

RPP -Sathyamoorthy (JV)

S.F.No.: 454, Ragupathyaiken Palayam,
Poondurai Main Road,
Railway Colony Post,
Erode – 638002
GST: 22ABCFR8363C1ZF
Email – raipur.rppvscjv@rppipl.com

Lr. No. RPP-SM-JV/RRW/70

Date: 03-09-2024

To,

The Authority's Engineer,
Dy. Chief Engineer,
Gati Sakti Unit, Raipur
O/o DRM Office Complex,
SECR-Raipur, 492008
Chhattisgarh, India.

Project: Major up-gradation of Raipur Railway Station of SECR on Engineering, Procurement and Construction (EPC) mode.

Subject: Submission of Quality Assurance Plan (QAP) as per Clause 11.2 of the EPC Agreement -Reg.

Ref: Authority Letter no- CPM-GSU-R/R-EPS/1 dated 14-08-2024.

Dear Sir,

With reference to the above cited subject, the EPC Contractor herewith submitting the Project specific Quality Assurance Plan.

In view of the above, 'Authority's Engineer' is requested to review and accord your approval. (The copy of QAP is attached for your ready reference).

Thanking you and assuring our best services at all times.

For RPP - SATHYAMOORTHY (JV)

ABHISHEK

GARG

Abhishek Garg
(Authorized Representative)

Encl.: As above

c/c:

1. The Chief Project Manager, Gati Sakti Unit, Raipur - For information please.
2. Head Office, RPP Infra Projects Ltd, Email- tender.bo@rppipl.com and project@rppipl.com - For information please.



	RPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02 Document No. :- RPP/QAP/R-02

Revision History

Rev. no.	Date of Issue	Reason of Rev.
0		NA
1		As per direction by Authority Engr.

Signature		
Date		
Name	Mr. A.Ajaya Rao	Mr. Debananda Baral
Designation	Engineer	Chief Project Manager
	Prepared By	Reviewed By



	RPP SATHYAMOORTHY JV	 INDIAN RAILWAY
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1.0 APPROVAL /ISSUE & CONTROL QAP :

Project Team (QA/QC & Planning) will prepare QUALITY ASSURANCE PLAN with support from H.O, the same to

be reviewed and the same to be approved by Project Coordinator. Then the documents to be forwarded to client for their approval; After received of their approval, the document to be issued and controlled to site and as per the distribution list controlled by Document Controller.

2.0 Introduction

This Quality Assurance Manual is prepared for the use of South East Central Railway Raipur sites. It is based on Various Quality Assurance practices, CPWD-2019 specifications, requirement of the tender document for test of materials, Field/laboratory testing and relevant IS: codes. This will provide a base document outlining policy, procedure, responsibilities, compliance acceptance criteria and documentation for carrying out tasks related to inspection, testing and reporting on various materials, items involved for the satisfactory completion of the work. In all cases however, it is important to understand that the contract documents including the technical specifications are the basis for execution of the construction. Quality Assurance Quality Control (QA/QC) Manual provides a guide line for supervision of construction project. A QA/QC Manual establishes a standard guideline for enabling effective monitoring of different activities of construction in respect of technical specifications. Quality assurance plan serves as a road map to monitoring staff to ensure quality of project works.



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3.0 PROJECT DETAILS:

Major upgradation of Raipur Railway Station of South East Central Railway on Engineering, Procurement and Construction (EPC).

Client : - South EastCentral Railway (SECR)

Consultant/Authority Engineer

EPC Contractor : - RPP SATHYAMOORTHY JV.

Contract value : - 412.81 cr.

Agreement No. : - SECR/R/GS/2024/0005

Project Site Location : - Raipur (Chhattisgarh)

Contract Duration : - 1095days

4.0 PURPOSE

QUALITY ASSURANCE PLAN (QAP) has been prepared and formulated as a Management Summary of the

quality related activities required to meet the terms of the prospective contract. It sets out the management practices and describes the Quality Management System and its relationship with RPPSM JV Integrated Management Systems.

5.0 SCOPE

The Scope of this Quality Assurance Plan shall comprise the following Project Management Processes:

- ❖ Project Organizational Structure, Coordination System including Responsibilities, Authorities and Job description of all Project Involved Key Personnel.
- ❖ Project Planning, Scheduling and Project Monitoring Processes.



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- ❖ Project Procurement and controlling processes.
- ❖ Project Documents and Drawing Control system.
- ❖ Project Quality Management System/Practices and Procedures.
- ❖ Project Non-conforming Processes and Products Control System/Practices.
- ❖ Project Internal Audits.
- ❖ Recruitment, Training and Assessment of Project personnel.
- ❖ Project Completion and Handover Procedure

Changes/Amendments to QUALITY ASSURANCE PLAN :

Any changes/ or Amendments required to be incorporated in this Project Quality Management Plan for any valid reasons, i.e., Companies and other interested party's views, requirements etc. shall be initiated by Project director and accordingly the Quality Assurance Plan shall be revised, reviewed, approved and re-issued.

6.0 PROJECT POLICIES

Policies and Objectives have been established by Top Management and implemented at all project sites. Herewith furnished all established Quality, Environmental and Occupational Health & Safety Management System Policies and Objectives. These Policies and Objectives shall drive the project personnel in meeting the project specific requirements set by Company and not only enable them to achieve Customer satisfaction but guide to execute various works in environment friendly and safely.



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7.0 DEFINITIONS

In the context of this document, the following abbreviations, words or phrases shall be taken to have the meaning assigned to the term

Client's Name: South East Central Railway, Raipur

Name of the Contractor: RPP SATHYAMOORTHY JV.

Third Party Inspection (TPI)

A service provided by a recognized independent inspection agency, employed by the Authority/Authority Engineer, to oversee inspections and tests whenever required by the client or his representative.

Quality

The totality of features and characteristics of a product or service that relies on its ability to satisfy stated or implied needs.

Quality Assurance (QA)

All those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy the given requirements for quality.

Quality Control (QC)

Operational techniques or activities (e.g. inspection or test) used to verify technical and quality requirements for services and / or products.

Quality Audit

A systematic and independent examination to determine whether quality activities and related results comply with planned requirements and whether these arrangements are implemented effectively and are suitable to achieve objective

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Quality Plan

A document setting out specific practices, resources and sequence of activities relevant to a particular material, procedure, service contract or project.

Procedures

A documented description of the method to be adopted in the performance of a given task and where applicable the accept / reject criteria for that task

Inspection

Activities such as measuring, examining, testing, gauging one or more characteristics of a product or service and comparing these with specified requirements.

Non-Conformity

The Non-fulfilment of specified requirements.

Corrective Action

An activity, the intention of which is to return a non-conforming item or action to a stage of conformity. It also covers the action taken to prevent further recurrences of non-conformity.

Concession

A formal approval by the appropriate agency to authorize a deviation from the specification or design which does not affect the final function of the proposed specification or design.

Repair

The process of restoring a non-conforming condition such that the item conforms to the original specified requirements, where such a repair or restoration is acceptable.

Inspection

A documented procedure showing Inspection and Test Plan (ITP) i.e. Systematic inspections and tests retaining to a product and indicating the agreed inspection and hold points for the interested parties.

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Hold Point

A state in the production cycles where inspections and/or tests are performed to determine the acceptability of an item for further processing.

Witness

A stage in the production cycle, when a third-party Inspector, Authority Engineer or its representative witnesses any inspection and/or test to determine the acceptability of an item for further processing.

Calibration

The comparison of two instruments, measuring devices or gauges (gauges in this sense shall be taken to include manufacturing jigs and fixture) one of which is of a known accuracy and where applicable, traceable to an internationally recognized standard.

Non-destructive Examination

The means whereby the integrity or conformity of an item can be assessed without resorting to destructive analytical procedures.

8.0 CROSS REFERENCES-

The following documents are used as a source of reference for the preparation of this QUALITY ASSURANCE PLAN .

RPP SATHYAMOORTHY JV

Bid documents / Contract/Technical Specs.



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9.0 PROJECT ORGANIZATION

General

The proposed project organization will be as shown on the attached organization charts (the organization will be subject to change to meet any final contract requirements).

Summary of Responsibilities

Project CGM:

- Administrates the Contract till completion, demobilization and expiry of defect liability period.
- Represents RPPSM JV , attends co-ordination meeting with client, and implements meetings outcome in connection with Project construction head Co-ordinates with local administration.
- Mobilization of resources and execution of works within the parameters of time and cost, quality and productivity.
- Monitors progress with respect to RPP SATHYAMOORTHY JV. Planning, reports to client on progress, invoice /bill to Authority Engineer, conduct weekly review meetings with site staff.
- Responsible for implementation of QMS/HSE at the respective site.

Project Manager/In charge:

- Reports to Company Director
- Responsible for execution of works as per contract specifications, schedules, milestones and set quality standards.
- Responsible for providing timely resources including trained personal for specialized activities in consultation with Project Manager.
- To ensure compliance to quality and safety standards.



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- Conduct site meetings with staff and to maintain regular contact with Authority/Authority engineer representatives for getting timely decisions on matters related to work.
- Responsible for implementation of QUALITY ASSURANCE PLAN .
- To participate and implement corrective and preventive actions.

Planning/Billing Incharge:

- Reports to Project Manager.
- Prepare Methodology, Project schedules, site logistics plan, mitigation plans as per environment conditions such as monsoon in consultation with RPP SATHYAMOORTHY JV and Project construction head.
- Prepare Cost Estimates, obtain approvals for the estimates from RPPSM JV.
- Controls Receipt/Issue of all drawings, letters, and any other communications to and from Project Manager Office to Authority.
- Process enquiries, recommends sub contractor's or supplier agencies with in advance for approvals by authorized personnel (Management).

Quality Manager

- Reports to Project Manager
- Implementation of Q.M. System in the Project Site.
- Responsible for Quality Planning, Assurance, Control and Quality Improvement
- Interaction with Clients / Consultants regarding Q.M. Procedure approval & implementation
- Reporting at Head, HO regarding the performance of Q.M. system at the relevant Project Site.
- Monitor Ensure the compliances of client's observation.
- Coordinating for early disposal of any material.



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- Training to subcontractors, supervisors and workmen to be conducted and evaluation of training to be done.
- Preparing and submitting of work procedure/methodology of any new activity for customer's approval.
- Conducting concrete mix design trials and coordinating with client for approval.
- Coordination and monitoring testing of materials as per Inspection Test Plan.
- To take approval of materials (Equivalent) other than WO from customer.
- Documents all tests in standard formats.
- Liaison with external lab, third party agency labs.
- Monitors implementation of procedures, record keeping by section through weekly audits.
- Reports non-compliance and proposes remedial action to Site Staff and Senior Management.
- Follows up through remedial measures.
- Conducts himself articulately and impartially with all sections

Survey Engineer

- Reports to Project construction head/Project Manager
- Understands client's requirements, prepares Project Survey Plan and Survey Scheme (Sketches)
- Locates Grid Control Stations, Benchmarks, etc. in consultation with the Section Engineer responsible. Constructs such survey features through the Section Engineers.
- Provides survey assistance for sections.
- Maintains daily survey records.
- Ensures calibration of all measuring equipment as per instrument calibration matrix
- Safe keeps all equipment/instruments under his scope.
- Conducts post construction checks – Reports deficiencies (if any) to Planning Engineer and QA.

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Site Engineer

- Reports to the Project construction head/Project Manager
- Prepares daily plans of work from agreed weekly/monthly plans.
- Organizes manpower, materials, equipment to achieve plans.
- Complies to all procedures, drawings while execution (QUALITY ASSURANCE PLAN)
- Checks all works done by subordinates and maintains check records applicable to each activity.
- Co-ordinates with other agencies when required.
- Ensures safety in the work place of RPPSM JV as per Project Safety Plan.
- Inculcates good housekeeping practices.
- Prepares Sub-Contractors Bills in time and submits to the Billing Engineer.
- Affords all facilities to quality audits.
- Assists in timely disposal of NCs.
- Reports any errors to Project construction head, endeavours to improve.
- Conducts trade tests for workmen.

Plant and Machinery/Mechanical Engineer

- Reports to the Project Head functionally.
- Co- ordinates with Project construction head for daily deployment of plant to various sections (Planning Engineer allots to sections as per priority).
- Conducts all preventive maintenance as per equipment requirements.
- Ensures adequate stock of fast-moving spares.
- Allots duty to Operators
- Ensures use of validated Equipment's and its parts.
- Conducts repairs, breakdown maintenance, arranges alternative equipment when required economically.



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Safety Manager

- Administratively Reports to the Project Head. Functionally reports to H.O
- Prepares Project Safety Plan, gets approval from clients/Authority Engineer
- Implement safety practices in workforce. Conducts lessons on good practices.
- Supervises work of Safety Stewards.

Accounts and Administration officer

- Reports to Project Head/Project Manager administratively.
- Processes local purchases, Sub- Contractors payments and other payments to Suppliers.
- Follows up with client for realization of running Bills, financial monitoring of Hold up amounts.
- Liaison with all local bodies and ensures administrative support to Project construction head (e.g. Communication, Transport, etc.)
- Staff welfare activities.
- Attend and resolve any non-conformity related to documents.

Stores In charge

- Reports to Project Head/Project Manager
- Processes all local purchase requirements and bulk purchase through Concerned Office.
- Receipt, Storage of Bulk Material, equipment.
- Material reconciliation and all accounting matters associated with Stores.
- Report to QA/QC department regarding new arrived material for client inspection.
- List of perishable material shall be updated regularly.
- Arranging for inspection/customer approval of incoming materials.
- Identification of list of perishable materials and updating regularly.
- Proper storage identification and traceability of materials.



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10.0 DESIGN

General

This section deals with the design phase of the Project which would be coordinated from the RPP SATHYAMOORTHY JV. Project Office and outlines the design control methods, change control and other intended procedures for the control and administration of the design. In this project the scope of design function will be restricted to the design to temporary support system only.

Design Control

The purpose of design control is to ensure that the Owner's requirements are reflected in the final design, that all of the appropriate codes and standards have been observed. To this end, the Design Control Procedure will be implemented by the Authority to address these criteria and to ensure compliance with the contract specifications.

Design Planning

Design Planning forms an overall part of the RPPSM JV project schedule. Design planning is the responsibility of RPPSM JV Design Director. The Project Co-ordinator will monitor such planning to ensure that the necessary technical interfaces are co related and that such planning is integrated into project schedule.

Design input

Design input will be based on the client supplied technical specifications/ soil Investigation Report/ Contract Documents/Vendors data sheets. / Data sheets of equipment Manufacturers.



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Design Output

All design output by the RPPSM JV and its subcontractors shall be documented by means of specifications, Drawings, calculations and analysis. The RPPSM JV shall ensure that all design output meets the requirements of the design input and shall contain or refer the necessary acceptance criteria/Conform to the necessary regulatory requirements and guaranteed output as per contract. Identify the characteristics, which are crucial to the safe operation of the designed product.

Design Verification

Design verification shall be carried out by the RPP SATHYAMOORTHY JV to ensure the design meets the input/output requirements by holding regular design reviews, implementing the necessary qualification tests, reviewing and checking calculations and by comparison with similar proven design. The design shall be submitted to the client for review and approval.

Design Change -Control

Design changes and modifications shall be identified and documented by the RPP SATHYAMOORTHY JV for review and approval on the appropriate form.

Design / Drawings / Standards to be controlled as per the documents control system in Corporate Quality Manual by making entry in Master register and issue of the same after recording in issue register. Revision of such documents should be controlled by putting "Superseded" stamp on older version and may be securely retained to avoids their unintended use. One person will be made responsible as Site Document and record Controller. This Drawing Issue Register Shall contain Drawing No. , Rev. Status, No. of Copies Distributed, Name of the Functional Head to whom it has been distributed, Date of Receipt and Signature of the concerned Recipient. When a particular



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Drawing / Engineering Document are issued to Functional Head it must bear a "Control Copy" stamp on it. The "Control Copy" stamp shall indicate the Control Copy No; issued To, Date of Issue.

11.0 PROCUREMENT

General

The responsibility for all procurement activities rests with the Project Team with the help of Materials Department. All procurement and associated expediting would be carried out in accordance with the Materials Management Manual.

Vendor Qualification and Selection

The RPP SATHYAMOORTHY JV has existing procedures for vendor selection, as per material Management Manual. Vendors will be selected from the approved list of vendors as approved by Client for the major construction materials such as cement, steel.

Selection of Suppliers:

Equipment, Mechanical and Electrical Components, Material will be procured as per Engineering Specifications, Drawings.

Following steps shall be followed for selection of suppliers:

For Construction Material:

Procurement Dept. shall ask suppliers to submit samples of required materials as per mentioned specification wherever required. All relevant technical data such as specification, test certificate, brochures are also to be submitted to procurement function.

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Project Quality assurance Department shall evaluate the quality of samples and seek approval from client for the items, which are directly going to affect the quality of final product.

Inspection at Suppliers' premises will be done if required for selection along with owner/owner's representative if he wishes to do so.

- On the basis of evaluation of suppliers/ manufacturers as per EPC criteria the procurement function will select the supplier for registration along with their products, plants or components.
- On the basis of this registered suppliers' list/ clients approved vendor lists and commercial terms and conditions, Procurement Dept. will release orders for materials as and when requirement arises.

Selection of Vendors/Suppliers shall be based on their ability to meet the specified requirements. Adequate control shall be exercised over the vendors/suppliers in terms of vendor/supplier registration, assessment, evaluation and de - registration if not delivering as per the product requirements.

12.0 HANDLING & STORAGE OF MATERIALS

Procedures for the handling, packing, marking, preservation, storage and delivery of material would be developed to take into account the prevailing weather conditions on the construction site and the likely conditions encountered during transit.

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Following steps shall be followed for storage and preservation of cement.

Cement in silo/ Bags

Cement received in bags shall be stored in cement godown only. The platform of the godown will be minimum 150 mm above ground level constructed with either masonry or concrete, further wooden/concrete platforms will be made on which the cement bags will be stored.

Maximum fifteen bags shall be stacked in one board. Cement shall be issued only when the same is accepted by Q.C. Any non-accepted batch of cement shall be kept separately and shall not be issued for use or rejected.

First-In First-out (FIFO) systems shall be followed while issuing the cement from the godown.

Each batch (truck load) of cement shall be stacked at a predefined place and shall be identified by display shall be taken to avoid damage to the packing. There should be passage all-round and in between two access two days.

If the cement stored, whether in silo or godown, beyond three month from its date of manufacture, the same shall be rejected.

Handling of Concrete Mix

Concrete mix shall be shifted through Transit Mixers at all times from Batching Plant. Retention time of the mix will be as defined as per mix design criteria of the respective mix.



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Handling and storage of aggregates:

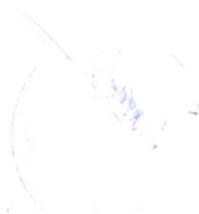
Aggregates to be stacked on levelled sound surface, preferably on P.C.C with sand bags barrier at periphery in separate bin under the shade.

Handling and Storage of Steel;

Steel to be stacked diameter wise placing it on stands constructed with MS channels with ground clearance of minimum 200 mm in a manner it does not touch the surface. During monsoon steels to be covered by tarpaulins sheets. Tagging of steel to be done for tested and non-tested steel as per ITP. It will not be used without testing/Client permission. BBS engineer will be custodian of the steel and will be responsible for fabrication and issue of steel to sub-contractor.

Bricks

1. Bricks shall be stacked in regular tiers as and when they are unloaded to minimize breakage and defacement. These shall not be dumped at site.
2. Bricks stacks shall be placed close to the site of work so that least effort is required to unload and transport the bricks again by loading on pallets or in barrows. Building bricks shall be loaded or unloaded a pair at a time unless palletized. Unloading of building bricks or handling in any other way likely to damage the corners or edges or other parts of bricks shall not be permitted.
3. Bricks shall be stacked on dry firm ground. For proper inspection of quality and ease in counting the stacks shall be 50 bricks long, 10 bricks high and not more than 4 bricks in width, the bricks being placed on edge, two at a time along the width of the stack. Clear distance between adjacent stacks shall not be less than 0.8 m. Bricks of each truck load shall be put in one stack. Bricks will be stored vendor wise.
4. Bricks of different types, such as clay bricks, clay fly ash bricks, fly ash lime bricks, sand lime (Calcium silicate) bricks, auto-clave bricks etc. shall be stacked separately. Bricks of different



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classification and size consideration (such as, conventional and modular) shall be stacked separately.

Also bricks of different types, such as, solid, hollow and perforated shall be stacked separately.

Blocks

1. Blocks are available as hollow and solid concrete blocks, hollow and solid light weight concrete blocks, autoclaved aerated concrete blocks, concrete stone masonry blocks and soil-based blocks.
2. Blocks shall be unloaded one at a time and stacked in regular tiers to minimize breakage and defacement. These shall not be dumped at site. The height of the stack shall not be more than 1.2 m. The length of the stack shall not be more than 3.0 m, as far as possible and the width shall be of two or three blocks.
3. Normally blocks cured for 28 days only should be received at site. In case blocks cured for less than 28 days are received, these shall be stacked separately identified using yellow tag. All blocks should be water cured for 10 to 14 days and air cured for another 15 days; thus, no blocks with less than 28 days curing shall be used in building construction, identified using green tag.
4. Blocks shall be placed close to the site of work so that least effort is required for their transportation.
5. Blocks manufactured at site shall be stacked at least for required minimum curing period. The date of manufacture of the blocks shall be suitably marked on the stacks of blocks manufactured at factory or site

Note- Mass stacking is proposed only in case of site dedicated RMC Plant



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Fly Ash/GGBS

Fly ash/GGBS in bulk quantities shall be stored in silo to avoid any intrusion of foreign matter. Fly ash/GGBS in bags shall be stored in stacks not more than 10 bags high. Godown construction will be same as described for cement godown.

Admixture:

Admixture will be stored under shed and FIFO to be maintained. Expiry date of admixture to be monitored.

Water

Wherever water is to be stored for construction purposes this shall be done in proper storage tanks to prevent any organic impurities getting mixed up with it.

All containers of paints, thinners and allied materials shall preferably be stored in a separate room on floors with sand cushions. The room shall be well-ventilated and free from excessive heat, sparks of flame and direct

13.0 PROCESS CONTROL SYSTEM

13.1 Controlling Operations

Process shall be controlled by identifying various major activities (segments) and preparing individual detailed Construction Methodology. All relevant Formats, reports etc. shall be maintained for execution of the Segment concerned.

Method statements will be submitted minimum of one month prior to start of each activity separately prior to execution of the work.



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The responsibilities and authorities for the execution of all Construction are as per the following matrix:

SR. No.	Activity	Responsible person		
		Performing	Checking/Verifying	Approving
01	Preparation of Construction Methodologies.	Project Team.	Project Incharge/Coordinator	Authority Engineer
02	Identification of Source of Construction Materials	Project Team	Project Incharge/Coordinator	Authority Engineer
03	Testing of Samples & Approval and Trial Mixes etc.	Laboratory Technician for the material procured	QA/QC Engineer	Authority Engineer
04	Survey & setting out works.	Surveyor/ Site Engineer	Project Incharge/Coordinator	Authority Engineer
05	Preliminary Ground preparation Works.	Site Engineer	Project Incharge/Coordinator	Authority Engineer
06	Construction of sub structure & superstructure.	Construction Manager	Project Director	Authority Engineer
07	Testing of construction materials.	QA/QC Engineer	Project Incharge /Coordinator	Authority Engineer
08	Clearance to release/final approval	Sr. Site Engineer	QA/QC Engineer & Project Coordinator	Authority Engineer

13.2 CONSTRUCTION METHODOLOGY:

13.2.1 SURVEY AND SETTING OUT WORKS

The main survey works will be carried out from the specified benchmarks and with values provided by the clients. The total survey work will be done using Total station and Coordinates & levels will be transferred near the buildings and the value of the same will be marked. Survey team will crosscheck



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the benchmark level and co-ordinates. From the building benchmark, the corners of the building will be set as per the co-ordinates provided in the drawings. Before casting the footing, the same will be crosschecked with the Survey team.

The boundary pillars will be constructed with 230mmx230mm thick masonry pillars and plastering for the same will be done. With oil paints, top of the pillars the column number and grid line will be marked. The gridlines and diagonals for the building will be checked. Site Engineer and Clients representative will carry out the joint recording for the ground levels jointly.

13.2.2 ANTI-TERMITE TREATMENT

After getting the approval from the consultant for the strata inspection. The next activity will be Anti-termite treatment for the foundations. The Anti-termite treatment will be carried out as per the IS 6313: 1981 by the approved agency as per the instructions and recommendation of the manufacture. The working methodology of the same is taken from the approved agency. After studying all his specifications and procedure the approval for the same will be given by SECR representative.

Record will be maintained on site to control the chemical treatment on each pit. The same shall be documented day-to day basis. Anti-termite material is hazardous, it will be stored separately and the Hazardous label will be marked on it to avoid further consequences. This is not mandatory to start the anti-termite treatment from the bottom of the founding level when concrete grade is higher than 1:2:4 as per IS-6313:1981,

13.2.3 PCC FOR FOUNDATIONS

Before starting the PCC for the foundations. The pre-pour cards will be filled by RPPSM JV and RFI (request for inspection) will be given to Client well in advance. The pits need to be checked for line level, working space, size and grid as per the foundation's drawings. The PCC will be carried out as per the grade/proportion mentioned in the BOQ, Specifications and Drawings. The thickness of the PCC



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will be carried out as per the level mentioned in the drawings by providing this at suitable intervals. If the size of the pit is considerably more than the shuttering will be provided. The level nail will be marked on the shuttering board to maintain the level.

PCC to be procured from RMC only in general. But in case of emergency or breakdown or any other reason site mixing may be done with approval from client. Before starting the PCC, the approval of aggregates (fine and course) will be checked for properties at plant as well as Lab as per the IS 383:2019 and IS 2386:1963. The cement for the PCC will be as per the grade mentioned in the work order. In case of plum concrete, max % age of plum will as per Tender spec. / item description. Plum of size 160-230mm to be placed of total concrete. The surface-to-surface distance between two plums and from the edge of concrete should not be less than 100 mm. Quality of plum should be same of the aggregate used in concrete. Concrete to plum ratio will be 60% and 40 % respectively.

13.2.4 PREPARATION, TRANSPORTATION AND COMPACTION OF CONCRETE

Concrete to be procured from RMC plant/Captive Plant only. But in case of emergency or breakdown or any other reason site mixing may be done with approval from client. The mixes should be pre-approved by SECR. RPPSM JV representative will periodically witness and review test report of concreting materials at RMC laboratory. RPPSM JV representative will conduct a surveillance visit to the RMC and will record the observations in an instruction register or fill up an observation report. Concrete to be placed within retention period, specified by RMC agency. Concrete will be placed properly with due care to avoid segregation during placing, through pump or crane bucket. If satisfactory performance is observed, pouring the concrete from more than 1.5 m height, then it can be followed. Proper access will be provided in each pit. After placing the concrete, proper compaction will be done. The top surface of the PCC will be finished properly in line and level with this. The curing



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of concrete will be done by means of curing compound/water for at least 7 days for OPC and 10 days for blended cement. For very small qty. mechanical mixers may be used. Acceptance of concrete mix design will be based on strength achieved at 28 days or as directed by RCC Consultant.

13.2.5 CONSTRUCTION OF STRUCTURAL COMPONENTS I.E. FOOTINGS, COLUMNS, BEAMS AND SLABS FORMWORK:

FORMWORK:

Form work will be structurally designed approved shuttering materials. Design and scheme of every typical formwork arrangement will be submitted for approval before use.



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10.3.3 Dosages of retarders, plasticisers and superplasticisers shall be restricted to 0.5, 1.0 and 2.0 percent respectively by weight of cementitious materials and unless a higher value is agreed upon between the manufacturer and the constructor based on performance test.

11 FORMWORK

11.1 General

The formwork shall be designed and constructed so as to remain sufficiently rigid during placing and compaction of concrete, and shall be such as to prevent loss of slurry from the concrete. For further details regarding design, detailing, etc, reference may be made to IS 14687. The tolerances on the shapes, lines and dimensions shown in the drawing shall be within the limits given below:

a)	Deviation from specified dimensions of cross-section of columns and beams	+ 12 mm - 6 mm
b)	Deviation from dimensions of footings	
1)	Dimensions in plan	+ 50 mm - 12
2)	Eccentricity	0.02 times the width of the footing in the direction of deviation but not more than 50 mm
3)	Thickness	± 0.05 times the specified thickness

guiding factor for removal of formwork, in normal circumstances where ambient temperature does not fall below 15°C and where ordinary Portland cement is used and adequate curing is done, following striking period may deem to satisfy the guideline given in 11.3:

Type of Formwork	Minimum Period Before Striking Formwork
a) Vertical formwork to columns, walls, beams	16-24 h
b) Soffit formwork to slabs (Props to be refixed immediately after removal of formwork)	3 days
c) Soffit formwork to beams (Props to be refixed immediately after removal of formwork)	7 days
d) Props to slabs:	
1) Spanning up to 4.5 m	7 days
2) Spanning over 4.5 m	14 days
e) Props to beams and arches:	
1) Spanning up to 6 m	14 days
2) Spanning over 6 m	21 days

For other cements and lower temperature, the stripping time recommended above may be suitably modified.

11.3.2 The number of props left under, their sizes and disposition shall be such as to be able to safely carry the full dead load of the slab, beam or arch as the case may be together with any live load likely to occur during curing or further construction.

REINFORCEMENT WORK:

Reinforcement will be fabricated as per the drawing and approved bar bending schedule. Bar bending will be done mechanically to the correct radius with proper tools and platform as per IS 2502 – 2004. Bending of material will be cold bending only. Cracked end of bars will not be used in works. Bars will be anchored, lapped and spaced in specified location as per bar bending schedule and the guidelines given in IS 456 - 2000. Also, it will be checked for its diameter, numbers and cover as per the



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specification and drawing. Unit weight of bars to be checked for every lot at site lab. Physical and chemical test to be conducted as per IS-1786 at external laboratory periodically and MTC for every lot to be reviewed.

BBS shall be prepared and approval shall be taken from AE prior to cutting bending of steel

13.2.6 REINFORCEMENT CEMENT CONCRETE

CONCRETE INGREDIENTS

CEMENT

The cement, OPC of 53 grade/43 grade/PPC (as specified in per technical specifications) will be used and it will be received in 50 kg bag or bulker. Cement to be procured from pre-approved source. MTC of cement to be reviewed for each lot. Cement held in storage for a period of ninety days or longer will be retested to conform its required quality before use.

The construction of go down will be as per standard procedure. Cement bags will be stored in dry enclosed shade well away from the outer wall and insulated from the floor to avoid contact with moisture from ground and so arranged as to provide ready access.

FLY ASH

Fly Ash as per IS-3812: 2003, Part-1, will be procured from reputed manufacturers and pre-approved source.

Max permissible limit of Fly ash of Total Cementitious material will be 20 % as per project specification.



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AGGREGATES

All aggregates will confirm to IS 383(2019) and the test for conformity will be carried out as per IS 2386 (1963) The aggregates will be chemically inert, strong, hard, durable against weathering and free from deleterious substances that may cause corrosion of reinforcement or may impair the strength and/or durability of concrete. All coarse and fine aggregate will be stacked separately in stockpile near work site in bins properly constructed to avoid intermixing of aggregates.

WATER

The quality of water will confirm to IS 456:2000 and test for conformity will be carried out as per IS 3025:1987 Water will be free from acid; alkali, sugar or salt Frequency of testing will be as per the inspection & test plan.

RCC WORK

Before starting of any RCC works the source of aggregates will be checked from the quality point of view as per the specification. The source of materials which is used in design mix concrete will be used during the execution. If the source of material changes; RMC agency will inform Authority Engineer in writing and approval for the next material source shall be obtained.

The Mix design will be carried out for various grades of concrete as per the standard procedure for the Mix Design. The recommendation for the Design strength in the Laboratory will be as per the strength mentioned in the specifications. The approval of the Mix designs for the grades mentioned in the Contract Documents to be obtained from Authority Engineer. The compressive strength of 7-days and 28-days will be checked. Acceptance criteria will be strength gained at 28 days only, in case of shortfall acceptance criteria in line with IS:456(2000) shall be followed.

Calibration of batching plant to be done as per Indian standard norms with duly stamped standard weights followed by report submission to Authority Engineer for approval.

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13.2.7 PROPORTIONING, BATCHING, MIXING, TRANSPORTING AND COMPACTION OF CONCRETE

PROPORTIONING

Proportioning of the aggregates will be done as per the approved mix design. Correction for water will be applied as per the direction of RMC manufacturer/Client/Consultant

BATCHING and MIXING

Batching and mixing of concreting materials will be done by using computerized automatic Batching plant only, which provide computer generated print out of batch quantity.

Care will be taken to see that the mix is of suitable workability & homogeneous. The mixing time will be as per manufacturer's specification.

TRANSPORTATION

Concrete to be transported by Transit mixers from RMC Plant to the Project Site.

Re-dosing of concrete: -Re-dosing of concrete will be as per site requirement.

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PLACING:

Due care will be taken while placing the concrete to avoid segregation. Concrete to be placed by Concrete pump. Concrete placed in restricted forms by wheel barrows or short chutes will be subject to the requirement for vertical delivery of limited height to avoid segregation and shall be deposited as nearly as practicable in its final position.

Concreting, once started, shall be continuous until the pour is completed. Concrete shall be placed in successive horizontal layers of uniform thickness. These shall be placed as rapidly practicable to prevent the formation of cold joints or planes of weakness between each succeeding layer within the pour. The thickness of each layer shall be such that it can be deposited before the previous layer has stiffened. The bucket loads or other units of deposit shall be spotted progressively along the face of the layer with such overlap as will facilitate spreading the layer to uniform depth and texture with a minimum of shovelling. Max. Permissible time of concrete retention will be as established during trial for respective grade from batch time.

Pour plan & sequence of pouring shall be mention & the same shall be forwarded with checklist.

COMPACTION

Concrete will be compacted during placing with approved vibrating equipment until the concrete has been consolidated to the maximum practicable density, is free of pockets of coarse aggregate and fits tightly against all form surfaces, reinforcement and embedded fixtures. Particular care will be taken to ensure that all concrete placed against the form faces and into corners of forms or against hardened concrete at joints will be free from voids or cavities. The use of vibrators shall be consistent with the concrete mix and caution exercised not to over vibrate the concrete to the point that segregation results.



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CURING

All concrete works will be cured by keeping it continuously damp for the period of time required for complete hydration and hardening to take place. Preference will be given to the use of continuous sprays, or pounded water, continuously saturated coverings of sacking, canvas, Hessian or other absorbent materials, wrapping with transparent plastic sheet or using curing compound etc. Extra precautions will be exercised in curing concrete during hot weather. The quality of curing water will be as per IS code. The Curing period will be as per IS 456:2000 page No 27.

13.2.8 BACK FILLING:

The backfilling material shall be deposited in layers not exceeding 300 mm in loose thickness. It shall be compacted to required density. Compaction shall be carried out at the optimum moisture content only. Each layer of material shall be thoroughly compacted to densities specified. Subsequent layers shall be placed only after the finished layer has been tested according to IS 2720 Method of Test for soils.

14.0 INSPECTION & TESTING

All the applicable Quality Assurance and Quality Control requirements as per the Contract Specifications and other relevant applicable Codes/Standards/Specifications during the execution shall be identified as **Inspection and Test Plans** for various sub-activities in the Segment.

On reaching materials at site RPPSM JV store will submit incoming materials documents along with **Incoming Materials Inspection form** to RPPSM JV QA/QC will prepare an incoming materials inspection report as per the format, enclosing challan of the materials and will submit to SECR Stores for record further Incoming material will be accepted after thorough checks on acceptance criteria. The materials, which will affect the quality of products / processes, should be included only, like cement, fly ash, steel, aggregates, and admixture. WPC, bricks, blocks, aggregates, etc. Rolling Margin, Bend and Rebend of steel to be established for each lot of Reinforcement



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The following parameters shall be considered during the preparation of the Inspection and Test Plan:

- a) Characteristics of the Plant, Product to be measured at each point, and the documentation and acceptance criteria to be used.
- b) Authority Engineer established points for Witness or Verification of selected characteristics of the work & Product as required by the contract technical specifications.
- c) The prepared ITP shall be attached to the QAP along with necessary Inspection and Testing Formats. No Construction Function shall be started without approval of the relevant segmental quality plans and Inspection and Test Plans by relevant authority. The ITP shall be reviewed periodically during execution of the segment for effective operation of various Quality Assurance and Quality Control activities.

15.0 CALIBRATION OF MONITORING AND MEASURING EQUIPMENTS:

The following steps shall be followed for Calibration of various Measuring and Monitoring Equipment's at Field Testing Laboratory.

All the instruments to be identified and recorded with unique identification code. A calibration plan to be maintained for all the instruments. Calibration status to be maintained for each instrument. A calibration tag to be attached with the instrument's indication last date of calibration and next due date of calibration. Calibration report should have traceability i.e., the details of calibration report of master calibrator; (comparing instruments) should also be available. Calibration shall be done by only NABL/Client approves laboratory/agency.



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16.0 HANDING OVER OF WORKS:

Handing over procedure of Structures

When any structure or part of the structure is completed substantially, Project Coordinator along with relevant functional will check the documents or records, for their adequacy with respect to SYSTEM/CONTRACT AGREEMENT/Technical spec in support of product /process conformity.

Project Coordinator will also initiate Corrective and preventive action for the open non-conformance Reports/ Pending customers complaints/pending testing which was asked by customer/pending legal issues.

A joint inspection of the structure/part of the structure will be conducted Project Coordinator & Authority Engineer representative and a snag list will be prepared.

The snag list will cover the defective/incomplete construction for which rework /rectifications are required and also the requirements of records/test reports pertaining to the product/documents etc. Agreed target date to be fixed for every point of the snag list.

On compliance of each point in the punch list, A QA/QC Engineer and Authority Engineer representative will sign off in the punch list.

After the completion of project or part of the project and the handover inspections as above have been satisfactorily completed Taking over notice shall be issued to the Authority as per the provision stated in reference Clause and defect liability period will start hence onward.



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17.0 DOCUMENT AND RECORD CONTROL SYSTEM

All IMS related documents, formats, procedures, manuals, Drawings and design and Codes are also documents and required to be controlled.

Document Issue and Control at site

The following steps will be followed for document issue & control:

- Step-1 The Document Controller at Site will receive the Copy of a Document
- Step-2 Document controller in coordination with Planning and relevant site functional shall identify for document distribution.
- Step-3 Document Controller at Site shall take the number of copies required and prepare a Document distribution list in a register.
- Step-4 Document Controller at Site shall put the "Dept./ Site Controlled Copy" stamp and also the copy number so as to ensure that all pertinent revisions of such documents are received by the relevant persons whenever new revision of the same comes and inform the receiver to destroy or put superseded stamp on the old revision.
- Step-5 Document Controller at Site shall enter the relevant details regarding the issue of the document in the Register, distributes the documents to the relevant persons as per the request and obtain the signature of the recipient on the document issue register as evidence of receipt of the document.



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Document Amendment:

In case the documents require any amendment, prepare an amended document with appropriate revision number and send the revised approved document for review by Project Coordinator in the same process of Document Issue and Control.

All the obsolete documents specially the Drawings from all the point of use shall be removed / identified separately as "Superseded" or destroyed.

Record Control System:

All the records required to demonstrate the effective operation of the Quality Management System are identified in the pertinent department / personnel.

All the records identified shall be codified to ensure proper identification and traceability of the record as per the Guidelines on Document Codification.

Each department shall prepare a department wise Master List of Record incorporating the Record no., Name of the Record, location of the Record, Retention period etc. for effective control of all the pertinent records. Department Head shall ensure that the records used in the department shall be legible.

18.0 CONTROL OF NON-CONFORMING PROCESS AND PRODUCT:

All project members are responsible for identifying and reporting any discrepancy found in process or activities within their area of responsibility. The discrepancy so found shall be identified by suitable means so as to prevent its unintended use or delivery.

The Project Manager and QA/QC Engineer along with the concerned Project Team shall carry out the review on non-Conformity and its existence. The concerned shall identify the non-conformity and separate the non-conformities through suitable means.



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Closure of a Non-Conformance:

The Quality Management / OH & Safety / Environmental Department will ensure that the recommended actions are undertaken, implemented, verified, tested and approved by client. A Summary of all Non-Conformities shall be maintained and will be sent to Project Coordinator with a copy to Authority Engineer for review on monthly basis.

Corrective and Preventive Actions:

The Corrective and Preventive action shall be implemented to determine action to eliminate the cause of existing or potential non-Conformities in order to prevent their recurrence or occurrence.

The Project Manager along QA/QC Engineer and the concerned Project Team shall carry out the review of the Non-Conformances reported and find out the root cause(s) of non-Conformities through appropriate analysis of data as per the procedure for Analysis of Data.

Appropriate Corrective / Preventive actions shall be initiated to close the potential non-Conformities. All the Corrective and Preventive actions shall be documented properly for future review.

19.0 INTERNAL AUDITS:

During the course of the project, regular quality audits would be performed to determine the effectiveness of the quality system and this plan in particular. To this end an audit schedule would be prepared to cover all project related activities at every Six months.

20.0 TRAINING OF SITE PERSONNEL:

To enhance the skills and competency of the project personnel training programme will be conducted. Training needs shall be identified by Project Management Functions at Project Site. Evaluation of the Training and Awareness Programs imparted shall be done to identify further Training needs.



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21.0 OH & SAFETY AND ENVIRONMENTAL MANAGEMENT PRACTICE

The Occupational Health & Safety and Environmental Management Plan for the project will be submitted separately

22.0 Annexures

Annexures - 1	Inspection & Test Plan
Annexures - 2	Frequency of Material Testing
Annexures - 3	Allowable Tolerance
Annexures - 4	Procedures for Testing
Annexures-5	Calibration Plan
Annexures-6	Sample Quality Assurance Plan
Annexures-7	General Format



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Annexures - 1 MATERIAL INSPECTION TEST PLAN

Legend:

P = Performer who will satisfy himself prior to offering any inspection and any documents for review

W = Witness: 100%

R= Review

V = Verification

SR. No.	Item	Category	Type/ Method of check	Extent of check	Reference document	Acceptance norms	Format of record	Records to be furnished	Remarks	
									A	B
1 Survey										
a)	Co-ordinates / Levels of Bench Mark	Critical	Dimensional	100%	Drawings	Drawings	Joint record	Yes	P	W
b)	Calibration of Theodolite /Level/Total station Machine	Critical	Dimensional check	100%	Respective IS Code	Respective IS Code	Calibration report	Yes	External Agency	W
2										
a)	Checking for layout	Critical	Dimensional check	100%	Drawings	Drawings	Joint Records	Yes	P	W
b)	Excavation with proper side slopes, Shoring Removing of Water, etc.	Major	Visual Checks	100%	Specifications	Specifications	--	No	P	W

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Checking location, firm bed, levels, free from slush	Major	Visual Checks	100%	Drawings	Drawings	--	Level Book	'P'	W
c) Dimension of excavation area	Critical	Dimensional	100%	Drawings	Drawings	---	No	P	W
d) Level of excavated pit	Critical	Dimensional check	100%	Drawings	Drawings	---	No	P	W
e) Disposal/proper stacking of excavated earth in demarcated area.	Minor	Visual Checks	100%	Specifications	Specifications	--	No	P	W

3 Back filling in foundation and trenches

Filling and compaction in layers not more than 300mm	Critical	Visual checks	100%	Specifications	Testing of each compacted layer	--	No	P.	W
b) Check for final level	Minor	Visual Check	100%	Drawings	Drawings	--	No	P.	W

4

a) Checking layout, line and level & dimension	Minor	Visual Check	100%	Drawing	Drawing	--	No	P.	W.
b) Establishment of Mix Proportion.	Critical	Visual Check	100%	Specifications	Specifications	Mix Design report	Yes	P.	W
c) Form work	Major	Visual	100%	Drawing	Drawing	--	Formwork	P	W.

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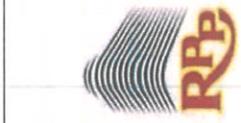
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			Check				Checklist		
d)	Pouring of PCC including compaction	Major	Visual Check	100%	Drawing	Drawing	--	PCC pour card	P W.
e)	Compaction of sub grade	Major	Visual Check	100%	Drawing	...	--	No	P W.
f)	Curing	Major	Visual Check	100%	Drawing	--	No	P W.
5									
a)	Adopting mix designs for various grades	Critical	Visual Check & Witness	100%	IS: 456	IS: 456-2000, IS-10262-2019, IRC SP23; IRS, Specification	Mix Design report	Yes	P
6									
a)	Preparatory works for steel / plywood	Major	Visual Check	100%	Specification	Specification	--	No	P RW
b)	Fixing and positioning in location for shuttering works and supports etc. and watertight ness.	Critical	Visual & Dimensional Check	100%	Drawings	Drawing	Pour Report	Yes	P W.
	Use of De shuttering oil	Major	Visual Check	50%	Job Procedure			P W.





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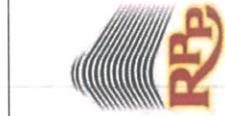
Date :- 05-10-2024

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		Critical	Visual & Dimensional Check	100%	Drawings	Drawing	Pour Report	Yes	P	W.
7 a)	Stacking of reinforcement bar	Major	Visual Check	100%	Job Procedure	Specification	...	No	P	W.
b)	Straightening, cutting, bending and binding	Major	Visual Check	100%	Drawing	Drawing	--	No	P	RW.
c)	Checking and fixing metal inserts/bolts as per drawing in location.	Major	Visual & Dimensional Check	100%	Drawing	Drawing	--	Yes	P	W.
d)	Fixing of cover block, chair, spacer bar and lapping of bar.	Major	Visual Check	100%	Drawing	Drawing	Pour Report	Yes	P	W.
e)	Top level of rebar or clear cover from concrete top.	Major	Visual Check	100%	Drawing	Drawing	Pour Report	Yes	P	W.
8	Concreting									





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a)	Pouring sequence methodology	Minor	Visual Check	100% for major and critical	Specification/ Job procedure	Specification	---	No	P	W.	
b)	Mixing, pouring and placement of fresh concrete including admixture	Major	Visual Check	100%	Design Mix	Established Design Mix	Batch report/	yes	P	W.	
c)	Checking of slump and cube	Major	Visual Check	100%	Design Mix	Established Design Mix	Batch report/	yes	P	W.	
d)	De shuttering with adequate precautions.	Major	Visual Check	100%	Specification	Specification	Post Pour Report	Yes	P	RW	
e)	Curing of Concrete	Minor	Visual Check	100%	Specification	Specification	---	No	P	W.	
f)	Check of visual inspection of concrete surface and rectification of unsatisfactory	Major	Visual Check	100%	Specification	Specification	Post Pour Report	Yes	P	W.	





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	performance, if any	Major	Visual Check	100% Specification	Specification	Post Pour Report	Yes	P	W.
g)	Check of final level of concrete, insert etc.								
9	Brick/Block masonry work								
a)	Checking of brick/Block	Major	Ref.Tes t Proced	QAP	QAP	IS-1077	Yes	P	W.
b)	Checking of sand	Major	Ref, Test Procedur e	QAP	QAP	IS-383	Yes	P	W.
c)	Mixing and preparation of cement mortar	Major	Visual Check	100%	Specification/ /Job procedure	Specification	--	No	P W.
d)	Hacking of surface, soaking of bricks, pointing of brick work	Major	Visual Check	100%	Specification/ Job procedure	Specification	--	No	P W.
e)	Staging and scaffolding	Major	Visual Check	100%	Specification	Specification	--	No	P W.





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				Specification	Specification	Specification	Specification	Specification	Specification	No	P	W.	
f)	Checking of bond, joints, thickness, true line, levels, verticality	Major	Visual Check	100%	Specification	Specification	Specification	Specification	Specification	--	No	P	W.
g)	Check for curing	Major	Visual Check	100%	Specification	Specification	Specification	Specification	Specification	--	No	P	W.
10	Plastering												
a)	Proportion of cement mortar, mixing and placing in location	Critical	Visual Check	100%	Specification	Specification	Specification	Specification	Specification	--	No	P	W.
b)	Checking of alignment thickness, verticality in line of construction drawing	Critical	Visual Check	100%	Specification	Specification	Specification	Specification	Specification	--	No	P	W.
c)	Curing	Major	Visual Check	100%	Specification	Specification	Specification	Specification	Specification	--	No	P	W.



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Annexures – 2

FREQUENCY OF MATERIAL TESTING

S. N.	MATERIAL	TEST	FREQUENCY OF TESTING	RELEVANT IS CODE	REMARKS
1	Soil	a)Standard/Modified proctor test b)Core cutter test/Sand Replacement Method	Once for each source of earth. <ul style="list-style-type: none"> • At every 300mm thick Layer of Compacted soil. • One sample at every 100m² of compacted area. <p>Note: - one sample consist 1cores</p>	IS 2720	External lab/agency
2	Fine Aggregate/ Crushed Sand (RMC Plant)	a) Sieve analysis and Fineness Modulus.	Every 100 cum and whenever require. Once in week for material in bin	IS 383	Internal lab
		b) Silt content in sand	Every Lot	IS 2386 & 383	Internal lab
		c) Bulkage of sand	In monsoon/rainy season when concreting is done by volumetric, this test to be performed daily and necessary bulk age corrective to be done.	IS 2386-Part-3	Internal lab
		d) Dry/loose bulk density	Every month or when source of material will change.		Internal lab
		e) Moisture content	Daily or when it rains		Internal lab
		f) Specific gravity and water absorption	Once or when source will Change.	IS 2386-Part-3	External Lab



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3	Coarse Aggregate (RMC Plant)	a) Sieve analysis	Every 100 cum and whenever require. For incoming; every truck load for size & fines once in week for material in bin Change of source & incase of doubt	IS 383	Internal lab
		b) Dry/loose bulk density	Every 15 days or when source of material will change.		Internal lab
		c) Moisture content	Daily during concreting work		Internal lab
		d) Flakiness index	Every 100 cum and whenever required	IS 2386-Part-1	Internal lab
		e) Aggregate Impact and crushing value	Once or when source will Change	IS 2386-Part-4	Internal lab
		f) Specific gravity and water absorption	Once or when source will Change	IS 2386-Part-3	external lab
		g) Deleterious substance	Once or when source will Change.	IS 2386-Part-2	external lab
4	AAC Block	a) Dimension Check	One sample for each source M.T.C to be obtained or 10000 blocks whichever is earlier	IS:2185-1993	External lab
		b) Compressive strength			
		c) Density			
		d) Thermal Conductivity			
		e) Drying Shrinkage			
5	Cement (RMC Plant)	Physical Test	M.T.C to be obtained		
		a) Fineness of cement	50 MT or on each change of source	IS 269/455/8112/ 3535/3812/ 1489/4031 and 4032.	external lab.
		b) Standard consistency of cement			



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		c) Setting time d) Compressive strength e) Soundness			External lab
6	Fly ash	a) chemical analysis b) sieve analysis	Every new brand of fly ash and every 6 months. M.T.C to be obtained.	IS 4031 & IS 3812	External lab
7	GGBS	a) chemical analysis b) sieve analysis	One test from each source or every 6 months	IS 12089	External lab
8	Micro Silica	a) chemical analysis	One test from each source or every 6 months	IS 15388	External lab
9	Reinforcement Steel	Physical test a) Rolling margin b) Tensile Test c) Elongation d) Bend Re bend test e) Elongation	M.T.C every lot. Every lot For bar dia. 8mm to 16mm, one sample in 100 MT For bar dia. Above 16mm, one sample in 100MT	IS 1786- 1985 IS 226 – 1962 for secondary steel, every heat no	Internal lab & External lab External lab
		Chemical Test a) carbon b) sulphur c) sulphur + phosphorous	Every 100MT for every dia. For every new brand	IS 1786- 1985 for secondary steel, every heat no	External lab
10	Structural Steel	Rolling Margin Physical and Chemical test	M.T.C to be obtained Whenever require as per Construction specs.	IS 226 and IS 2062	Internal lab External Lab
11	Concrete	a) Slump/Flow Test b) Compressive Strength (Cube Casting)	RMC-Each transit mixer The cube samples shall be taken for each grade of concrete for daily concrete quantity. Number of samples shall be as per IS 456. Note:- One sample consist	IS 456-2000	Internal lab

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			3nos of cubes.		
12	Admixture	Chemical Analysis	M.T.C to be obtained. One test from each source once	IS 9103:1999 & 6925	
13	Water	PH Value and Solid analysis.	To be tested once for source	IS 456-2000 Clause 5.4 and IS 3025	Internal lab
			To be tested on every change of source and every 3 months		External lab
14	Gypsum	Physical and Chemical test	M.T.C to be obtained and every 6 months./ change of source/type.	IS 1288,2547	External Lab
15	Putty	Chemical Composition	M.T.C with every lot and every 6 months /change of source/type.	IS 63-2006	Supplier
16	Curing Compound		MTC will be submit	As per manufacturer.	Supplier
17	Shuttering Oil	Chemical Composition	M.T.C with every lot	As per manufacturer.	Supplier
18	Jointing Mortar (For Block Work)		M.T.C with every lot	As per manufacturer.	Supplier
19	Bonding Agent (Old to new concrete, Gypsum plaster and Cement plaster)		M.T.C with every lot	As per manufacturer.	Supplier
20	Coupler	Physical Chemical test and	M.T.C with every lot and Third-party test, a. up to 500: - Nil b. 501 to 1200: 1 sample c. 1201 to 3200: 2 sample d. 3201 to 10000: 3 sample.	IS 1786:2008, IS 1608:2005/1617 2/BS8110 part 1 section 3	Supplier and Third party lab Every lot dia. Wise
21	Anchor/Bolt (Hilti)	Pullout Test	Once during approval		Supplier



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Annexures – 3 Allowable Tolerances

Conform to the requirements listed below and as given in IS 456 and IRC SP 24 or ACI 117, whichever is more stringent. Tolerances indicated shall apply to the full height of the building. Variations from grade and flatness of Work may be measured prior to removal of supporting formwork or shores, except where another time for measurement is specifically indicated, and shall be taken as either plus or minus from a true line.

1. Concrete work around elevator shafts, including slabs, beams, columns and walls, shall not fall more than 13 mm away from theoretical locations, except where jump-form tolerances apply.

2. Variations from Plumb:

- a) Lines and surfaces of columns, walls, corners:
6 mm per 3 m;
25 mm per 12 m or more; and
50 mm maximum for the entire height of building.

- b) Exposed column, control joint grooves, and other conspicuous lines shall correspond at all locations, and shall not exceed:
6 mm per 6 m;
10 mm per 10 m; and
13 mm per 12 m and larger

3. Level Alignment:

- a) Elevation of top of slab (both slab-on-ground and suspended slabs prior to shoring removal), 20 mm measured from planned elevation.
- b) Elevation of top of slab, measured at columns and walls at time of turnover of floors for tenant fit-out, maximum differential slope between adjacent columns and walls of distance/500 with a Maximum deviation from the average elevation of a full floor of 30 mm.
- b) Elevation of formed surfaces before removal of shores, 20 mm.
- c) Lintels, sills, parapets, horizontal grooves and other lines exposed to view, 13 mm.

4. Relative Alignment:

- a) Stairs
 - i) Difference in height between adjacent risers, 3 mm.
 - ii) Difference in width between adjacent treads, 6 mm.
- b) Unless otherwise noted, formed surfaces may slope with respect to the specified plane at a rate not to exceed:
 - i) 6 mm in 3 m.
 - ii) for lintels, sills, parapets, horizontal grooves and other lines and surfaces exposed to view, 6 mm in 6 m.



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5. Building Lines: Variations of the linear building lines from established position in plan and related positions of columns, walls, beams and partitions:

- 6 mm in 3 m;
- 9 mm in 6 m;
- 13 mm in 12 m; and
- 25 mm maximum.

6. Faces of formed slab edges, turned down spandrels, and parapets shall not deviate from theoretical position or alignment by more than the distance in consideration divided by 500 or by 13 mm, whichever is less.

7. Place post-tension tendons and anchorages to the following horizontal and vertical tolerances for the corresponding horizontal and vertical member dimensions:

- a) 200 mm and less: plus, or minus 6 mm
- b) 200 mm to 600 mm: plus, or minus 9 mm
- c) Greater than 600 mm: plus, or minus 13 mm
- d) Deviations in horizontal plane which may be necessary to avoid openings or inserts shall have radius of curvature of not less than 6.4 m.
- e) Provide concrete cover not less than that required by the applicable fire rating.

8. Sleeves and Openings: Variations of the sizes and locations of sleeves, floor and wall openings and the like shall not exceed minus -6 mm or plus +25 mm from size and 13 mm from centerline locations given in accepted Shop Drawings.

9. Anchors and Inserts: Variations in the location of anchors and inserts shall not deviate more than 10 mm vertically nor 6 mm horizontally from positions shown in accepted Shop Drawings.\

10. Cross-Sectional Dimensions of columns and beams and the thicknesses of slabs and walls shall not deviate from theoretical by more than the following:

- a) for dimensions of 300 mm or less +10 mm, -0 mm
- b) for dimensions of more than 300 mm but not over 900 mm +13 mm, -10 mm
- c) for dimensions over 900 mm +25 mm, -19 mm



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Annexures - 4

PROCEDURE FOR TESTING
OF
CONSTRUCTION MATERIALS

Prepared by QA/QC : _____

Reviewed by Debananda Baral (Chief Project Manager): _____

Approved by : _____

Issued by : _____ Dt: _____



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ACCEPTANCE CRITERIA FOR VARIOUS MATERIAL

Material	IS code	Clause /Pg	Details of Acceptance
River Sand	IS:383 - 1970(reaffirmed in 1997)	Table -4/pg- 11	<p>As per Grading zone-I- III. 4.75 mm passing 90-100%. 150 micron passing 0-10%. Grading Zone-I-III is generally suitable for RCC.</p> <p>600 micron passing for Zone-I – 15-34%, Zone-II- 35-59%, Zone-III- 60-79, Zone-IV- 80-100</p>
		Table-1/pg-8	<p>Limit of Deleterious material (%) by weight</p> <p>Coal & Lignite – 1%, Clay lumps – 1%, 75micron passing – 3%, Shale-1%</p> <p>Total % of deleterious material – 5%</p>
Crushed sand	IS:383 - 1970(reaffirmed in 1997)	Table -4/pg- 11	<p>150 micron passing – 20%. Rest grading zone etc. is same</p>
		Table-1/pg-8	<p>Limit of Deleterious material(% by weight)</p> <p>Coal & Lignite- 1%, Clay lumps- 1%, 75 micron passing – 15%, shale-1%</p> <p>Total % of deleterious material except 75 micron passing – 2%</p>
			<p>Silt Content:</p> <p>8% by Volume after 3 hrs.</p> <p>20% by Volume after 10 minutes.</p>



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Coarse aggregate Crushed	IS:383 - 1970(reaffirmed in 1997)	Table-2 /pg-9	% Passing for Single size aggregate of nominal size <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">IS sieve</th><th colspan="5" style="text-align: center;">Nominal size</th></tr> <tr> <th></th><th style="text-align: center;">40mm</th><th style="text-align: center;">20 mm</th><th style="text-align: center;">16 mm</th><th style="text-align: center;">12.5 mm</th><th style="text-align: center;">10 mm</th></tr> </thead> <tbody> <tr> <td>40mm</td><td style="text-align: center;">85-100</td><td style="text-align: center;">100</td><td></td><td></td><td></td></tr> <tr> <td>20mm</td><td style="text-align: center;">0-20</td><td style="text-align: center;">85-100</td><td style="text-align: center;">100</td><td></td><td></td></tr> <tr> <td>16mm</td><td></td><td></td><td style="text-align: center;">85-100</td><td style="text-align: center;">100</td><td></td></tr> <tr> <td>12.5mm</td><td></td><td></td><td></td><td style="text-align: center;">85-100</td><td style="text-align: center;">100</td></tr> <tr> <td>10mm</td><td style="text-align: center;">0-5</td><td style="text-align: center;">0-20</td><td style="text-align: center;">0-30</td><td style="text-align: center;">0-45</td><td style="text-align: center;">85-100</td></tr> <tr> <td>4.75mm</td><td></td><td style="text-align: center;">0-5</td><td style="text-align: center;">0-5</td><td style="text-align: center;">0-10</td><td style="text-align: center;">0-20</td></tr> <tr> <td>2.36mm</td><td></td><td></td><td></td><td></td><td style="text-align: center;">0-5</td></tr> </tbody> </table>	IS sieve	Nominal size						40mm	20 mm	16 mm	12.5 mm	10 mm	40mm	85-100	100				20mm	0-20	85-100	100			16mm			85-100	100		12.5mm				85-100	100	10mm	0-5	0-20	0-30	0-45	85-100	4.75mm		0-5	0-5	0-10	0-20	2.36mm					0-5	
IS sieve	Nominal size																																																									
	40mm	20 mm	16 mm	12.5 mm	10 mm																																																					
40mm	85-100	100																																																								
20mm	0-20	85-100	100																																																							
16mm			85-100	100																																																						
12.5mm				85-100	100																																																					
10mm	0-5	0-20	0-30	0-45	85-100																																																					
4.75mm		0-5	0-5	0-10	0-20																																																					
2.36mm					0-5																																																					
		3.3/pg-6	Aggregate Crushing Value - 45% for concrete other than wearing surface. 30% for concrete for wearing surface.																																																							
		3.4 /pg-6	Aggregate Impact Value- Alt to 3.3 45% for concrete other than wearing surface. 30% for concrete for wearing surface.																																																							
		Table-1/pg-8	Limit of Deleterious material (% by weight) Coal & Lignite- 1%, Clay lumps- 1%, 75 microns passing - 3%, Total % of deleterious material – 5%																																																							
			Flakiness Index: 30% for concrete.																																																							
Common Clay Bricks	IS:1077 – 1992(Reaffirmed in1997)	Table-1 /pg-1	Classification on basis of average compressive strength: Class Designation Min Avg. Comp. Strength, N/mm ² kg/sqcm ² 3.5 35 5 50																																																							

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			7.5 75 etc Compressive strength shall not fall below above limits.
	IS: 5454 – 1978 (Reaffirmed in 2010)	cl. 5.2.1.1	Compressive Strengths of any individual brick in the sample shall not fall below the min average compressive strength specified for corresponding class by more than 20%.
		cl.6.2 /pg-1	Tolerances Non-modular: For 20 bricks Length – 4600 +/- 80 mm Width – 2200 +/- 40 mm Height – 1400 +/- 40 mm
		cl.7.2 /pg-3	Water Absorption: Should not be more than 20% by weight upto class 12.5 and 15% by weight for higher classes.
		cl.7.3/pg-3	Efflorescence: 'Moderate' up to class 12.5 and 'Slight' for higher classes.
Concrete	IS:456 - 2000	cl. 15.4 /pg-29	The test results shall be average of 3 specimens. Individual variation should not be more than +/- 15%
			Compressive Strength: The mean strength from any group of 4 consecutive test results shall be as below: For M:15 - it shall be $> / = F_{ck} + 0.825 \times S.D.$ Or $F_{ck} + 3 \text{ N} / \text{mm}^2$ whichever is Greater (rounded off to nearest 0.5 N/mm ²) Provided individual test results shall be $> / = F_{ck} - 3 \text{ N/mm}^2$



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			<p>For M: 20 or above – it shall be $>/= F_{ck} + 0.825 \times S.D.$ Or $F_{ck} + 4N/mm^2$ whichever is greater (rounded off to nearest 0.5 N/mm²)</p> <p>Provided individual test results shall be $>/= F_{ck} - 4N/mm^2$.</p> <p>Note: In case S.D. is not established then assumed S.D. as per Table-8 shall be considered.</p>
		cl. 17.8 / page- 31	<p>Non- destructive Tests:</p> <p>The methods adopted include Ultrasonic pulse velocity, rebound hammer, probe penetration, pull-out and maturity.</p> <p>These methods give only estimation of physical concrete properties. Accuracy however depends upon the correlation between strength and the physical quality measured by the test.</p> <p>Any 2 test shall be performed which complement each other like UPV & Rebound hammer of these methods can be adopted, in which case the <u>acceptance criteria shall be agreed upon prior to testing</u></p>
		cl. 16.3 /pg-29	<p>Qty of Concrete represented by test results:</p> <p>Group of 4 results: Includes the batches from which the 1st and last samples were taken together with all intervening batches. individual pour 28 days strength acceptance only</p>
Cement 43 grade	IS:8112 - 1989		<p>Insoluble residue not > than 2%</p> <p>Total loss on ignition not > than 5%</p> <p>Soundness – Le Chatelier method not > than 10mm</p> <p>Auto clave method not > than 0.8%</p> <p>Initial setting time not < than 30 minutes</p> <p>Final setting time not > than 600 minutes</p>

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		Compressive strength: 72 +/- 1 hr. not < than 23 Mpa (23 N/mm ²) 168 +/- 2 hrs not < than 33 Mpa (33 N/mm ²) 672 +/- 4 hrs not < than 43 Mpa (43 N/mm ²)
Cement 53 grade	IS:12269 -1987 (Reaffirmed in 1999)	Insoluble residue not > than 2% Total loss on ignition not > than 4% Soundness – Le Chatelier method not > than 10mm Auto clave method not > than 0.8% Initial setting time not < than 30 minutes Final setting time not > than 600 minutes
		Compressive strength: 72 +/- 1 hr. not < than 27 Mpa (27 N/mm ²) 168 +/- 2 hrs not < than 37 Mpa (37 N/mm ²) 672 +/- 4 hrs not < than 53 Mpa (53 N/mm ²)
Cement Portland Pozzolana	IS:1489 - 1991 (Reaffirmed in 2005)	Pozzolana shall not less than 15% and more than 35% Total loss on ignition not > than 5% Soundness – Le Chatelier method not > than 10mm Auto clave method not > than 0.8% Initial setting time not < than 30 minutes Final setting time not > than 600 minutes
Reinf. Steel	IS:1786 – 1985 (Reaffirmed in 1990)	Chemical Composition: Max limits Carbon Sulphur phosphorus Sulphur and Phosphorus Fe 415 0.3% 0.06% 0.06% 0.11% Fe 415D 0.25% 0.045% 0.045 % 0.085% Fe 500 0.3% 0.055% 0.055% 0.105%

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			Fe 500D 0.25% 0.040% 0.040% 0.075% Fe 550 0.3% 0.055% 0.05% 0.10% Fe 550D 0.25% 0.040% 0.040% 0.075%
			Variation over specified max limit, max C- 0.02% P- 0.005% S - 0.005% S+P - 0.01%
			Tensile Strength: Min requirement Grade 0.2% proof stress Min tensile strength N/mm ² N/mm ² Fe : 415 /D 415 485 Fe: 500/D 500 545 Fe: 550/D 550 585
			Elongation: Min Requirement Grades Fe: 415/D Fe : 500/D Fe : 550/D % Elongation 14.5%/18%12% /16%10 %/14.5%
	IS:1786 – 1985 (Reaffirmed in 1990)	Cl. 8.5	Retest: If any one of the test pieces first selected fail to pass any of the test, two further samples shall be selected in respect of each failure. If the samples from retest pass then material is accepted.
			Rolling Margin : Dia of bar Tolerance limit Upto & incl. 10 mm +/- 7% Above 10 &incl. 16 mm + /- 5% Over 16 mm +/- 3%
Struct. Steel	IS:2062 - 2011	Table-3 /pg-5	Mechanical Properties : Fe 410 WA Fe410WB Fe 410WC Min Tensile streg. Mpa 410 410 410



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			Min Yield Stress Mpa <20 mm thk. 250 250 250 20-40 mm thk 240 240 240 >40 mm thk 230 230 230
			% Elongation, min 23% 23% 23%
	IS:2062 -2011	Cl. 16	Retest: If any one of the test pieces first selected fail to pass any of the test, two further samples shall be selected in respect of each failure. If the samples from retest pass, then material is accepted.
	IS:1852 -1985 <i>(Reaffirmed in 1995)</i>		Rolling Margin: Rolled Sections - +/- 2.5% on std. weight shown in IS: 808.

Testing of Concrete and Concreting Materials

1.0 Compressive Strength of Concrete

Purpose: To Check Crushing Strength of Concrete using Compression Testing Machine

Scope : This procedure is applicable for checking of Concrete Cube Strength.

Reference: As per IS -516 - 1959

Apparatus: Cube Moulds (150 X 150 X 150 mm), Tamping Rod (16mm dia. 600mm), Spanners (12-13, 14-15 size), Scoop, Levelling Float, Big G.I. Pan (Ghamela), Wheel Barrow, Cotton Waste, Mould Releasing Oil, MS Trey, Measuring scale, setsquare.

Material: Concrete.

Procedure:

Preparation of Cube Moulds:



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- a. All internal faces especially at edges and joints should be cleaned.
- b. Oiling to be done for inner side of cube moulds before casting of cubes.
- c. Measure and verify correct dimensions such as size and diagonal of cube moulds.
- d. Place the moulds on hard and levelled surface.

Sampling of concrete:

- a. The concrete should be unloaded half in the trolley below the mixer to take one pan of concrete and then unload fully to take one more pan or for transit mixer first one-third of a m3of concrete to be discharged prior to taking any samples. Homogeneously mix the concrete in trolley before taking sample in the pan.
- b. Sufficient quantity of concrete should be taken for cube casting i.e. at least three cubes to be cast.

Casting of Cubes:

- a. Mix sample homogeneously.
- b. Cubes shall be filled in three layers of approximately 50mm. Each layer shall be compacted with 35 blows of standard tamping rod.
- c. To avoid entrapment of air in the corners and sides it is recommended to tamp the sides of moulds using wooden mallet equally from all the sides or tamping can be done on the base plate using a tamping rod.
- d. Finally trowel the surface level on top of the mould.
- e. After final finishing the following details to be marked on top of cube in the order a shown in the sketch:
 1. & 2. Grade of Concrete according to code given for each grade (i.e. M15, M30, M35, M40).
 3. Name of Site (Initial Name i.e. XXXXX)
 4. Structure (Column = CL, Slab = SL, Beam = BM)
 5. Cube number
 6. Brand of Cement (Ultratech, JK, Ambuja = U/T).



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Sample Calculations:

Cross Sectional Area of Cube = 150 mm x 150 mm = 22500 sq.mm.

Failure Load as indicated in Cube Testing Machine = 1200KN.

Compressive/ Crushing Strength = $(1200 \times 1000) / 225 \times 100 = 53.33 \text{ N/mm}^2$.

Observation/ Conclusion:

Compressive / Crushing Strength from above sample calculation = 53.33 N/MM²

Documentation: Daily Cube Testing Register

OR Concrete Cube Strength Record.

2.0 Slump Test

Purpose: To Check Slump of Concrete using Standard Slump Cone.

Scope : This procedure is applicable to Slump of concrete.

Reference: As per IS 516 - 1959

Apparatus: Standard Slump Cone, Standard Tamping Rod, Scoop, Measuring Tape, Pan (Ghamela)

Material: Fresh Concrete.

Procedure:

1. Clean internal surface of slump cone, top surface of base plate and place on level ground.
2. Fill the Slump Cone with concrete in 4 layers with 25 blows uniformly with Standard Tamping Rod.
3. Level the top surface of concrete in slump cone with trowel.
4. Clean the slump cone from outside and base plate.
5. Lift the slump cone slowly after removing base clips.
6. To measure slump keep the cone on base plate in inverted position and keep tamping rod on it horizontally & measure using tape, or lift handle of slump cone and measure slump with calibrated tamping rod.
7. Measure slump in millimetres at centre places.
8. Clean the Slump Cone, Base Plate and Tamping Rod.



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Observation/Conclusion:

For site mixing.

- Slump of Concrete should be between 70 to 85mm for column & slab.
- For, congested area it should be 100mm, except otherwise specified.

For RMC. Min 100-120 mm, up to 160 mm required. Slump should be In the range of +/_ 25 mm of the slump, observed and finalized in trial and mix design.

Documentation: 8.1 Daily Cube Casting Register

3.0 Grading Analysis of Aggregates

Purpose: To Check Properties of Aggregates using I.S. Sieves.

Scope: This procedure is applicable for checking properties of aggregate like Fineness modulus, grading & zone of fine aggregates.

Reference:

Apparatus: IS Sieves (40mm, 20mm, 10mm, 4.75mm 2.36mm, 1.18mm, 0.6mm, 0.3mm, 0.15mm), balance pan, weigh balance 10kg Capacity, Standard Weights.

Material: Dry aggregate samples.

Procedure:

Conduct quartering for sample preparation according to procedure as shown below i.e. divide materials into 4 parts and select diagonally opposite parts.

Take following quantity of materials for quartering.

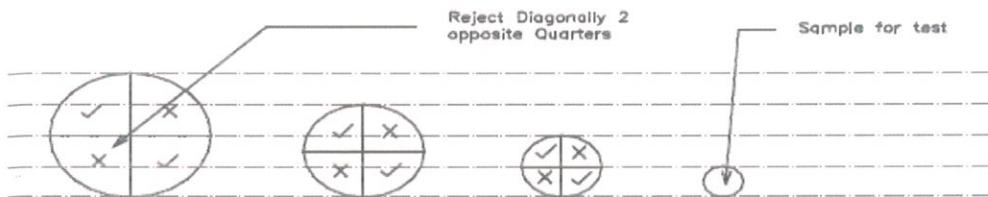
FAII= 6kg + - 200 grams

CAI= 5 kg + - 200 grams

CAII= 5 kg + - 200 grams.



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Take dry sample of Fall 1.5 Kg, CAI = 1.2 kg., CAII = 1.2 Kg

(all + - 100 grams) for sieve analysis and start sieving.

Continue sieving till material stops falling through sieve.

Weigh samples retained on each sieve.

Calculate Cumulative Percent Passing, Cumulative Percent

Retained and Fineness Modulus (FM) using the table given below.

FM = Addition of all values of Cum. Percent Retained / 100

Sieve Analysis

IS Sieve Size(mm)	Wt held	Wt. passed	% passing	% held.
40 mm				
20 mm				
10 mm				
4.75 mm				
2.36 mm				
1.18 mm				
0.6 mm				
0.3 mm				
0.15 mm				
Balance			$\Sigma=$	
Total			F.M.	



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Sample Calculations -

Building : Somerset		Material: Fall		Sample:	1500 gm	Date: 3.6.05
Sr No	Sieve Size(mm)	Wt. Held	Wt. Passing	% Passing	% Held	
1	40mm	0	1500	100	0	
2	20mm	0	1500	100	0	
3	10mm	5	1495	100	0	
4	4.8mm	150	1345	90	10	
5	2.4mm	200	1145	76	24	
6	1.2mm	420	725	48	52	
7	0.6mm	280	445	30	70	
8	0.3mm	405	40	3	97	
9	0.15mm	35	5	0	100	
	Balance	5		$\Sigma=$	353	
	Total	1500		F.M.	3.53	

Observation/Conclusion:

- Fineness Modulus of aggregate as per Sample calculation = 3.53.
- Zone of Fine aggregate = 2.

Documentation: 8.1 Sieve Analysis Register.

4.0 BULKAGE TEST.

Purpose: To Check Bulk age of fine aggregate using 20 litres & 25litres of Measuring Boxes at Site.

Scope: This procedure is applicable for checking Bulkage of fine aggregate.

Reference: As per IS 2386:1963 Part -3

Apparatus: 20 lits, 25 litres measuring boxes, Bucket, Measuring tape.

Material: Sand & Water

Procedure:



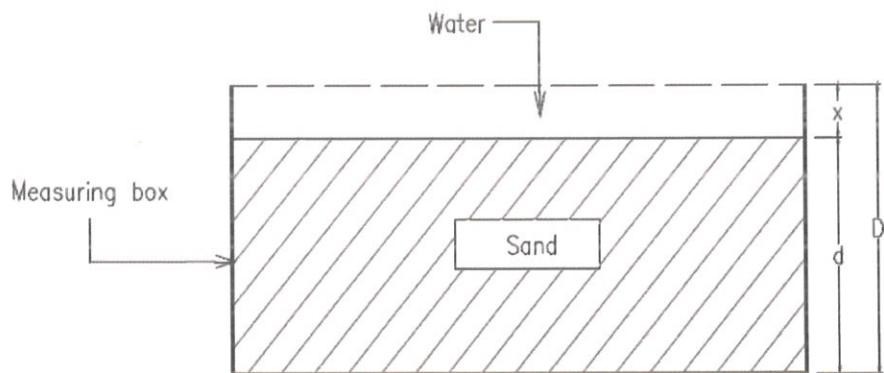
	RPP SATHYAMOORTHY JV PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
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1. Fill sand loosely in 20 litres, Measuring box and level with wooden log. No pressure to be applied.
2. Unload the measured sand in 25 litres measuring boxes.
3. Fill 20 litre box with water up to $\frac{3}{4}$ heights.
4. Unload sand from 25 lit box in water in 20 lit box and level properly.
5. Remove water from top of sand and measure the level of sand at 4 places and take average depth.
6. Calculate Bulkage using the following formula.
7. Bulkage (%) = $X \times 100 / d$

Where d = Final level of sand

D = Initial level of sand

X = Average depth of Settlement



Sample Calculations:

$$\text{Bulkage (\%)} = X * 100 / d$$

Where d = Final level of sand

D = Initial level of sand

X = Average depth of Settlement

$$d = D - X$$

$$X = \text{Average depth of sand} = X_1 + X_2 + X_3 + X_4 / 4$$

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X1 = 3.0cms.

X2 = 3.8cms.

X3 = 3.5cms.

X4 = 3.2cms.

Therefore,

$$X = (3 + 3.8 + 3.5 + 3.2) / 4 = 3.375 \text{ cms.}$$

$$d = D - X = 30 - 3.375 = 26.625 \text{ cms}$$

$$\text{Therefore, \% Bulkage} = [4.25 / 26.625] \times 100 = 15.96 \%$$

Observation/Conclusion: As Per Sample Calculation, Bulkage = 15.96%.

5.0 SILT CONTENT

(River Sand/Crushed Sand) (CPWD Specs Page 42,

Take About 110 Ml Of Sample In A Graduated Cylinder Of 200 Ml

- Add Water Up to 150ml Mark. Add Salt @ 5ml/500ml Of Water
- Shake Well & Let It Settle For About 3 Hours
- Take Reading Of Top(A) & Bottom(B) Of Silt Level
- Silt % = $(A-B)/(B \times 100)$ $\leq 8\%$, after 3 hrs.

Not more than 20 % after 10 min.

6.0 MOISTURE CONTENT BY RAPID MOISTURE METER (SAND & STONE DUST)

- Take Sample Of Fine Aggregate In Moisture Apparatus Balance
 - Put It In Apparatus Cup. Take Calcium Carbonate Spoonful. Put It In 2nd Cup. Put 2nd Cup Over 1st Cup In Apparatus. Tighten The Screw.
- Shake Well The Apparatus. Reading In The Meter Is %Age Of Moisture In Sample.

7.0 FLAKINESS & ELONGATION: (IS: 2386 -1963Pt-I, Para 4 IS: 383 PARA 3.1 LAST LINE)



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- Take sample in sufficient quantity such that 200 number of pieces are retained on each sieve i.e. 20,16,12.5,10 & 6.3 sieves as applicable
- Weigh retention on 10 & 6.3mm for 10mm & 20, 16, 12.5,10& 6.3mm for 20mm (a).
- Pass through flakiness (thickness) gauge for different retentions (b).
- Flakiness= $(b*100)/a$ (not more than 35% average of all gauges in different gauges).
- Pass through elongation gauges for different retentions (b).
- Elongation= $(b*100)/a$ (take average of all gauges in different gauges).

8.0 WATER ABSORPTION OF AGGREGATES

This test helps to determine the water absorption of coarse aggregates as per IS: 2386 (Part III) – 1963. For this test a sample not less than 2000g should be used. The apparatus used for this test are Wire basket – perforated, electroplated or plastic coated with wire hangers for suspending it from the balance, Water-tight container for suspending the basket, Dry soft absorbent cloth – 75cm x 45cm (2 nos.), Shallow tray of minimum 650 sq.cm area, Air-tight container of a capacity similar to the basket and Oven.

Procedure to determine water absorption of Aggregates.

- i) The sample should be thoroughly washed to remove finer particles and dust, drained and then placed in the wire basket and immersed in distilled water at a temperature between 22 and 32°C.
- ii) After immersion, the entrapped air should be removed by lifting the basket and allowing it to drop 25 times in 25 seconds. The basket and sample should remain immersed for a period of 24 + ½ hrs. afterwards.
- iii) The basket and aggregates should then be removed from the water, allowed to drain for a few minutes, after which the aggregates should be gently emptied from the basket on to one of the dry clothes and gently surface-dried with the cloth, transferring it to a second dry cloth when the first would remove no further moisture. The aggregates should be spread on the second cloth and exposed to the atmosphere away from direct sunlight till it appears to be completely surface-dry. The aggregates should be weighed (Weight 'A').

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- iv) The aggregates should then be placed in an oven at a temperature of 100 to 110°C for 24hrs. It should then be removed from the oven, cooled and weighed (Weight 'B').

9.0 AGGREGATE IMPACT VALUE

This test is done to determine the aggregate impact value of coarse aggregates as per IS: 2386 (Part IV) – 1963. The apparatus used for determining aggregate impact value of coarse aggregates is Impact testing machine conforming to IS: 2386 (Part IV)- 1963, IS Sieves of sizes – 12.5mm, 10mm and 2.36mm, A cylindrical metal measure of 75mm dia. and 50mm depth, A tamping rod of 10mm circular cross section and 230mm length, rounded at one end and Oven.

Preparation of Sample

- i) The test sample should conform to the following grading:
 -Passing through 12.5mm IS Sieve – 100%
 -Retention on 10mm IS Sieve – 100%
- ii) The sample should be oven-dried for 4hrs. at a temperature of 100 to 110°C and cooled.
- iii) The measure should be about one-third full with the prepared aggregates and tamped with 25 strokes of the tamping rod.

A further similar quantity of aggregates should be added and a further tamping of 25 strokes given. The measure should finally be filled to overflow, tamped 25 times and the surplus aggregates struck off, using a tamping rod as a straight edge. The net weight of the aggregates in the measure should be determined to the nearest gram (Weight 'A').

- i) Procedure to determine Aggregate Impact Value

The cup of the impact testing machine should be fixed firmly in position on the base of the machine and the whole of the test sample placed in it and compacted by 25 strokes of the tamping rod.

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- ii) The hammer should be raised to 380mm above the upper surface of the aggregates in the cup and allowed to fall freely onto the aggregates. The test sample should be subjected to a total of 15 such blows, each being delivered at an interval of not less than one second.

Reporting of Results

- The sample should be removed and sieved through a 2.36mm IS Sieve. The fraction passing through should be weighed (Weight 'B'). The fraction retained on the sieve should also be weighed (Weight 'C') and if the total weight (B+C) is less than the initial weight (A) by more than one gram, the result should be discarded and a fresh test done.
- The ratio of the weight of the fines formed to the total sample weight should be expressed as a percentage.

$$\text{Aggregate impact value} = (B/A) \times 100\%$$

- Two such tests should be carried out and the mean of the results should be reported.

10.0 Aggregate Abrasion Value

This test helps to determine the abrasion value of coarse aggregates as per IS: 2386 (Part IV) – 1963. The apparatus used in this test are Los Angles abrasion testing machine, IS Sieve of size – 1.7mm, Abrasive charge – 12 nos. cast iron or steel spheres approximately 48mm dia. and each weighing between 390 and 445g ensuring that the total weight of charge is 5000 +25g and Oven.

Sample Preparation

The test sample should consist of clean aggregates which has been dried in an oven at 105 to 110°C to a substantially constant weight and should conform to one of the grading shown in the table below:



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Grading of test samples

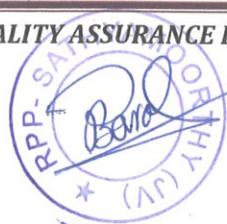
Sieve size (Square hole)		Weight in g of test sample for grade						
Passing through (mm)	Retained on (mm)	A	B	C	D	E	F	G
80	63	-	-	-	-	2500*	-	-
63	50	-	-	-	-	2500*	-	-
50	40	-	-	-	-	5000*	5000*	-
40	25	1250	-	-	-	-	5000*	5000*
25	20	1250	-	-	-	-	-	5000*
20	12.5	1250	2500	-	-	-	-	-
12.5	10	1250	2500	-	-	-	-	-
10	6.3	-	-	2500	-	-	-	-
6.3	4.75	-	-	2500	-	-	-	-
4.75	2.36	-	-	-	5000	-	-	-

Procedure to determine Aggregate Abrasion Value

The test sample and the abrasive charge should be placed in the Los Angles abrasion testing machine and the machine rotated at a speed of 20 to 33 revolutions/minute for 1000 revolutions. At the completion of the test, the material should be discharged and sieved through 1.70mm IS Sieve.

- i) The material coarser than 1.70mm IS Sieve should be washed, dried in an oven at a temperature of 100 to 110°C to a constant weight and weighed (Weight 'B').
- ii) The proportion of loss between weight 'A' and weight 'B' of the test sample should be expressed as a percentage of the original weight of the test sample. This value should be reported as,

$$\text{Aggregate abrasion value} = (A-B)/B \times 100\%.$$



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12.0 Determine the In-Situ Dry Density Of Soil By Sand Replacement Method

This test is done to determine the in-situ dry density of soil by sand replacement method as per IS: 2720 (Part XXVIII) – 1974. The apparatus needed is

- i) Sand-pouring cylinder confirming to IS: 2720(Part XXVIII)-1974
- ii) Cylindrical calibrating container conforming to IS: 2720 (Part XXVIII) – 1974
- iii) Soil cutting and excavating tools such as a scraper tool, bent spoon
- iv) Glass plate – 450mm square and 9mm thick or larger
- v) Metal containers to collect excavated soil
- vi) Metal tray – 300mm square and 40mm deep with a 100mm hole in the center
- vii) Balance, with an accuracy of 1g

Procedure To Determine the In-Situ Dry Density of Soil by Sand Replacement Method

A. Calibration of apparatus

- a) The method given below should be followed for the determination of the weight of sand in the cone of the pouring cylinder:
 - i) The pouring cylinder should be filled so that the level of the sand in the cylinder is within about 10mm of the top. Its total initial weight (W_1) should be maintained constant throughout the tests for which the calibration is used. A volume of sand equivalent to that of the excavated hole in the soil (or equal to that of the calibrating container) should be allowed to runout of the cylinder under gravity. The shutter of the pouring cylinder should then be closed and the cylinder placed on a plain surface, such as a glass plate.
 - ii) The shutter of the pouring cylinder should be opened and sand allowed to run out. When no further movement of sand takes place in the cylinder, the shutter should be closed and the cylinder removed carefully.
 - iii) The sand that had filled the cone of the pouring cylinder (that is, the sand that is left on the plain surface) should be collected and weighed to the nearest gram.



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- iv) These measurements should be repeated at least thrice and the mean weight (W_2) taken.
- b) The method described below should be followed for the determination of the bulk density of the sand (Y_s):
 - i) The internal volume (V) in ml of the calibrating container should be determined from the weight of water contained in the container when filled to the brim. The volume may also be calculated from the measured internal dimensions of the container.
 - ii) The pouring cylinder should be placed concentrically on the top of the calibrating container after being filled to the constant weight (W_1). The shutter of the pouring cylinder should be closed during the operation. The shutter should be opened and sand allowed to runout. When no further movement of sand takes place in the cylinder, the shutter should be closed. The pouring cylinder should be removed and weighed to the nearest gram.
 - iii) These measurements should be repeated at least thrice and the mean weight (W_3) taken.

B. Measurement of soil density

The following method should be followed for the measurement of soil density:

- i) A flat area, approximately 450sq.mm of the soil to be tested should be exposed and trimmed down to a level surface, preferably with the aid of the scraper tool.
- ii) The metal tray with a central hole should be laid on the prepared surface of the soil with the hole over the portion of the soil to be tested. The hole in the soil should then be excavated using the hole in the tray as a pattern, to the depth of the layer to be tested upto a maximum of 150mm. The excavated soil should be carefully collected, leaving no loose material in the hole and weighed to the nearest gram (W_w). The metal tray should be removed before the pouring cylinder is placed in position over the excavated hole.
- iii) The water content (w) of the excavated soil should be determined as discussed in earlier posts. Alternatively, the whole of the excavated soil should be dried and weighed (W_d).



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- iv) The pouring cylinder, filled to the constant weight (W_1) should be so placed that the base of the cylinder covers the hole concentrically. The shutter should then be opened and sand allowed to run out into the hole. The pouring cylinder and the surrounding area should not be vibrated during this period. When no further movement of sand takes place, the shutter should be closed. The cylinder should be removed and weighed to the nearest gram (W_4).

CALCULATIONS

- i) The weight of sand (W_a) in gram, required to fill the calibrating container should be calculated from the formula:

$$W_a = W_1 - W_3 - W_2$$

- ii) The bulk density of the sand (γ_s) in kg/m³ should be calculated from the formula:

$$\gamma_s = \frac{W_a}{V} \times 1000$$

- iii) The weight of sand (W_b) in gram, required to fill the excavated hole should be calculated from the formula:

$$W_b = W_1 - W_4 - W_2$$

- iv) The bulk density (γ_b), that is, the weight of the wet soil per cubic meter should be calculated from the formula:

$$\gamma_b = \frac{W_w}{W_b} \times \gamma_s \text{ kg/m}^3$$

- v) The dry density (γ_d), that is, the weight of dry soil per cubic meter should be calculated from the formula:

$$\gamma_d = \frac{100\gamma_b}{100+w} \text{ kg/m}^3$$

$$\gamma_d = \frac{W_d}{W_b} \times \gamma_s \text{ kg/m}^3$$



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CALCULATIONS

REPORTING OF RESULTS

The following values should be reported:

- i) Dry density of soil in kg/m³ to the nearest whole number; also to be calculated and reported in g/cc correct to the second place of decimal.
 - ii) Water content of the soil in percent reported to two significant figures.
- A sample proforma for the record of the test results is given below.

IN-SITU DRY DENSITY OF SOIL BY SAND REPLACEMENT METHOD

Calibration of apparatus Source: www.engineeringcivil.com

S. No.	Description	Determination
1	Mean weight of sand in cone (of pouring cylinder) (W_2) in g	450
2	Volume of calibrating container (V) in ml	980
3	Weight of sand + Cylinder, before pouring (W_1) in g	11040
4	Mean weight of sand + Cylinder, after pouring (W_3) in g	9120
5	Weight of sand to fill calibrating container ($W_a = W_1 - W_3 - W_2$) in g	1470
6	Bulk density of sand $\gamma_s = \frac{W_a}{V} \times 1000 \text{kg/m}^3$	= 1500 kg/m ³

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Measurement of soil density

Source:
www.engineeringcivil.com

S. No.	Observation and calculations	Determination No.		
		I	II	III
1	Weight of wet soil from the hole (W_w) in g	2310	2400	2280
2	Weight of sand + Cylinder, before pouring (W_1) in g	11040	11042	11037
3	Weight of sand + Cylinder, after pouring (W_4) in g	8840	8752	8882
4	Weight of sand in the hole ($W_b = W_1 - W_4 - W_2$) in g	1750	1840	1705
5	Bulk density $\gamma_b = \frac{W_w}{W_b} \times \gamma_s \text{ kg/m}^3$	1980	1956.5	2005.8
6	Water content (w) in %	18.48	18.81	19.26
7	Dry density $\gamma_d = \frac{100\gamma_b}{100 + w} \text{ kg/m}^3$	1671.17	1646.75	1681.87
Dry density (Average value)		1667 kg/m^3		

Note: The figures given in the above tables are for illustration purpose only.

15.0 Determining Water Content in Soil – Oven Drying Method

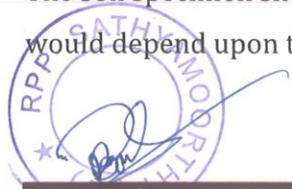
This test is done to determine the water content in soil by oven drying method as per IS: 2720 (Part II) – 1973. The water content (w) of a soil sample is equal to the mass of water divided by the mass of solids.

Apparatus required :-

- i) Thermostatically controlled oven maintained at a temperature of $110 \pm 5^\circ\text{C}$
- ii) Weighing balance, with an accuracy of 0.04% of the weight of the soil taken
- iii) Air-tight container made of non-corrodible material with lid
- iv) Tongs

PREPARATION OF SAMPLE

The soil specimen should be representative of the soil mass. The quantity of the specimen taken would depend upon the gradation and the maximum size of particles as under:



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Procedure to determine Water Content In Soil By Oven Drying Method

- i) Clean the container, dry it and weigh it with the lid (Weight 'W1').
- ii) Take the required quantity of the wet soil specimen in the container and weigh it with the lid (Weight 'W2').
- iii) Place the container, with its lid removed, in the oven till its weight becomes constant (Normally for 24hrs.).

Size of particles more than 90 percent passing through IS Sieve	Minimum quantity of the Soil specimen to be taken for test (g)
425 μ m	25
2.00 mm	50
4.75 mm	200
9.50 mm	300
19.0 mm	500
37.5 mm	1000

- iv) When the soil has dried, remove the container from the oven, using tongs.
- v) Find the weight 'W₃' of the container with the lid and the dry soil sample.

REPORTING OF RESULTS

The water content

$$w = [W_2 - W_3] / [W_3 - W_1] * 100\%$$

16.0 Determine the In-Situ Dry Density Of Soil By Core Cutter Method

This test is done to determine the in-situ dry density of soil by core cutter method as per IS: 2720 (Part XXIX) – 1975. The apparatus needed for this test is



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- i) Cylindrical core cutter
- ii) Steel dolly
- iii) Steel rammer
- iv) Balance, with an accuracy of 1g
- v) Straightedge
- vi) Square metal tray - 300mm x 300mm x 40mm
- vii) Trowel

Procedure Determine the In-Situ Dry Density of Soil by Core Cutter Method

- i) The internal volume (V) of the core cutter in cc should be calculated from its dimensions which should be measured to the nearest 0.25mm.
- ii) The core cutter should be weighed to the nearest gram (W_1).
- iii) A small area, approximately 30cm square of the soil layer to be tested should be exposed and levelled. The steel dolly should be placed on top of the cutter and the latter should be rammed down vertically into the soil layer until only about 15mm of the dolly protrudes above the surface, care being taken not to rock the cutter. The cutter should then be dug out of the surrounding soil, care being taken to allow some soil to project from the lower end of the cutter. The ends of the soil core should then be trimmed flat in level with the ends of the cutter by means of the straightedge.
- iv) The cutter containing the soil core should be weighed to the nearest gram (W_2).
The soil core should be removed from the cutter and a representative sample should be placed in an air-tight container and its water content (w)

REPORTING OF RESULTS



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Bulk density of the soil gm/cc $Y = [W_2 - W_1] / V$ gm/cc

Dry density of the soil gm/cc $Y_d = 100Y/[100+w]$ gm/cc. Average of at least three determinations should be reported to the second place of decimal in g/cc

17.0 TESTING OF BRICKS

Brick shall be locally available; fairly uniform in size, with plane rectangular faces shape and colour. Brick shall be uniformly well burnt so as to give clear ringing sound when struck and shall be free from cracks or other flaws which impair their strength.

They shall show a fine grained, uniform, homogeneous and dense texture on fracture and shall be free from lumps of lime, laminations, cracks, air holes, soluble salts causing efflorescence or other defects which may impair their strength, durability, appearance or usefulness for the purpose intended. They shall have frog of 10 to 20 mm depth.

Classification of Bricks: (CPWD 2019) Table No.6.2

The common burnt clay brick shall be classified on the basis of their minimum compressive strength as given below:

Avg. Compressive Strength Not Less Than	Class Designation (Kg / sq.cm)	Less Than (Kg / sq.cm)
125	125	150
100	100	125
75	75	100
50	50	75
35	35	5.0

Sampling:

For carrying out compressive strength, water absorption, efflorescence and dimensional test, the sample of the brick shall be taken at random as given below:

Class Designation	Lot Size	No. of Samples
125	More than 50,000 bricks	20 Nos.
100		
75		



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50 More than 1, 00,000 bricks 20 Nos.
 35

TESTING OF BRICKS:

- a) **Dimensions:** 20 bricks shall be selected at random from stacks per lakh of bricks, cleaned of blisters, kiln, rubbish, and laid touching edge to edge for measuring length, breadth and height. Dimension shall be measured with a steel tape correct to 1mm, Dimension tolerance shall be $\pm 8\%$ from the standard dimension, which will be 10 mm less than the required dimension to allow for mortar Joints. Thus, a 230 mm brick may have an actual standard dimension up to 220 mm x 105 mm x 65 mm. Tolerance on the plus side is acceptable provided nothing extra shall be payable for thicker masonry.
- b) **Compressive Strength:** The sample of bricks shall be taken at random according to their designation, numbers, lots and number of samples as per the table given above. 2 The sample brick shall be thoroughly wetted, the frog filled with CM (1:3) cured for 24 hours under wet gunny bags and 3 days under water; on removal from water, the test sample shall be wiped dry. The test sample shall be placed between plywood sheets of 3mm thick in such a way that frog project upward and brick correctly centre in the machine. The length, breadth of each brick, shall be measured correct to one mm. The load shall be applied at the rate of 140 kg / Sqm. per minute. The strength shall be worked out in kg/ Sqm. as follows: Compressive strength in kg/ cm²: Max. load at failure (in kg.) Area of bricks (in Sqm.) The average of the five test results shall be the compressive strength.

- c) **Water absorption:** The sample of the bricks (5 Nos.) selected at random shall be dried in a ventilated over for 48 hrs. at 110° C to 115° C, then allowed to cool for at least 2 hours under fan at room temperature. Find out the weight (W1) in kg. at room temperature. After weighing, the sample bricks shall be kept under water for a period of 24 hours. The brick shall be removed from water and

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wiped with a damp cloth and find out the weight (W2) in kg. Calculate the absorption percentage of each sample as follows:

$$\text{Absorption percentages} = (W2 - W1)/W1 \times 100$$

The average of five tests of brick sample being taken as the percentage. The water absorption shall not exceed 15 %.

18. Non-Destructive Test: -

Non-Destructive Tests are used to obtained estimation of the properties of concrete in the structure. Method adopted include,

A. Rebound Hammer, as per IS: 13311, part-2

B. Ultrasonic Pulsed velocity, as per IS: 13311, part-1.

Non-Destructive Tests provide alternative to core tests for estimating the strength of concrete. These methods are based on measuring a concrete property that bears some relationship to strength. The accuracy of these methods is determined by the degree of correlation between strength and physical quality measured by the non-destructive tests.

19. Block work

6.1 Maximum variation in the dimensions shall be +/- 5% in length and +/- 3% in width and height as per IS 2185 Part 3. The number of blocks with dimensions outside the tolerance limit and or with visual defects, among those inspected, shall not be more than two.

6.2 For density, the mean value shall be within the range specified in Table 1 of IS 2185 Part 3.

6.3 For compressive strength, the mean value, say "X" shall be determined. The test results shall be grouped into groups of 4 and individual values of ranges shall be determined and the average range a calculated from these values and shall satisfy the following condition: $X - 0.6 R > \text{minimum value specified in Table 1 of IS 2185 Part 3}$



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6.4 For thermal conductivity, the mean value shall be equal to or less than the value specified in Table 1.

6.5 For drying shrinkage, all the test specimens shall satisfy the requirements of the test. If one or more specimens fail to satisfy the requirements, the remaining 3 blocks shall be subjected to these tests. All these blocks shall satisfy the requirements

20. Tiles:

Technical Specification (Minimum Requirements)

S.No.	Characteristics	Wall Tiles	Floor Tiles	Vitrified Tiles	Industrial Tiles
A	Dimention & Surface Quality				
1	Deviation in length	+ / - 0.5%	+ / - 0.6%	+ / - 0.6%	±0.75%
2	Deviation in thickness	+ / - 10%	+ / - 5%	+ / - 5%	±5%
3	Straightness of sides	+ / - 0.3%	+ / - 0.5%	+ / - 0.5%	±0.5%
4	Rectangularity	+ / - 0.5%	+ / - 0.6%	+ / - 0.6%	±0.6%
5	Surface flatness (warpage)	+ / - 0.5%	+ / - 0.5%	+ / - 0.5%	±0.5%
6	Surface quality	Min.95% free from defects	Min.95% free from defects	Min 95%	Min 95%
B	Physical Properties				
1	Water Absorption	> 10 % & < 20 %	> 3 % & ≤ 6 %	≤ 0.5 %	< 0.5%
2	Bending Strength/modulus of Rupture (N/sq.mm)	≥15	≥22	≥32	≥32
3	Scratch hardness (Mohs) EN 101	Minimum 3	4 to 6	Minimum 6	Min 6
4	Resistance to surface abrasion	To be specified by mfr.	To be specified by mfr.	Deep abrasion Maximum 175 mm ³	< 175 mm ³



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5	Crazing resistance	Required	Required	Required	Required
6	Moisture expansion	Required	Required	Required	Required
8	Skid resistance (friction coefficient)			> 0.4	> 0.4
9	Breaking strength in N	Min 200	Min 600	Min 700	Min 700
10	Density (g/cm ³)			> 2.00gm/cc	> 2.00gm/cc
11	Frost resistance			Required	Required
12	Colour change resistance			Required	

C	Chemical Properties				
1	Resistance to staining	Minimum class 2	Minimum class 2	Required	Required
2	Resistance to household chemicals	Minimum class B	Minimum class B	Required	Required
3	Resistance to acid (wt. loss)	To be specified by mfr	To be specified by mfr	No damage	<1.5%
D	Thermal Properties				
1	Thermal shock resistance	Required	Resistance to 10 cycles	Required	Required
2	Thermal expansion	< 9 x 10 ⁻⁶ k ⁻¹			

Technical Specifications - Wall Tile

S.No.	Property	ISO 13006 / EN-159 Group B III	Wall tile value	Method of Testing
1	Deviation in Length & Width	±0.5%	±0.3%	ISO 10545-2
2	Deviation in thickness	±5%	±4%	ISO 10545-2
3	Straightness of sides	±0.3%	±0.3%	ISO 10545-2



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4	Rectangularity	$\pm 0.5\%$	$\pm 0.3\%$	ISO 10545-2
5	Surface flatness	$\pm 0.5\%$	$\pm 0.3\%$	ISO 10545-2
6	Surface Quality	Min 95%	Min 95%	ISO 10545-2
7	Water Absorption	> 10%	14% - 19%	ISO 10545-3
8	Flexural Strength (Average MOR)	> 15 N/mm ²	> 16 N/mm ²	ISO 10545-4
9	Scratch hardness of surface (Moh's scale)	Min, 3	Min, 3	EN 101
10	Crazing resistance	1 Cycle	2 Cycles at 7.5 Bar, Min	ISO 10545-7
11	Linear Thermal Expansion	9 x 10 ⁻⁶ K ⁻¹ , Max	9 x 10 ⁻⁶ K ⁻¹ , Max	ISO 10545-8
12	Thermal shock Resistance	No damage	No damage	ISO 10545-9
13	Resistance to household Chemicals	Resistance	Resistance	ISO 10545-13
14	Resistance to Staining	Resistance	Resistance	ISO 10545-14

Technical Specifications - Floor Tile

S.No.	Property	ISO 13006 / EN177 (Group BIIa)	Floor tile value	Method of Testing
1	Deviation in Length & Width	$\pm 0.6\%$	$\pm 0.5\%$	ISO 10545-2
2	Deviation in thickness	$\pm 5\%$	$\pm 4\%$	ISO 10545-2
3	Straightness of sides	$\pm 0.5\%$	$\pm 0.4\%$	ISO 10545-2
4	Rectangularity	$\pm 0.6\%$	$\pm 0.2\%$	ISO 10545-2
5	Surface flatness	$\pm 0.5\%$	$\pm 0.3\%$	ISO 10545-2
6	Surface Quality	Min 95%	Min 95%	ISO 10545-2
7	Water Absorption	3% - 6%	3% - 6%	ISO 10545-3
8	Flexural Strength (Average MOR)	> 22 N/mm ²	> 22 N/mm ²	ISO 10545-4

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9	Scratch hardness of surface (Moh's scale)	> 3	4 to 6	EN 101
10	Resistance to Surface Abrasion (PEI)	I - V	PEI II -V	ISO 10545-7
11	Crazing resistance	2 Cycles	2 Cycles	ISO 10545-11
12	Linear Thermal Expansion	<9 x 10-6 K-1	<9 x 10-6 K-1	ISO 10545-8
13	Thermal shock Resistance	No damage	No damage	ISO 10545-9
14	Resistance to household Chemicals	Resistance	Resistance	ISO 10545-13
15	Resistance to Staining	Resistance	Resistance	ISO 10545-14

Technical Specifications - Vitrified Tile

No.	Technical Specifications	International Std. ISO 13006 / EN176 Group Bla	Vitrified Tile	Method of Testing
1	Deviation in Length & Width	±0.6%	±0.1%	ISO 10545-2
2	Deviation in thickness	±5%	±4%	ISO 10545-2
3	Straightness of sides	±0.5%	±0.1%	ISO 10545-2
4	Rectangularity	±0.6%	±0.2%	ISO 10545-2
5	Surface flatness	±0.5%	±0.2%	ISO 10545-2
6	Surface Quality	Min 95%	Min 95%	ISO 10545-2
7	Water Absorption	< 0.5%	< 0.05%	ISO 10545-3
8	Scratch hardness of surface (Moh's scale)	≥6	≥6	EN 101
9	Flexural Strength (Average MOR)	>35N/mm ²	>38N/mm ²	ISO 10545-4
10	Breaking Strength	>1300N	>1500N	ISO 10545-4
11	Resistance to deep Abrasion	<175mm ³	<144mm ³	ISO 10545-6



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12	Skid Resistance (Friction coefficient)	>0.4	>0.4	ISO 10545-17
13	Bulk Density, in (g/cc)	>2	>2	DIN 51082
14	Linear Thermal Expansion	<9 x 10-6 K-1	<9 x 10-6 K-1	ISO 10545-8
15	Thermal shock Resistance	No damage	No damage	ISO 10545-9
16	Frost resistance	Frost proof	Frost proof	ISO 10545-12
17	Resistance to Chemicals	Resistant	Resistant	ISO 10545-13
18	Colour resistance to UV light	Resistant	Resistant	DIN 51094
19	Moisture expansion	Nil	Nil	ISO 10545-10

S.No.	Test Description	I.S. 4457: 2007	
A	Dimension		Industrial tile
1	Length & Width	±0.75%	±0.6%
2	Thickness	±5%	±5%
3	Straightness of sides	±0.5%	±0.5%
4	Rectangularity	±0.6%	±0.6%
5	Surface flatness	±0.5%	±0.3%
B	Physical Properties		
1	Water absorption	< 0.5 %	< 0.5 %
2	Mohs Hardness	-	>7
3	Flexural strength (MOR)	>35 N/mm ²	>35 N/mm ²



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4	Breaking Strength	≥1300N	>1500 N
5	Abrasion resistance/Deep abrasion	<175mm ³	<140mm ³
6	Skid Resistance	>0.4	>0.6
7	Density (gm/cc)	>2	>2
8	Moisture expansion	Nil	Nil
C	Chemical Properties		
1	Resistance to Acid (wt. Loss)	< 1.5 %	< 1.5 %
D	Thermal Properties		
1	Thermal expansion	<9 x 10 ⁻⁶	<9 x 10 ⁻⁶
2	Thermal shock resistance	No damage	No damage

21. TECHNICAL SPECIFICATION FOR FALSE CEILING

1. Gypsum Board False Ceiling - Gypsum board Core shall be regular gypsum core - Gypsum board Overall thickness shall be 12mm thick - Surface Paper: 100 percent recycled content paper on front, back and long edges - Gypsum board Long edges shall be Squared or tapered - Fiber tape shall be used at the joints of minimum 50mm wide - Ready mix joint compound shall be used - GI frames with suspension hangers shall be placed with spacing no larger than 300 mm

2. Mineral Fiber Acoustic Suspended Ceiling - Mineral Fiber Acoustic Suspended ceiling shall be of size 595mm x 595mm bevelled regular edged - Mineral Fiber Acoustic Suspended ceiling Overall thickness shall be 14mm thick - Mineral Fiber Acoustic Suspended ceiling board should have Noise Reduction Coefficient (NRC value) = 0.5, Humidity Resistance (RH) of 95% - Mineral Fiber Acoustic Suspended ceiling board all edges shall be bevelled or tapered - Ceiling to be hanged on Silhouette profile grid system with face profile 15mm, hot dipped galvanized steel - Silhouette profile grid need to be installed with Suspension system

3. WPC Baffles Ceiling - WPC Baffle shall be made of mixture of wood dust & poly ethylene mainly. - Colour shall be of wooden texture - Size shall be 40mm x 100 mm (W x H) & shall have 100mm Gap, Including all accessories such



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as hanging arrangement, screws and other accessories - All suspended hanger, clips, unigrid channel shall be Galvanised mild steel - Installation shall be done as per manufacturer's specification - Shall have dimensional stability, longevity resistance to rot and crack, Stable over a wide temperature range, weather resistant, Moisture resistant, low flame spread, High impact resistant, Outstanding screw and nail retention, Environmentally friendly, recyclable and Contains no toxic chemicals or preservatives - Colour of Baffle shall be approved prior to installation

22. TECHNICAL SPECIFICATION FOR COLUMN CLADDING & PARTITION

1. Column Cladding - Cladding shall be 1/2" thk with designed laminate (Century Mica/Green Lam/Merinolam) finish on all sides over 12mm ply (Surya/Sagun/Greenboard/Duro) with necessary packing for line level installation
2. Partition Low Height & full Height - Partition shall be 3" thk with designed 1mm thick laminate (Century Mica/Green Lam/ Merinolam) finish on both sides over 12mm ply (Surya/Sagun/ Greenboard /Duro) fixed on haldu or pine wood frame work of 2"x2" sections - The partition shall have necessary openings for door/windows all complete as per design drawing. - There shall be separate slots for passage of data and electrical wires - Glass shall be 8mm toughened clear edge polished glass with frosted sticker. - Smooth, seasoned Pinewood batten shall be used for fixing glass on partition along with proper silicon sealing & capping on top, open sides of low height partition. - Size of capping on low height partition 3" x $\frac{3}{4}$ " as per design & lacquer finished clear polish on wooden capping
3. Wooden Glazed Door - Door shall be 35mm thick with designed 1mm thick laminate (Century Mica/Green Lam/ Merinolam) finish on both sides - Design & Dimension as per drawing details attached - Glass shall be 8mm toughened clear edge polished glass with frosted sticker. - 3 nos. of SS normal hinge to be used - Mortise Lock of good company to be used - Hydraulic Door closer of good company to be used

23. TECHNICAL SPECIFICATION FOR Toughen Glass Swing door –

Glass shall be clear 12mm toughened - Dimension as per drawing details attached - Lock to be used, Patch Lock type Patch lock with strike box for full height double door, suitable for 12mm glass - Door Handle rectangular section pull handle with back-to-back installation on glass with gaskets to prevent the contact between glass & metal. - Hinge, Lock & Handle shall be made of High-quality SS material with high operational values

**The items which are not covered in this QAP will be added/ In cooperated in this QAP as per requirement as decided and approved by Authority Engineer.



	RPP SATHYAMOORTHY JV PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02 Document No. :- RPP/QAP/R-02

Annexures - 5





RPP SATHYAMOORTHY JV

PROJECT: MAJOR UPGRADEATION OF RAIPUR RAILWAY STATION OF SOUTH
EAST CENTRAL RAILWAY ON (EPC) MODE



QUALITY ASSURANCE PLAN

Date :- 14-08-2024

Revision :- R-02

Document No. :- RPP/QAP/R-02

CALIBRATION PLAN

Project : - Major upgradation of Raipur Railway Station of South East Central Railway on (EPC)

Client : - South East Central Railway Raipur (Chhattisgarh)

AE

Contractor:- RPP SATHYAMOORTHY JV

S.R. No.	Description of the Equipment / Device	Code No. of Equipment	Qty.	Make	Least Count	Devices Required for the Calibration	Calibration Agency	Frequency of Calibration	Controlling Specification / Procedure for Calibration	Calibration Verifying Document	Calibration Date	Next Due Calibration Date	Remarks
1	CTM (2000 KN)						External	Once in Year	IS 516-1959	Test Certificate			
2	Slump Cone						External	Once in Year	IS 1199 & IS 7320	Test Certificate			
3	Flow table						External	Once in Year	IS 2848-1986	Test Certificate			
4	Cylinder mould (100 mm dia ,300 mm ht.)						External	Once in Year		Test Certificate			
5	Cube mould (150X150X150 mm)						External	Once in Year	IS 10086-1982	Test Certificate			Once in a month validation
6	Density mould						External	Once in Year		Test Certificate			



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PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
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SR. No.	Description of the Equipment / Device	Code No. of Equipment	Qty.	Make	Least Count	Devices Required for the Calibration	Calibration Agency	Frequency of Calibration	Controlling Specification / Procedure for Calibration	Calibration Verifying Document	Calibration Date	Next Due Calibration Date	Remarks
7	Weigh Balance (30 Kg)						External	Once in Year	-	Test Certificate			
8	Mortar Moulds (70.6 X 70.6 X 70.6mm)						External	Once in Year	IS 10086-1982	Test Certificate			
9	Vernier Caliper						External	Once in Year	IS 3651-1985(Part-2)	Test Certificate			
10	Thermometer						External	Once in Year					
11	Total Station/Theodolite						External	Once in Year					
12	Auto Level						External	Once in Year					

NOTE:- Calibration of all Equipment's to be done through qualified agency.



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	QUALITY ASSURANCE PLAN
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Annexures – 6

SAMPLE QUALITY ASSURANCE PLAN For Steel Structure

For.....as per s Drg. No.

Name of project

Manufactured by
Workshop Address.

SN	Component/ Operations	Characteristic Check	Frequency & type of check	Reference Document	Fabricators Quality Control	Inspection details		Type of Record	Acceptance criteria	Remarks
						Inspecting Agency	Extent of inspection			
1	2	3	4	5	6	7	8	9	10	11
1.0	Raw Material									





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PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE



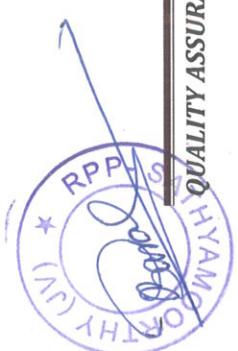
QUALITY ASSURANCE PLAN

Date :- 14-08-2024

Revision :- R-02

Document No. :- RPP/QAP/R-02

1.1	Steel Plates, Structural Section	Identification and correlation with Mill Test Certificate from Supplier e.g., SAIL, TISCO, IISCO etc.	As per Mill T.C. and tests required by RDSO/Authority from Govt./NABL approved lab	Challan, Mill T.C.	Verification of reference document Authority Engineer/Rep.	100%	Fabricator's record	Plates: IS 2062-2006, Gr. E 250 B0, 12mm & above thick. Plates are fully killed & normalized or control cooled. Sections IS 2062-2006, Gr. E 250 B0/A
		Physical condition i.e., Pitting, rusting, straightness, rolling defect, etc.	Visual	-	Complete visual inspection Authority Engineer/Rep.	100%	Fabricator's Record	IS 20622006 -





PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH
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QUALITY ASSURANCE PLAN

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1	2	3	4	5	6	7	8	9	10	11
	Mechanical Test as per IS 2062-2006	Lab Test at appvd. Laboratory	-	Lab Test Report Authority Engineer/Rep.	-	-	-	IS 20622006 Gr. E 250 B fully killed & normalized or control cooled	Raw matl. Clearance shall be by Authority Engineer/Rep.
	Charpy test at 0°C for plates of thks. 12mm and above	-Do-	-Do- Authority Engineer/Rep.	Heat/Cast no. section wise as per IS 2062-2006	-	-	-	-	-
	Chemical Analysis as per IS 2062-2006	-Do-	-Do- Authority Engineer/Rep.	-Do-	-	-	-	Table 1, along with Note No. 2 of IS 2062-2006, Gr. E 250 B	
	Ultrasonic test for 12mm & above thi. Plates, as per IS 4225 or ASTM-SA 435/435M	By ASN Level II operator	-	Lab Test Report Authority Engineer/Rep.	100%	-	-	IS 4225 or ASTM SA 435/435M	
	Dimensions	Measurement	Challan	Measurement of Dimension Authority Engineer/Rep.	100%	Fabricator's Record & Zonal Railway Records			



PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH
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1.2	Rivets, Bolts & Nuts	a) Dimensions	Visual/ Measurement	Challan	Verification of Reference Document Authority Engineer/Rep.	As per requirement	-	For Rivet IS 1148 For Bolt: IS 1367(Part ii) & property classes as per relevant Dir.	Paints to be procured from vendors approved by RDSO
	b) As per specn.	Mechanical & Chemical	Lab test at Govt. appvd. Lab	Manufacturer's Test Certificate	-Do-	-Do-	-Do-	-Do-		
1.3	Paints	Verification of Manufacturer's Test Certificate, Inspection Certificate, Challan	Visual	Challan., Manufacturer's Test Certificate	Verification of Reference Document Authority Engineer/Rep.	Each Batch	Manufacturer's Test Certificate	IS 102, Contract agreement	Paints to be procured from vendors approved by RDSO
	Tests as per Specification	Lab test at Govt. Appvd. Lab	Manufacturer's Test Certificate	Challan., Manufacturer's Test Certificate	Verification of Reference Document Authority Engineer/Rep.	Random	Lab. Test Report	IS 102 Contract agreement	-Do-
1.4	Welding Consumables	As per specification and as approved by RDSO	Any test as required	Manufacturer's Test Certificate	Verification of Reference Document Authority Engineer/Rep.	As per requirement	Fabricator's Record	-	Consumables should be of RDSO appvd. Brand



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PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH
EAST CENTRAL RAILWAY ON (EPC) MODE



QUALITY ASSURANCE PLAN

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Revision :- R-02

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2.0	Manufacturing Process	Dimension	Measurement with calibrated steel tape & gauges	Approved Drawing	Measurement of Dimension	Authority Engineer/Rep.	100%	Inspection Report of Inspection Official	Relevant IS/IRS Codes & Approved Drawings	Clearance by Authority Engineer/Rep.
2.1	Lay out of Components & Joints									
	a) Normal	Dimension,	Measurement with calibrated steel tape & gauges	Approved Drawing	Measurement of Dimension	Authority Engineer/Rep.	100%	Record of Jigs & fixtures as per proforma issued by RDSO	IRS B12001	Clearance by Authority Engineer/Rep.
	b) Jigs & Templates	Intersection, lines, pitch, gauge, dia. Of Holes & No. of holes								
	c) Cutting, Straightening, Edge preparation	Dimension, Freedom from defect	Visual/ Measurement	Inspection Report of Inspection Official & Fabricator's Record	Visual& Measurement of dimension	Authority Engineer/Rep.	100%	Inspection Report of Inspecting Official & Fabricator's Record	IRS B12001, IS 1852-85	
3.0	Welding:									
	a) WPSS	Review of WPSS	Verification	IRS B1-2001 IS 9595-96 WBC-2001	Verification of Reference Document	Authority Engineer/Rep.	100%	Fabricator's Record	IRS B12001 IS 9595-96 WBC-2001	



QUALITY ASSURANCE PLAN



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EAST CENTRAL RAILWAY ON (EPC) MODE



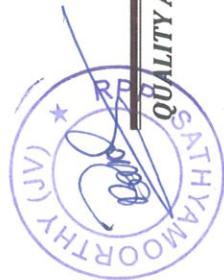
QUALITY ASSURANCE PLAN

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1	2	3	4	5	6	7	8	9	10	11
	b) WPQR	Witnessing of established WPSS Witnessing of Welder Qualification test	Visual, DT & NDT at approved lab	As per code requirement	Verification of Reference Document	Authority Engineer/Rep.	100%	WPQR Sheet to be recorded in presence of RDSO Rep.	IS 7310(I)74	
c) Preheating	Measurement of Temperature	Visual with thermal Chalk	As per approved WPSS	Verification of Reference Document Authority Engineer/Rep.	Random	Inspection Report of Inspection Officials & Fabricator's Record	IRS B12001		
d) Baking of Electrode, Flux	To have moisture free Electrode & Flux	Visual Check of Electrodes & beating	As per Manufacture's recommendations	Verification of Reference Document Authority Engineer/Rep.	100%	Inspection Report of Inspection Officials & Fabricator's Record	IRS B12001		
e) Selection of correct Electrodes & Flux	Reference to WPSS, IRS Class, etc.	Visual	As per approved WPSS	Verification of Reference Document Authority Engineer/Rep.	100%	Inspection Report of inspection official & Fabricator's Record	As per list of vendors approved by RDSO		





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PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH
EAST CENTRAL RAILWAY ON (EPC) MODE



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f) Current Condition	Measurement of Amp. & Voltage	Visual with Ammeter & Voltmeter	As per approved WPSS	Verification of Reference Document Authority Engineer/Rep.	Random	Inspection Report of Inspection Official & Fabricator's Record	IRS B12001
g) Sequence of Welding	To control distortion	Visual	As per approved WPSS	Verification of Reference Document Authority Engineer/Rep.	Random	Inspection Report of Inspection Official & Fabricator's Record	IRS B12001
h) Provision of Run-on & Run off Plates	To avoid crater defects	Visual	As per IRS B12001	Verification of Reference Document Authority Engineer/Rep.	100%	Inspection Report of Inspection Official & Fabricator's Record	



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	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE
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RPP

1	2	3	4	5	6	7	8	9	10	11
4.0	Inspection of Welding	For Fillet Welds: Visual, D.P.Test Fillet Size, Penetration, Leg Length, Throat thickness, etc.	Visual, Macro Etching.	Approved Drg. & WPSS	Inspection & Verification of dimension by gauges	Authority Engineer/Rep.	100%	Fabricator's Record	Relevant IS/IRS Code, Approved Drg. & WBC-2001	Clearance by Authority Engineer/Rep.
5.0	Trial Assembly	Camber on Jack Dead Load deflection Dimension Fairness of holes Temporary fasteners Infringement Butting of compression edges	Visual & Dimensional	Approved Drg.	Complete dimensional check of Control Assembly	Authority Engineer/Rep.	One complete span	IRS B12001	Inspection Report of Inspection Official & Fabricator's Record	Clearance by Authority Engineer/Rep.



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Date :- 14-08-2024

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**PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH
EAST CENTRAL RAILWAY ON (EPC) MODE**



QUALITY ASSURANCE PLAN

Date :- 14-08-2024

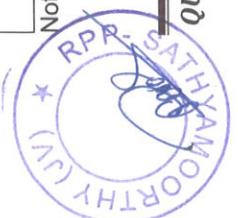
Revision :- R-02

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6.0	Final Clearance	Component completeness of 1 st span after dismantling & 2 nd span onwards	Visual Dimensional & Structural	Stage clearance Record	Verification of Stage clearance Record	Authority Engineer/Rep.	Girder fabrication with approved Jigs-100%	Inspection Report of Inspection Official & Fabricator's Record	IRS B12001
7.0	Surface preparation by Shot Blasting & Metallizing	Surface condition after blasting	Visual checking with reference to surface preparation	Approved Fabrication Drawing & IRS B1-2001	Verification of stage clearance records Authority Engineer/Rep.	100% by fabricator & Random by Railway	Fabricators record	IRS B1-2001 Appendix-VII IS: 6586 IS: 5905 IS: 2590.
	Surface finish after Metallizing	Visual checking	-Do-	-Do- Authority Engineer/Rep.	-Do-	-Do-		Clearance shall be given by Authority Engineer/Rep.
	DFT checking	Measurement	-Do-	-Do- Authority Engineer/Rep.	Minimum one reading per M ²	Measurement Record		

8.0	Cleaning & Painting	Surface condition before painting	Visual checking .	Approved Fabrication Drawing & IRS B1-2001	Verification of stage clearance records Authority Engineer/Rep.	100% by fabricator & Random by Railway	Fabricators record	IRS B1-2001 IS:104, IS:51, IS: 2339, IS: 5666
	Surface finish after painting	Visual checking	-Do-	-Do-	-Do-	-Do-	-Do-		Clearance shall be given by Authority Engineer/Rep
	DFT checking	Measurement	-Do-	-Do-	Minimum one reading per M ²	Measurement Record			

Note: 1. During fabrication, internal inspection to be done by Authority Engineer to ensure that carry out welding as per approved WPSS, work is as per dimensional tolerances and other quality aspects and should satisfy itself before sending Inspection call to RDSO for Trial Assembly or components inspection.



	RPP SATHYAMOORTHY JV <hr/> PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
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Annexures - 7

General Formats



	PPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02 Document No. :- RPP/QAP/R-02

NAME OF PROJECT	Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.					
CLIENT	South East Central Railway Raipur (Chhattisgarh)					
AUTHORITY ENGINEER						
EPC CONTRACTOR	RPP SATHYAMOORTHY JV					
FORMAT No.						
AGGREGATE IMPACT VALUE IS: 2386(Part 4) 1963						
Source			Date of sampling			
Location			Date of testing			
Type of material			Tested By			
Description	Units	Test 1	Test 2	Test 3	Average	
Weight of oven dry sample(A)	gms					
Weight of fraction retained on 2.36 mm IS Sieve after Impact test (B)	gms					
Weight of fraction passing 2.36 mm IS Sieve after Impact test (C)	gms					
Impact Value = (C/A) x 100	%					
Specified Limit: - 45% Maximum						
Remarks:						
EPC Contractor's Representative	Authority Engineer's Representative		SECR. Representative			



	RPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02
	Document No. :- RPP/QAP/R-02	

NAME OF PROJECT	Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.				
CLIENT	South East Central Railway Raipur (Chhattisgarh)				
AUTHORITY ENGINEER					
EPC CONTRACTOR	RPP SATHYAMOORTHY JV				
FORMAT No.					
BULK Density of Coarse/Fine Aggregate IS: 2386(Part III)					
Sl.no	Observations	Sample 1	Sample 2	Sample 3	
	Value of Empty Container in ltr. (V)				
	Weight of Empty Container in gms. (W1)				
	Weight of Container + Loose Sample in gms (W2)				
	Weight Loose Sample in gms W=W2-W1				
	Loose Bulk Density gms/cc D=W/V				
	Average				
Compacted Bulk Density					
Sl.no	Observations	Sample 1	Sample 2	Sample 3	
1.	Value of Empty Container in ltr. (V)				
2.	Weight of Empty Container in gms. (W1)				
3.	Weight of Container + Loose Sample in gms (W2)				
4.	Weight Loose Sample in gms W=W2-W1				
5.	Loose Bulk Density gms/cc D=W/V				
6.	Average				
Remarks :-					
EPC Contractor's Representative		Authority Engineer's Representative		SECR. Representative	

	PPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02
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NAME OF PROJECT	Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.			 
CLIENT	South East Central Railway Raipur (Chhattisgarh)			
AUTHORITY ENGINEER				
EPC CONTRACTOR	RPP SATHYAMOORTHY JV			
FORMAT No.				
DATE ON CALIBRATION		150 M DIA CYLINDER (01)	NEXT CALIBRATION DATE	
CALIBRATION OF SAND POURING CYLINDER (As per IS-2720 PART 28)				
DESCRIPTION	Test 01	Test 02	Test 03	Average
Initial Weight of sand in the cylinder (gms)				
Weight of sand in the cylinder in cone (gms)				
Weight of sand in the cylinder after pouring it to calibrating container (gms)				
Weight of sand in the calibrating container up to top level (gms)				
Volume of calibrating container (cc)				
Bulk Density of sand (gm/cc)				
Remarks :				
EPC Contractor's Representative	Authority Engineer's Representative		SECR. Representative	



	RPP SATHYAMOORTHY JV	
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	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02
	Document No. :- RPP/QAP/R-02	

NAME OF PROJECT		Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.							 									
CLIENT		South East Central Railway Raipur (Chhattisgarh)																
AUTHORITY ENGINEER																		
EPC CONTRACTOR		RPP SATHYAMOORTHY JV																
FORMAT No.																		
COMPRESSIVE STRENGTH OF BRICKS IS: 3495 (Part 1)																		
Sr.N o.	Date of Sampling	Date of testing	Location	Make/ Brand	Length (mm)	Width (mm)	Area (mm ²)	Load	Compressive Strength (N/mm ²)	Avg. Compressive Strength (N/mm ²)								
1.																		
2.																		
3.																		
4.																		
5.																		
6.																		
7.																		
8.																		
9.																		
10																		
11																		
12																		
13																		
14																		
15																		
Remarks:																		
EPC Contractor's Representative			Authority Engineer's Representative				SECR. Representative											



QUALITY ASSURANCE PLAN

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	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02 Document No. :- RPP/QAP/R-02

NAME OF PROJECT		Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.											 
CLIENT		South East Central Railway Raipur (Chhattisgarh)											
AUTHORITY ENGINEER													
EPC CONTRACTOR		RPP SATHYAMOORTHY JV											
FORMAT No.													
COMPRESSIVE STRENGTH TEST OF CONCRETE CUBE (IS: 456)													
Sl.No	Date of Casting	Location/ Part of structure	Grade of Concrete	Quality	No. of cube	Age of Cube	Date of Testing	Wt. of Cube	Density of Cube	Load (kN)	Compressive Strength (N/mm ²)	Avg. Compressive Strength (N/mm ²)	
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
Remarks:													
EPC Contractor's Representative				Authority Engineer's Representative				SECR Representative					



	RPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02
	Document No. :- RPP/QAP/R-02	

NAME OF PROJECT	Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.			
CLIENT	South East Central Railway Raipur (Chhattisgarh)			
AUTHORITY ENGINEER				
EPC CONTRACTOR	RPP SATHYAMOORTHY JV			
FORMAT No. CONCRETE FOUR CARD -1				
1	Reference Document			
2	Type Of Structure			
3	Level	From:	To:	
4	Grade of concrete/Approved design mix:			
5	Brand name, Grade and Batch No. of Cement			
6	Estimate of Volume of Concrete (as per covering)			
7	Quantity of Cement			
8	Reinforcement Checking Details	No.	Dia.	Length
A	Laps			
B	Separators			
C	Chairs			
D	Any other			
Remarks:-				
9	Pre pour inspection details		Checked	NA
A	Survey/Layout			
B	Sub soil compaction			
C	Completion of underground work/MEP works			
D	Cleanliness			
E	Cover to reinforcement			
F	Anchor Bolts			
G	Sleeves/Pockets			
H	Water stops			
I	Formworks			
J	Slops			
K	Construction/Expansion joint			
L	Admixture			
M	Any other			
10	Quality & Availability of all aggregates			
11	Machinery mobilization/ Batching Plants		YES	NO
12	Pour Start Time	AM/PM	YES	NO
13	Slump		Date	
14	W/C Ratio			
15	Type of Weather			
16	Temp. of Concrete Poured			
17	Number of Cubes Taken			
18	Quantity of Concrete Poured			
19	Pour completion time	AM/PM	Date	
20	Curing Method	Traditional	Curing Compound	
		Blankets/Gunny Bags	Others(specify)	
21	Period for removal of framework			
22	Any defects observed during concreting			
EPC Contractor's Representative		Authority Engineer's Representative	SECR Representative	

 **QUALITY ASSURANCE PLAN**

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	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
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	Document No. :- RPP/QAP/R-02	

NAME OF PROJECT		Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.					
CLIENT		South East Central Railway Raipur (Chhattisgarh)					
AUTHORITY ENGINEER							
EPC CONTRACTOR		RPP SATHYAMOORTHY JV					
FORMAT No.							
AGGREGATE CRUSHING VALUE TEST IS: 2386(Part IV)							
Sl. No	Date	Type Of Material	Source	Wt. of Sample Filled in the Metal Measure (gms)	Wt. of Sample Passing on 2.36 mm sieve (gms)	Aggregate Crushing Value (%)	Average Crushing Value (%)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
Remarks:							
EPC Contractor's Representative				Authority Engineer's Representative		SECR. Representative	



	RPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02
	Document No. :- RPP/QAP/R-02	

NAME OF PROJECT		Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.						
CLIENT		South East Central Railway Raipur (Chhattisgarh)						
AUTHORITY ENGINEER								
EPC CONTRACTOR		RPP SATHYAMOORTHY JV						
FORMAT No.								
DIMENSION OF BRICKS IS : 1077								
Sl. No	Date of Sampling	Date of Testing	Location	Make/Brand	Length(mm)	Width(mm)	Height(mm)	Remarks
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
Remarks:								
EPC Contractor's Representative			Authority Engineer's Representative			SECR. Representative		



QUALITY ASSURANCE PLAN

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	RPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02
	Document No. :- RPP/QAP/R-02	

NAME OF PROJECT		Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.			 	
CLIENT		South East Central Railway Raipur (Chhattisgarh)				
AUTHORITY ENGINEER						
EPC CONTRACTOR		RPP SATHYAMOORTHY JV				
FORMAT No.						
EFFLORESCENCE TEST OF BRICKS IS : 3495 (PART III)						
SLNo	Date of Sampling	Date of Testing	Location	Make/Brand	Observation of Efflorescence	Remarks
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
Remarks:						
EPC Contractor's Representative			Authority Engineer's Representative		SECR Representative	



	RPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02 Document No. :- RPP/QAP/R-02

NAME OF PROJECT		Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.		
CLIENT		South East Central Railway Raipur (Chhattisgarh)		
AUTHORITY ENGINEER				
EPC CONTRACTOR		RPP SATHYAMOORTHY JV		
FORMAT No. DETERMINATION OF FIELD DRY DENSITY (CORE CUTTER METHOD) IS: 2720 (PART 29)				
Agency/ source		Report no.: -		
Location:		Date of sampling: -		
Date of Testing:		Sampled by: -		
SL.No	DESCRIPTION	SAMPLE NO		
		1	2	3
1.	Layers no.			
2.	Weight of core cutter WC (gms)			
3.	Weight of core cutter + Wet soil WS (gms)			
4.	Weight of Wet soil WS - WC (gms)			
5.	Volume of core cutter (Vc) (cc)			
6.	Bulk density Db = (WS-WV)/Vc (gm/cc)			
7.	Rapid Moisture Reading IS 2720:PART2 (%)			
8.	Natural Moisture content (m/(100-m)) * 100%			
9.	Dry density, DD=DB/[1=(M/100)] (gm/cc)			
10.	Lab maximum dry density in (gm/cc)			
11.	Optimum moisture content (%)			
12.	Percentage of FDD (%)			
13.	Average (%)			
Remarks:				
EPC Contractor's Representative		Authority Engineer's Representative		SECR Representative

	PPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02 Document No. :- RPP/QAP/R-02

NAME OF PROJECT	Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.						 
CLIENT	South East Central Railway Raipur (Chhattisgarh)						
AUTHORITY ENGINEER							
EPC CONTRACTOR	RPP SATHYAMOORTHY JV						
FORMAT No.							
FIELD DRY DENSITY TEST BY SAND REPLACEMENT METHOD IS: 2720 (PART 28)							
Source of Material:		Date of Testing:-					
Lab Maximum Dry Density (gm/cc):		OMC (%)					
Sand Pouring Cylinder No:		Rapid Moisture Meter No:-					
Bulk Density of Sand (gm/cc):		Weight of Sand in Cone W(gm):					
Test Number		1	2	3	4	5	6
Layer							
Test Pit Location							
FIELD DENSITY							
Weight of wet material from hole W(gm)							
Weight of sand + cylinder before pouring W1 (gm)							
Weight of sand + cylinder after pouring W2 (gm)							
Weight of sand in hole [W = W1-W2-W] (gm)							
Volume of hole [V = W2/Ys] (cc)							
Bulk density of material (gm)							
MOISTURE CONTENT (By Oven Dry Method)							
Weight of wet sample m1 (gm)							
Weight of dry sample m2 (gm)							
Moisture content [m-(m1-m2/m2) x 100] (%)							
RESULTS							
Field dry density (gm/cc)							
Compaction obtained (%)							
Average compaction obtained (%)							
Remarks:							
EPC Contractor's Representative		Authority Engineer's Representative				SECR Representative	



	RPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02 Document No. :- RPP/QAP/R-02

NAME OF PROJECT		Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.			
CLIENT		South East Central Railway Raipur (Chhattisgarh)			
AUTHORITY ENGINEER					
EPC CONTRACTOR		RPP SATHYAMOORTHY JV			
FORMAT No. COMBINED FLAKINESS AND ELONGATION INDEX IS: 2386 (PART 1) (1963)					
Agency/ source		Date of Testing:-			
Location:		Date of sampling:-			
Sample No.:-		Proposed Use -			
Sieve Size in mm		Total Wt. of agg. Retained on sieves (A) (gms)	Wt. of agg. Passing through thickness gauge (B)	Wt. of agg. Ret.on thickness gauge (C)	Wt. of agg. Retained on length gauge after ret. On thickness gauge (D)
Passing	Retained				
63	50				
50	40				
40	31.5				
31.5	25				
25	20				
20	16				
16	12.5				
12.5	10				
10	6.3				
	Total				
Flakiness Index (B/A) X 100 =					
Elongation Index (D/C) X 100 =					
Remarks:					
EPC Contractor's Representative		Authority Engineer's Representative		SECR. Representative	

	PPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02 Document No. :- RPP/QAP/R-02

NAME OF PROJECT	Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.			
CLIENT	South East Central Railway Raipur (Chhattisgarh)			
AUTHORITY ENGINEER				
EPC CONTRACTOR	PPP SATHYAMOORTHY JV			
FORMAT No.				
FRAMEWORK INSPECTION CHECKLIST				
Date: -				
Location:				
RFI No.				
Ref Drawing No.				
Sr.No.	Description	Yes	No	N.A
1.	Framework design & drawing sketch including de shuttering arrangement			
2.	Trail panel approved (if required)			
3.	Formwork alignment correct			
4.	Formwork level correct, including screeds			
5.	Formwork dimension correct			
6.	Formwork member spacing correct			
7.	Formwork member material quality acceptable			
8.	False work member sizes correct			
9.	False work member spacing correct			
10.	False work member material quality acceptable			
11.	Gaps between primary and secondary member closed wedged			
12.	Face boarding/Plywood/Metal thickness correct			
13.	Joints between panels closed (no gaps)			
14.	Joints between panels push (no steps)			
15.	Panel flatness acceptable			
16.	Gaps between secondary member and face panels closed			
17.	Tie rod spacing correct			
18.	Tie rod spacing correct			
19.	Tie rod tight, face cones flush			
20.	Spacers between shutter surface tightly fitting			
21.	Box Outs, cast-in items, ducts fixed correct, securely			
22.	Pre-stressing sheathing and vent alignments & spacing of supports acceptable			
23.	Empty sheathing against flotation			
24.	Pre-stressing anchorages position and fixing acceptable			
25.	Chamfers/Fillets sizes, straightness, fixing acceptable			
26.	Formwork clean			
27.	Formwork release while material approved			
28.	Formwork release while applied correctly			
29.	Construction joint preparation satisfactory			
30.	Contraction			
31.	Safe access constructed			
32.	Adequate workspace provided for labour, equipment			
33.	Shutter vibrator (if required) location & fixing arrangement approved			
Remarks:				
EPC Contractor's Representative	Authority Engineer's Representative	SECR Representative		

 QUALITY ASSURANCE PLAN

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	RPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02
	Document No. :- RPP/QAP/R-02	

NAME OF PROJECT	Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.			 	
CLIENT	South East Central Railway Raipur (Chhattisgarh)				
AUTHORITY ENGINEER					
EPC CONTRACTOR	RPP SATHYAMOORTHY JV				

FORMAT No.
SIEVE ANALYSIS OF 20MM COARSE AGGREGATE IS: 383

Agency/ source	Date of Testing: -					
Location:	Date of sampling: -					
Size of Aggregate: -	Tested by: -					
	Total Wt. (gms) -					
Sieve Size in mm	Wt. of Retained agg. (gms)	Cum. Wt. of Retained (gms)	% Cum Retained (%)	% of passing	Specification Limits as Per IS:383	
					Lower	Upper
40					100	100
20					85	100
10					0	20
4.75					0	5
Pan						

Remarks:

SIEVE ANALYSIS OF 10MM COARSE AGGREGATE IS: 383

Agency/ source	Date of Testing: -			
Location:	Date of sampling: -			
Size of Aggregate: -	Tested by: -			
	Total Wt. (gms) -			
Sieve Size in mm	Wt. of Retained agg. (gms)	Cum. Wt. of Retained (gms)	% Cum Retained (%)	% Of passing
				Lower
40				100
20				85
10				0
4.75				0
Pan				5

Remarks:

EPC Contractor's Representative	Authority Engineer's Representative	SECR. Representative
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	PPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02 Document No. :- RPP/QAP/R-02

NAME OF PROJECT		Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.			 		
CLIENT		South East Central Railway Raipur (Chhattisgarh)					
AUTHORITY ENGINEER							
EPC CONTRACTOR		RPP SATHYAMOORTHY JV					
FORMAT No.							
GRADATION OF FINE AGGREGATE IS 383-2016 (Table No-9)							
Agency/ source				Date of Testing: -			
Location:				Date of sampling: -			
Sample No.: -				Tested by: -			
Type of Material				Total Wt. (gms) -			
IS Sieve Size mm	Wt. of material Retained (gms)	Weight Cumulative Retained (gms)	% Cumulative weight Retained (%)	% of passing	Specification Limits as Per IS:383		
					Zone I	Zone II	Zone III
10					100	100	100
4.75					90-100	90-100	90-100
2.36					60-95	75-100	85-100
1.18					30-70	55-90	75-100
0.600					15-34	35-59	60-79
0.300					5-20	8-30	12-40
0.150					0-10	0-20	0-10
Pan							
Fineness modulus = (Sum of Cum. % Retained on each sieve)/100							
Remarks:							
EPC Contractor's Representative		Authority Engineer's Representative			SECR. Representative		

	RPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02
		Document No. :- RPP/QAP/R-02

NAME OF PROJECT	Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.	
CLIENT	South East Central Railway Raipur (Chhattisgarh)	
AUTHORITY ENGINEER		
EPC CONTRACTOR	RPP SATHYAMOORTHY JV	

FORMAT No.

**GRADATION OF FINE SAND
IS 1542 : 1992**

Agency/ source		Date of Testing:-	
Location:		Date of sampling:-	
Sample No.: -		Sampled by:-	
Type of Material		Tested by:-	
Weight of sample (gms): -			
IS Sieve Size mm	Wt. of material Retained (gms)	Weight Cumulative Retained (gms)	% Cumulative weight Retained (%)
10			
4.75			
2.36			
1.18			
0.600			
0.300			
0.150			
Pan			

Fineness modulus = (Sum of Cum. % Retained on each sieve)/100

Remarks:

EPC Contractor's Representative

Authority Engineer's Representative

SECR. Representative



	RPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02 Document No. :- RPP/QAP/R-02

NAME OF PROJECT	Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.			
CLIENT	South East Central Railway Raipur (Chhattisgarh)			
AUTHORITY ENGINEER				
EPC CONTRACTOR	RPP SATHYAMOORTHY JV			
FORMAT No.				
REINFORCEMENT CHECKLIST				
Date: -				
Location:				
RFI No.				
Ref Drawing No.				
Sr.No.	Description	Yes	No	N.A
1.	Working Drawing Checked and Approved			
2.	Latest Revision being used			
3.	Bar Schedules approved			
4.	Reinforcement steel material approved			
5.	Bar bending & cutting satisfactory			
6.	Corrosion Treatment of bars in bars in bars required satisfactory			
7.	Bar size correct			
8.	Bar spacing correct			
9.	Bar lap length correct			
10.	Bar lap at correct location			
11.	Bar tied as specified			
12.	Bar assembly right and adequately supported			
13.	Cover to bottom bar correct			
14.	Cover to sides bar correct			
15.	Cover to top bar correct			
16.	Cover block approved including fixing			
Remarks:				
EPC Contractor's Representative	Authority Engineer's Representative	SECR Representative		





RPP SATHYAMOORTHY JV

**PROJECT: MAJOR UPGRADATION OF RAIPUR
RAILWAY STATION OF SOUTH EAST
CENTRAL RAILWAY ON (EPC) MODE**



QUALITY ASSURANCE PLAN

Date :- 14-08-2024 | Revision :- R-02

Document No. :- RPP/QAP/R-02

NAME OF PROJECT	Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.	 
CLIENT	South East Central Railway Raipur (Chhattisgarh)	
AUTHORITY ENGINEER		
EPC CONTRACTOR	RPP SATHYAMOORTHY JV	

FORMAT No.

REQUEST FOR INSPECTION (RFI)

Submission Time: -

Submission Date: -

Inspection Time: -

Inspection Date: -

Location:

RFINo.

Inspected by: -

Requested By:-

Authority Engineer Representative date/time

EPC Contractor Representative

Comments:-

Request to begin the activity IS APPROVED/ NOT APPROVED

EPC Contractor's Representative

**Authority Engineer's
Representative**

SECR.
Representative

QUALITY ASSURANCE PLAN

	RPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02 Document No. :- RPP/QAP/R-02

NAME OF PROJECT	Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.			 
CLIENT	South East Central Railway Raipur (Chhattisgarh)			
AUTHORITY ENGINEER				
EPC CONTRACTOR	RPP SATHYAMOORTHY JV			
FORMAT No.				
SILT CONTENT TEST				
Agency/ source		Date of Testing: -		
Location:		Date of sampling: -		
Sample No.: -		Sampled by: -		
		Tested by: -		
Sample No	1	2	3	
Volume of Sand (V1)				
Volume of Silt Above Sand (V2)				
Silt Content (V2/V1) x 100				
Result/ AVG				
Acceptable: - Yes/No	{IS383 : 2016} {CPWD-2019}			
Limits Maximum8%				
EPC Contractor's Representative	Authority Engineer's Representative		SECR. Representative	



	RPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02
	Document No. :- RPP/QAP/R-02	

NAME OF PROJECT	Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.			 
CLIENT	South East Central Railway Raipur (Chhattisgarh)			
AUTHORITY ENGINEER				
EPC CONTRACTOR	RPP SATHYAMOORTHY JV			
FORMAT No.				
SLUMP TEST IS : 1099 (PART-II)				
Sr.No	Date of Pouring	Location	Grade of Concrete	Slump in MM
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
Remarks: -				
EPC Contractor's Representative		Authority Engineer's Representative		SECR. Representative



	RPP SATHYAMOORTHY JV	
	PROJECT: MAJOR UPGRADATION OF RAIPUR RAILWAY STATION OF SOUTH EAST CENTRAL RAILWAY ON (EPC) MODE	
	QUALITY ASSURANCE PLAN	Date :- 14-08-2024 Revision :- R-02
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NAME OF PROJECT		Major Upgradation of Raipur Railway Station of South east Central Railway on Engineering Procurement and Construction (EPC) mode.			 			
CLIENT		South East Central Railway Raipur (Chhattisgarh)						
AUTHORITY ENGINEER								
EPC CONTRACTOR		RPP SATHYAMOORTHY JV						
FORMAT No.								
WATER ABSORPTION OF BRICKS IS : 3495 (PART III)								
SLNo	Date of Sampling	Date of Testing	Location	Make/Brand	Wt. of sample SSD (gms)	Wt. of sample Oven Dry (gms)	Water absorption (%)	Average Water Absorption
1.								
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								
11.								
12.								
13.								
14.								
15.								
Remarks:								
EPC Contractor's Representative		Authority Engineer's Representative		SECR Representative				

