of prestressed concrete members shall conform to the requirements as per drawing.

x. Contractor shall prepare and submit the Concrete Design Mix as per IS code 10262:2009 subject to compliance of Railway codes. The work will only be started after the approval of submitted Concrete Design Mix from the competent railway authority.

xi. Preparation of concrete samples for design mix approval and testing of these samples through NABL/NABCB/Govt. approved lab shall be done by contractor.

xii. Before submitting the tender contractor should have gone through the scope of work along with relevant drawings.

xiii. The payment of concreting / slabs will only be done after the contractor submits the Test reports of cubes of 28 days from the approved laboratory.

xiv. In case the 28 days cube doesn't attained the desired strength, then no payment will be done for concreting, reinforcement and HTS wire & duct.

xv. The size and/or number of samples (concrete cubes, steel reinforcement, HTS wires, ducts etc.) will be based on the relevant IS Codes and the cost of testing of all samples will be borne by the contractor.

xvi. Contractor shall ensure that different components of prestressing such as jacks, bearing plates, anchorages, strands and HDPE ducts are compatible to each other.

xvii. Slab casting work will be carried out in contractor's casting yard, if so desired by competent authority the available railway land may be provide in the interest of railway free of cost.

xviii. A laboratory will be setup by contractor on his own cost in casting yard for cube testing, workability test, sieve analysis & other tests which can be performed inside yard as per direction of Railway Engineer.

4. MATERIALS

A. Sheathing

- i. The sheathing ducts shall be of the spiral corrugated type. Unless otherwise specified, the material shall be Cold Rolled Cold Annealed (CRCA) Mild Steel conforming to IS:513 intended for mechanical treatment and surface refining but not for quench hardening or tempering.
- ii. The material shall normally be bright finished. However, where specified, as in case of use in aggressive environment, galvanized or lead-coated mild steel strips shall be used. The thickness of sheathing shall be as shown on the drawing, but shall nevertheless not be less than 0.3mm, 0.4mm and 0.5mm for sheathing ducts having internal diameter of 50mm, 75mm and 90 mm respectively. For larger diameter of ducts, thickness of sheathing shall be based on recommendations of prestressing system supplier or as directed by the Engineer.
- iii. The length of the coupler should not be less than 150mm but should be increased upto 200mm wherever practicable. The joints between the ends of the coupler and the duct shall be sealed with adhesive sealing tape to prevent penetration of cement slurry during concreting. The couplers of adjacent ducts should be staggered wherever practicable. As far as possible, couplers should not be located in curved zones. The corrugated sleeve couplers are being conveniently manufactured using the sheath making machine with the next higher size of die set.
- iv. The internal diameter of the sheathing duct shall be in accordance with the recommendations of the system manufacturer and shall be about three times the area of the tendons. In case of 6T13, 12T13 and 19T13 sizes of tendons comprising 12/13mm dia strands, the inner diameter of the sheathing shall not be less than 50mm, 75mm and 90mm respectively or those shown in the drawing, whichever is greater.

B. Anchorages

Anchorages shall be procured from authorized manufacturers only. Anchorages shall conform to BS 4447. Test certificates from a laboratory fully equipped to carry out the tests shall be furnished to the Engineer. Such test certificates shall not be more than 12 months old at the time of making the proposal for adoption of a particular system for the project. No damaged anchorages shall be used. Steel parts shall be protected from corrosion at all times. Threaded parts shall be protected by greased wrappings and tapped holes shall be protected by suitable plugs until used. The anchorage components shall be kept free from mortar and loose rust and any other deleterious coating.

The anchorage system in general comprises the anchorage itself and the arrangement of tendons and reinforcement designed to act with the anchorage. The anchorage may consist of any device patented or otherwise, which complies with the requirements laid down below—

- i. The anchoring device shall be capable of holding without more than nominal slip the prestressing tendon subjected to a load midway between the proposed initial prestressing load and the ultimate strength of the prestressing tendon.

- ii. The anchoring device shall be strong enough to resist in all respects a force equal to at least the breaking strength of the prestressing tendon it anchors.
- iii. The anchorage shall transfer effectively and distribute, as evenly as possible, the entire force from the prestressing tendon to the concrete without inducing undesirable secondary or local stresses.
- iv. The anchorage shall be safe and secure against both dynamic and static loads as well as against impact.
- v. The anchorage shall have provision for the introduction of a suitable protective medium, such as cement grout, for the protection of the prestressing steel unless alternate arrangements are made.
- vi. Proprietary anchorages shall be handled and used strictly in accordance with the manufacturer's instructions and recommendations.
- vii. Anchorages shall be procured from authorized manufacturers only.
- viii. Test as per IS 1343:2012 Appendix C shall be conducted as per QAP.
- ix. After completion of pre-stressing and grouting of cable in PSC girders, the extra length prestressing strands projecting outside the anchorage are required to be cut and an anchored end are to be sealed.

C. Prestressing Steel

The prestressing steel shall be any of the following:-

- i. Plain hard-drawn steel wire conforming to IS:1785 (Part-I).
- ii. Uncoated stress-relieved strand conforming to IS:6006.
- iii. High tensile steel bars conforming to IS:2090.
- iv. Uncoated stress relieved low relaxation strands conforming to IS:14268.

All prestressing steel shall be free from splits, harmful scratches, surface flaws, rough, jagged and imperfect edges and other defects likely to impair its use in prestressed concrete. However, type of prestressing steel as per drawing used in casting shall be governing criteria for selection of Prestressing steel.

Various tests as recommended in IS:14268 shall be conducted before transporting lot to the site (Also attached in QAP). Apart from 1000 hours relaxation test conducted by manufacturer, at least two such tests (1000 hours relaxation test) are required to be conducted by independent agency in the beginning of project.

D. Prestressing Strands/Wires Storage

- i. All high tensile steel for prestressing work shall be stored about 30 cm above the ground in a suitably covered and closed space to protect it from dampness. It shall also be invariably wrapped in gunny cloth or tar paper or any other suitable materials, as per approval of Engineer. Even if it is to be stored in an

area at the site for short time during transit it shall be suitably covered. Protection during storage and repacking or application of washable protective coating to the H.T. steel shall be given by the contractor at no extra cost if the packing of H.T. Strand/wire during unloading and storage/handling in the stores gets damaged.

ii. Stock piling of H.T. Steel on the work site shall not be allowed any time, especially before and during the monsoon.

iii. Engineer-in-Charge or his authorized representative shall always have an easy access to the store-yard for inspecting the H.T. Wire/strands/Bars and satisfying themselves regarding the condition thereof. Any modifications regarding storage suggested by Engineer shall scrupulously be followed by the contractor. During monsoon days, H.T wires/strands shall be kept in reasonable air tight store, if required by the Engineer, at no extra cost.

5. TESTING OF PRESTRESSING STEEL AND ANCHORAGES

All materials specified for testing shall be furnished free of cost and shall be delivered in time for tests to be made well in advance of anticipated time of use. All strands to be transported to the site shall be assigned a lot number and tagged for identification purposes. Anchorage assemblies to be transported shall be likewise identified. All samples submitted shall be representative of the lot to be furnished and in the case of strand, shall be taken from the same master roll. The Contractor shall furnish samples of at least 5.0m length selected from each lot for testing. Also, two anchorage assemblies, complete with distribution plates of each size or types to be used, shall be furnished along with short lengths of strands as required.

6. Workmanship

A. Cleaning

- i. Tendons shall be free from loose rust, oil, grease, tar, paint, mud or any other deleterious substance.
- ii. Cleaning of the steel may be carried out by immersion in suitable solvent solutions, wire brushing or passing through a pressure box containing carborundum powder. However, the tendons shall not be brought to a polished condition.

B. Straightening

- i. High tensile steel wire and strand shall be supplied in coils of sufficiently large diameter such that tendons shall retain their physical properties and shall be straight as it unwinds from the coil. Tendons of any type that are damaged, kinked or bent shall not be used.
- ii. The packing of prestressing wire/strand shall be removed only just prior to making of cable for placement. Suitable stands shall be provided to facilitate uncoiling of wires/strands without damage to steel. Care shall be taken to avoid the possibility of steel coming into contact with the ground.

C. Positioning

For post tensioning:-

- i. Prestressing tendons shall be accurately located and maintained in position, both vertically and horizontally, as per drawings. Tendons shall be so arranged that they have a smooth profile without sudden bends or kinks.
- ii. The positioning of prestressed cables shall be such as to facilitate easy placement and vibration of concrete in between the tendons. High-capacity tendon shall be used to reduce the number of cables thereby eliminating the necessity of grouping. The selected profiles of the tendons shall be such that their anchorages are not located in the top deck surface. Where two or more rows of cables have to be used, the cables shall be vertically in line to enable easy flow of concrete. The clear vertical and horizontal distances between any two cables shall in no case be less than 100mm anywhere along the length of the superstructure. Where precast segments are used, the clear distance shall be at least 150mm.
- iii. Sheathing shall be placed in correct position and profile by providing suitable ladders and spacers. Such ladders may be provided at intervals of approximately 1.0m. Sheathing shall be tied rigidly with such ladders/space bars so that they do not get disturbed during concreting.
- iv. Sheathing in which the permanent tendon will not be in place during concreting shall have a temporary tendon inserted or shall be stiffened by some other method to be approved by the Engineer. The temporary tendon shall be pulled out before threading the permanent tendon into place by a special threading machine or other contrivance.
- v. Where possible, tendons shall not be placed until immediately prior to stressing. Tendons shall be handled with care to avoid damage or contamination, to either the tendon or the sheathing. Any tendon damaged or contaminated shall be cleaned or replaced.

For pre tensioning:-

- i. Prestressing steel shall be accurately located and maintained in position, both vertically and horizontally as per drawings.

D. Cutting

- i. Cutting and trimming of wires or strands shall be done by suitable mechanical cutter only. Flame cutting shall not be resorted to in any circumstances.
- ii. In post-tensioning the ends of prestressing steel projecting beyond the anchorages, shall be cut after the grout has set.

E. Protection of Prestressing Steel