Quality Acceptance of Railway Track Engineer on Ballastless Track System

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Abstract: The Supervision Management team and Organization, in accordance with the regulations, rules, codes and standards issued by the MOR, in order to improve the supervision level and standardize the supervisory practice in ballastless system construction shall: Establish the leading group; Clarify the responsibility; Establish Document Management system; Train and Tests of personnel. This document clarifies all these aspects according to the client requirement for the Ballastless track system construction process. The Supervision organization shall check technical control system and quality management system of the contractor that mainly included: Organization Structure of technical management and quality management System; Technical and quality management system; Full time quality management personnel and their presence on site; and Train, Tests, Qualification certificate and Work License of special staff.

Leading Group

In the supervision layout, with the full consideration of actual situation of the construction project, the working goal and the working requirements of project supervision organization shall be clarified and detailed. The working system, procedure, methods and measurements shall be determined. Implementation detail for Supervision: If needed this aspect shall be compiled and completed before the construction start-up. The implementation detail has to be detailed, specific and workable. The general Layout of the Supervision organization on Ballastless track system of CYJL2, according to the necessity shall have no less than 42 - 44 Technicians and Engineers (included the Foreign staff) leaded by the Foreign Chief Supervision. As shown in Figure 1.

All the Supervision Team shall act in accordance with the laws, codes, regulations, specifications and standards issued by the Nation and MOR, the approved construction drawings and in accordance with the contract. The foreign personnel shall fulfill at least: Deal with documentation concerned the Contract. Daily operation of project supervision and notify in written to the Client and Contractor. Review, approve and act supervision layout and implementation details for project supervision. Review construction commencement report. To Inspect and Preside the site for Quality and Safety assurance (See Quality Inspection Lists – Annex A to Annex D). To check and accept the labor, material and facilities invested by contractor. To check equipment, testing report and other quality proofs. Meeting with Contractor and Client. Check the documentation and the site working progress. Stop-work order and resumption order, supervision order concerned the works. Give solutions to Quality and Safety problems. Train Engineer from Partner and Contractors about special works.
Responsibility

Quality Control of Material, Components and Facilities Delivered on Site

The Supervision organization shall control the quality material delivered on site according to the procedure and requirements of the Client. In detail: Check the documents that verify the appearance, specification, type and quality of materials, components and equipments. Check the documents that verify the appearance, specification, type and quality of materials, components and equipments of new material, new products and new technique. Test the on-site materials, components and facilities according to the related regulations. Make test or parallel test on the on-site material. The quality of test shall meet the related construction quality standard for acceptance. Make “witness inspection” on the on-site components and equipments. Check the concrete and mortar mixing ratio.

Quality Control during Construction Process

The work concerning the Ballastless track system required some additional Quality control during the Construction process: Maximum precision during installation is needed to ensure exact and long-lasting track positioning. The great majority of the bi-block must be produced locally in especially constructed production plants. In addition, a surveying technique especially developed for this system assures great exactness of track position and geometry. The alignment techniques used here (using spreader bars and spindle-base adjustment units) enable precise alignment and securing of the track panel, even under the most unfavourable of construction-site installation conditions. The spreader-bar adjustment system involves a combined technique consisting of the following two elements: vertical adjustment by means of spindles attached at the ends of the sleepers. horizontal adjustment by special spreader bars at the centre of the sleepers. The spindle adjustment supports the track panel directly at the rail base and enables both vertical as well as horizontal track-panel alignment. With both techniques, the adjustment procedures are completed with approval granted by the survey engineer. The next step includes the casting of the sleepers into a track concrete layer. Here, two measured points on the rail may at intervals of 5 m have position or height differences of no more than ± 2 mm with reference to each other dimensions that demand a maximum of exactness in concrete construction. The top-down installation procedure inherent to this system can optimally satisfy these exacting requirements. Production of special sleepers (with manufacture and installation of this system by local construction companies) allows optimal economical cost/benefit relationship. During construction process special attention is needed for the Climatic condition (winter, raining season and summer installation).
Quality Acceptance of Construction

Construction quality acceptance shall be based on the high-speed railway construction quality standards for acceptance. For ballastless, the construction sequences, consisting of manual and mechanized steps of work, are listed below. In detail the logistic activities are: Preparation of the substructure. Assembly of the track panel. Rough alignment of the track panel. Installation of the track formwork. Final alignment of the track panel. Placing of the track concrete. Supplementary working steps. Important key tasks involved in Track Quality Assurance are: Checking of design and construction drawings, and of the geodetic project; Verification of the quality management of the manufacturers of sleepers and other components; Certification of the concrete supplier(s) for the track; Checking, documenting, and clearance of the track-positioning state before concreting; Checking of delivery documents and conformity of the concrete supplied; Checking of the concrete technology, processing, and curing in the track; Supervision of rail handling: laying, welding, and grinding; Re-checking of the track position; Checking of the final documentation; Preparation of the quality report; Turnover with the line operator and other participants.

For implementation of these methods (for example, as set forth in CENELC standards, particularly in EN 50126) track design must follow a process that verifiably assures the safety and the reliability of the entire system and its sub-systems and additionally in conformity with purely engineering requirements. This process must above all satisfy two aspects: reliable break-down of the system into components, step-by-step development, detailing, and checking.

As follow, the Supervision Team (Foreign and Chinese team), has to check the necessary document for the Starting condition, the acceptance standards, and the working development. Conformity to the Design requirements: According to the Design approved, according to the Client requirements and the MOR standards. Inspection Items for Railway Construction Quality: According to the client requirements, See Annex A - Phases of Acceptance Procedure. Ballastless track work starting condition inspection and acceptance standard: According to the client requirements.

Resolution of Quality Defects and Quality Accidents in Construction: When quality hazards or defects are found during construction process, Supervision shall issue the notification and order the contractor to rectify. When quality accidents occur in construction, Supervision will issue a construction work suspension order. The Supervision shall take measures according to the regulations.

Supervision Work on Construction Safety

The Supervision organization shall respect the construction Safety supervision prescribed by Nation and MOR. The Supervision Team shall: check the Safety production license of the Contractor and Subcontractors, the validity of special operators qualification certificated and work licenses, review the technical safety measures in the construction organization of the contractor, check the safety protection measures on site and their conformity to the compulsory standard.

Working procedure of Construction Safety supervision: The Supervision organization shall verify the construction according to; Measures for the safety construction management; Safety management responsibility system at all level; Operation instruction for the safety construction; Emergency plan. Review of Construction Progress plan. The Supervision organization shall review and check the construction progress plan submitted by the Contractor, meanwhile the construction progress shall be submitted to the client for the approval as well.

Implementation of Construction Scheduled. The chief engineer shall periodically report to the client the construction progress and give suggestion to avoid construction delay and claim for compensation against the client.
Control of Construction Investment and Contract Management

According to the relevant regulations issued by the Nation and MOR, the design documents and the contracts, the Supervision organization shall have a good control over the project investment. The Contract agreement shall be highly respected and there shall be no omission, no exceedance, no repetition concerning the items for survey and payment. According to the relevant standards and regulations issued by the Nation and MOR, the Supervision organization shall have a good control over the project regarding the Contract management taking in account.

The contractor shall respect the specific requirement by the Client and the contract and the Supervision team shall follow step by step the working development according to these requirements. The Document management of Supervision shall be real, detailed and according to the Client form. The documentation produced by the Supervision team is at least as follow: Supervision Log - Daily diary of the personnel; Supervision Journal – recoding of daily activities of construction situation and main supervision work in a day; Supervisor Monthly Report – general condition of construction in each month; Supervision work Summary – after construction is completed remark the general condition of the construction; Classification of Supervision Documents – according to the Client requirements; Daily Management of Supervision documents – Collection, storing keeping and management; Site visit report – According to the site situation; On site Meeting – First on site meeting and Regular meeting: to discuss main issues and its problem solution. Every meeting must be recorded and the minutes of the meeting shall be available, the meeting members shall sign the “Meeting attendance sheet”.

All the staff of the Supervision Team has to be trained and tested. The training goal is the site checking, give solutions and to be problem solving oriented. According to the work development attention shall be made on: Survey training and Construction Quality acceptance method training.

The main content of the training shall include: Overview of Ballastless Track systems; Ballastless Track System Design and Component; Structural configuration ; Installation Techniques; The production sequences; Fastening systems (WJ-8); Electromagnetic compatibility (EMC); Survey Technique; RAMS Analysis of the ballastless track system; Risk Analysis for Safety Assurance; Risk Analysis for Quality Assurance; Site problems and resolution.

The training and the Tests are also needed for the all level of the Contractor according to the Technical acceptance standards of the Ballastless system technology and Client requirements. The entire technician, engineer, special workers and workers involved must pass the Tests.

Conclusions

Supervision organization shall perform the supervision work according to the prescribed working time, working content and working range of the contract. If any defects and some section needed reconstruction, after the remedy is finished, supervision team shall inspect the quality of the rectified situation, accept and sign for them if they are up to standards. If any defects, the Supervision team shall make investigation into the causes of construction defects, and determinate which party shall be responsible of the defects.

During construction, supervision organization shall remind the contractor to file the construction technical documents of unit project according to different specialities and construction sites, to determine the contents to controlled, sort and file them.

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References


