


<p>सिविल अभियांत्रिकी विभाग, कोल इंडिया लिमिटेड (महाराज कंपनी) कोल भवन, परिसर सं-4, एम.ए.आर, प्लॉट सं-ए.एफ-III, एक्शन एरिया- 1 ए, न्यूटाउन, राजारहाट, कोलकाता - 700156 फोन: 033-71104180 फैक्स: 033-2324 6633 ई-मेल: gmcivil.cil@gmail.com वेबसाइट: www.coalindia.in</p>	 महाराज कंपनी A Maharatna Company	<p>CIVIL ENGG. DIVISION COAL INDIA LIMITED, (Maharatna Company) Coal Bhawan, Premises No.4, MAR, Plot No.AF-III, Action Area- 1A, New Town, Rajarhat, Kolkata - 700156 TEL: 033-71104180 Fax: 033-2324 6633 E-MAIL: gmcivil.cil@coalindia.in WEBSITE: www.coalindia.in</p>
(एक ISO 9001:2015, ISO 14001:2015 & ISO 50001:2011 प्रमाणित कंपनी)		

सन्दर्भ संख्या: सी. आई. एल/सिविल/31(Pl-13)/1595

dated: 17.10.2024

18

To
General Manager/HoD(Civil),
SECL/MCL/BCCL/CCL/NCL/WCL/ECL/CMPDIL,
ED (IICM), General Manager, NEC,
General Manager, Delhi

Sub:- Standard Operating Procedure (SOP) for Condition Survey and Quality Control w.r.t. Civil & Structural works in CIL and its Subsidiaries.

Dear Sir,

A Standard Operating Procedure (SOP) for 'Condition Survey and Quality Control w.r.t. Civil & Structural works in CIL and its Subsidiaries' was prepared by CMPDIL to prevent structural failures. This SOP addresses standardized procedure for conducting condition surveys and ensuring quality control during the construction and erection of the coal handling plants including maintenance ensuring compliance with contract specifications, safety standards, and engineering best practices.

This is being issued with approval of competent authority for implementation with immediate effect.

Yours faithfully


ED(CD)/HoD(Civil) 17/10/24

~~प्रमाणित~~ / विभागध्यक्ष (सिविल)
~~General Manager~~ / HoD (Civil)
सिविल अभियांत्रिकी विभाग
Civil Engineering Division
कोल इंडिया लिमिटेड
Coal India Limited

Copy to:-

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- Office copy

SOP for Condition Survey and Quality Control

1.0 Purpose

To establish a standardized procedure for conducting condition surveys and ensuring quality control during the construction and erection of the coal handling plants including maintenance ensuring compliance with contract specifications, safety standards, and engineering best practices.

2.0 Scope

This SOP applies to all activities related to the construction, erection, and commissioning of civil & structural components as per the contract agreement.

3.0 Detailed Jobs and Responsibilities

3.1 Responsibilities of the Contractor:

3.1.1. Preparation and Planning:

- Develop a comprehensive condition survey plan that outlines the scope, frequency, and methodology of inspections for all construction and erection activities.
- Prepare a detailed quality control plan that aligns with the contract specifications, incorporating testing methods, inspection procedures, and acceptance criteria.
- Assign qualified personnel, including surveyors, quality control engineers, and safety officers, to implement the quality control and condition survey plans.

3.1.2. Material Control:

- Ensure all materials (cement, aggregates, steel, mechanical and electrical components) meet the specifications outlined in the contract agreement and approved Quality Assurance Plan (QAP)
- Maintain records of all material test certificates, including manufacturer's certificates, batch test results, and third-party laboratory tests.
- Store and handle materials properly to prevent contamination, degradation, or damage. Conduct regular inspections of storage facilities.

3.1.3. Execution of Construction and Erection:

- Follow approved drawings, designs, and method statements for all construction activities, including excavation, concreting, formwork, reinforcement, and structural erection. If any deviation from approved drawing, the revised drawings shall be approved by competent authority before construction.
- Erect and assemble mechanical and electrical components, such as conveyors, crushers, hoppers, and substations, in accordance with the approved erection sequence and safety protocols.
- Conduct pre- and post-installation checks to ensure alignment, levelling, and secure fastening of all erected components.
- Immediately report any non-conformances or deviations from approved drawings/design to the client and take corrective actions as agreed.
- The project must strictly follow the initial PERT chart submitted. Any deviations from the initial plan should be immediately identified. If any changes or deviations occur during the project execution, a revised PERT chart must be created and submitted for approval before proceeding further.
- Install all safety devices, such as emergency stop switches, fire extinguishers, and dust suppression systems, as per the design and statutory requirements.
- Ensure all fabrication drawings are approved by authorized structural engineer of the contractor. A certificate from structural engineer may be obtained certifying that all the joints, connections and other details of fabrication drawings are as per design vis-a-vis codal provision.

3.1.4. Quality Control Activities:

- Perform regular inspections, tests, and audits at each stage of construction and erection to ensure compliance with contract specifications & approved Quality Assurance Plan (QAP)
- Conduct specific tests, including slump tests, cube tests for concrete, tensile tests for steel, and non-destructive testing (NDT) of welds and joints.
- Implement a system for documenting all quality control activities, including inspection reports, test results, and corrective actions taken.
- Immediately report any non-conformances or deviations from quality standards to the client and take corrective actions as agreed.

3.1.5. Condition Survey:

- Carry out condition surveys as per the agreed schedule, focusing on key areas like foundation integrity, concrete quality, structural alignment, and equipment installation.
- Use appropriate tools and techniques, such as laser levels, ultrasonic testers, and radiographic devices, to assess the condition of the constructed elements.

- Maintain a detailed log of all condition surveys, including observations, findings, and actions taken.

3.1.6. Reporting and Documentation:

- Submit weekly and monthly progress reports to the client, including quality control findings, test results, and condition survey outcomes.
- Provide immediate notification to the client of any critical defects, safety hazards, or non-conformances.
- Maintain a comprehensive record of all quality control documentation for review by the representative of EIC and third-party auditors.

3.1.7. Safety and Compliance:

- Ensure that all construction and erection activities comply with safety regulations, environmental guidelines, and contractual requirements.
- Conduct regular safety training sessions for all workers, focusing on hazard identification, PPE usage, and emergency response.
- Implement environmental control measures, such as dust suppression, noise reduction, and proper waste management, as required by the contract.

3.1.8. Final Inspection and Handover:

- Conduct a final inspection with the client to identify any defects or non-conformances before the handover.
- Rectify all identified defects and ensure all construction elements meet the quality standards specified in the contract.
- Submit all required documentation, including as-built drawings, test certificates, and compliance reports, to the client for final approval.

3.2 Responsibilities of the EIC/Quality Control Engineer of Subsidiary:

3.2.1. Review and Approval:

- Review and approve the contractor's quality control plan, condition survey plan, and all related documents before the commencement of construction.
- Ensure that the contractor's quality control procedures align with the contract requirements and applicable standards.
- Approve all design drawings, material specifications, and method statements submitted by the contractor.

3.2.2. Inspection and Monitoring:

- Conduct regular inspections and quality control, either independently or with third-party consultants, to verify the contractor's adherence to quality standards.
- Monitor the contractor's performance through progress meetings, site visits, and review of quality control documentation.
- Verify & Approve contractor's test results, material certificates, and inspection reports to ensure compliance with the contract.

3.2.3. Non-Conformance Management:

- Review all non-conformance reports submitted by the contractor and approve corrective actions.
- Ensure that the contractor addresses all non-conformances promptly and effectively.
- Conduct follow-up inspections to confirm that corrective actions have been implemented and are effective.

3.2.4. Documentation and Record Keeping:

- Maintain a record of all inspections, test results, non-conformance reports, and corrective actions for future reference.
- Ensure that all necessary documentation, including quality assurance plans, certificates, and test results, are complete and accurate.

3.2.5. Approval of Payments:

- Verify that all construction activities meet the quality standards and contractual requirements before approving payment milestones.
- Hold payments until all non-conformances and defects have been rectified by the contractor.

3.2.6. Final Acceptance and Handover:

- Conduct a final inspection jointly with the contractor to ensure all work complies with the contract terms.
- Approve the final acceptance certificate after all defects are rectified, all quality control documentation is submitted, and all conditions of the contract are met.
- Ensure the contractor provides all necessary training for the operation and maintenance of the plant after commissioning.

3.3 Responsibilities of consultant to subsidiary pertaining to drawing/design scrutiny:

3.3.1 Acceptance of Geotechnical Soil Report:

Verify that the geotechnical soil report comprehensively covers all aspects necessary for construction, including soil type, bearing capacity, moisture content, and other relevant geotechnical parameters.

Ensure the soil investigation and reporting comply with relevant Indian Standards (IS) and any other applicable international standards or codes.

Confirm that the soil report accurately reflects the existing site conditions, including all borehole data, laboratory test results, and analysis of soil properties.

Check the consistency of the soil report with the current plot plan. If there are any changes in the plot plan or project layout, ensure that new boreholes are explored and additional geotechnical investigations are conducted to address the revised conditions.

Identify any potential risks related to soil conditions, such as high water table, slope stability issues, or the presence of unsuitable soil layers, and recommend appropriate mitigation measures.

Ensure that construction activities do not commence until the geotechnical soil report has been thoroughly reviewed and accepted.

If additional boreholes or investigations are required due to changes in the plot plan, ensure all modifications are documented, reviewed, and accepted before proceeding with construction.

3.3.2 Civil & Structural Drawings Approval:

Verify that all drawings comply with project requirements, including structural and civil works.

Ensure all drawings meet Indian standards (BIS) or relevant international standards (British, American, German, or Russian).

Confirm that the technical data and parameters used in the drawings align with the system requirements and design specifications provided in the tender.

Validate that the design drawings reflect actual site conditions, including soil data, existing infrastructure, and environmental considerations.

Manage revisions and approvals for modifications in the drawings based on site feedback or changes in project scope.

Ensure fabrication drawings are accessible on-site, both digitally and physically, with proper logs and updates. Communicate updates to contractors and clients, and conduct regular audits and training for compliance.

3.4 Responsibilities of third party quality auditors:

3.4.1. Preparation and Pre-Audit Review

3.4.1.1 Understand Contractual Requirements:

- Review contract documents, specifications, and Quality Assurance Plan (QAP).
- Familiarize yourself with relevant codes, such as IS (Indian Standards), BIS (Bureau of Indian Standards), or international standards like ASTM, ISO, etc.
- Verify that all required permits, approvals, and documentation are in place before the audit begins.

3.4.1.2 Review Contractor's Plans:

- Check the contractor's Quality Control Plan, including inspection and testing procedures.
- Verify the condition survey plan for the project to ensure all critical areas are being monitored.
- Review method statements and work plans submitted by the contractor.

3.4.2. Material Inspection

3.4.2.1 Materials Received on Site:

- Check material storage conditions (e.g., cement, steel, aggregates) to ensure proper handling and protection from contamination.
- Verify batch certificates and test certificates for materials such as concrete, steel, aggregates, and mechanical components.
- Conduct visual inspections for any signs of damage, rusting, or deterioration of materials.
- Verify that all materials comply with the contract specifications and approved Quality Assurance Plan (QAP).

3.4.2.2 Third-Party Test Reports:

- Ensure that material tests (e.g., compressive strength, tensile strength) have been conducted in accredited laboratories.
- Review material test results to verify compliance with contract requirements.

- Re-test or cross-check selected material samples as needed to confirm quality.

3.4.3. Structural and Civil Works

3.4.3.1 Foundations and Substructures:

- Check geotechnical reports and soil conditions before foundation work begins.
- Verify that excavation, backfilling, and compaction are done as per approved methods and test results (e.g., density tests).
- Inspect the placement of reinforcement in footings, beams, and columns.
- Verify the alignment, levels, and layout of foundation work.
- Ensure that concrete pouring and curing follow approved procedures, and that slump tests and cube tests are conducted.

3.4.3.2 Superstructures and Erection:

- Inspect formwork and scaffolding for stability and compliance with safety protocols.
- Check the reinforcement detailing (size, spacing, cover) for beams, columns, and slabs.
- Verify that structural elements are erected as per approved drawings and sequences.
- Conduct random checks on the quality of welds, bolted connections, and anchorage points.
- Review non-destructive test (NDT) results for welds and joints, if applicable.

3.4.4. Quality Control Activities

3.4.4.1 Ongoing Quality Checks:

- Conduct random quality checks on-site to ensure compliance with QAP and contract specifications.
- Verify that the contractor is conducting all required tests (slump test, cube test for concrete, tensile test for steel).
- Review the contractor's test results and inspection reports.
- Ensure that any non-conformances are reported, documented, and corrective actions are taken promptly. All non-conformances must be approved by competent authority before disposal.

3.4.4.2 Verification of Workmanship:

- Conduct visual inspections for defects such as cracks, honeycombing in concrete, improper alignment, or poor workmanship.
- Inspect surfaces for smoothness, straightness, and compliance with tolerances.
- Verify that finishes, coatings, and treatments are applied as per the specifications

3.4.5 Condition Survey

Detailed at Annexure-1

3.4.6 Non-Conformance and Corrective Actions

3.4.6.1 Non-Conformance Reporting:

- Ensure that any deviations or non-conformances from the approved plans and quality standards are documented.
- Verify that the contractor has submitted non-conformance reports (NCRs) and corrective action plans.
- Review and approve the contractor's proposed corrective actions.

3.4.6.2 Follow-Up Inspections:

- Conduct follow-up inspections to confirm that corrective actions have been implemented and defects have been rectified.
- Ensure that rectified work complies with contract specifications and standards.

3.4.7 Safety and Compliance Checks

3.4.7.1 Health, Safety, and Environment (HSE) Compliance:

- Verify that the contractor is adhering to safety protocols, including PPE usage, safety signage, and emergency procedures.
- Inspect construction areas for compliance with housekeeping, waste management, and environmental controls (e.g., dust suppression, noise control).
- Ensure that fire extinguishers, emergency stop switches, and other safety devices are properly installed.

3.4.7.2 Training and Toolbox Talks:

- Confirm that the contractor conducts regular safety training sessions and toolbox talks.
- Review records of safety meetings and training sessions.

3.4.8 Documentation and Reporting

3.4.8.1 Audit Reports:

- Maintain detailed records of all inspections, observations, and tests.
- Prepare and submit audit reports to the client, including findings, non-conformances, and recommended corrective actions.
- Ensure that all quality control documentation (test certificates, material records, non-conformance reports) is well-organized and available for review.

3.4.8.2 Verification of Contractor's Records:

- Cross-check the contractor's records of material certificates, test results, and inspection reports for completeness and accuracy.
- Ensure that the contractor uses digital tools or standardized forms for consistent documentation.

3.4.9 Final Inspection and Handover

- Conduct a joint inspection with the client and contractor before handover.
- Verify that all defects and non-conformances have been rectified.
- Check the as-built drawings, compliance reports, and test certificates for completeness.

3.4.10 Continuous Improvement

- Provide feedback to the client and contractor regarding areas for improvement.
- Suggest improvements to quality control processes or construction methodologies based on audit findings.
- Participate in review meetings to discuss audit findings and lessons learned.

4. Quality Control Measures

4.1. Material Quality Control:

- Ensure that all materials (cement, aggregates, steel, etc.) meet the specifications outlined in the contract.
- Maintain records of material test certificates and inspection results.
- Store materials properly to prevent degradation or contamination.

4.2. Construction Quality Control:

- Monitor construction activities, including excavation, concrete pouring, formwork, and steel reinforcement.
- Conduct routine checks on the placement, spacing, and alignment of construction elements.
- Perform quality tests (e.g., slump tests, cube tests for concrete) as per the contract requirements.

4.3. Erection Quality Control:

- Ensure that structural components are erected as per the approved sequence and method statements.
- Verify that temporary supports and braces are adequately installed and removed only after permanent structures are stabilized.
- Inspect welds, bolts, and connections for proper installation and alignment.

4.4. Final Inspection:

- Conduct a final inspection with the client to ensure all construction and erection work meets the contract standards.
- Ensure all defects are rectified before the final handover.

5.0 Safety and Environmental Considerations:

- Follow all safety protocols, including the use of personal protective equipment (PPE), safety signage, and barriers.
- Ensure proper housekeeping and waste management practices.
- Monitor environmental parameters (dust, noise, water quality) to comply with regulatory requirements.

6.0 Documentation and Records:

- Maintain all records, including inspection reports, test results, and corrective action logs, for future reference.
- Use digital tools or software to manage documentation effectively and ensure real-time updates.

7.0 Review and Improvement:

- Regularly review the SOP based on survey findings, project requirements, and client feedback.
- Update the SOP as needed to address new risks or changes in scope.

Procedure for Condition Survey

1. Survey Planning:

- Develop a condition survey plan outlining the frequency, scope, and methodology of inspections.
- Schedule surveys at critical construction milestones and at regular intervals.
- Ensure that qualified personnel (surveyors, quality control engineers) are assigned to conduct surveys.

2. Inspection Checklist:

- Create a detailed checklist covering all aspects of construction and erection. Sample format attached below.

3. Survey Methodology:

- Visual Inspections: Conduct visual inspections to detect surface defects, alignment issues, and compliance with specifications.
- Dimensional Checks: Use measuring tools (tapes, callipers, laser devices) to verify structural dimensions and alignment.
- Non-Destructive Testing (NDT): Apply NDT methods (ultrasonic testing, radiography, magnetic particle inspection) to check weld quality and concrete integrity.
- Material Sampling and Testing: Collect samples for laboratory testing to verify material properties (e.g., compressive strength, tensile strength).
- Photographic Documentation: Record detailed photographs of inspected areas to document conditions, defects, and non-conformances.

4. Reporting:

- Maintain a log of all condition surveys, including date, time, areas surveyed, observations, and findings.
- Use standardized forms or digital tools to capture data comprehensively.
- Submit reports of any non-conformances or potential issues to the client promptly.

5. Analysis and Corrective Actions:

- Analyze survey data to identify patterns or recurring issues.
- Evaluate the impact of defects on structural integrity and project timelines.
- Recommend corrective actions, including repairs, rework, or design modifications.
- Verify the implementation of corrective actions and conduct follow-up surveys as necessary.

CONDITION SURVEY (APP 1.1)

Name of Work:		Date:	
Agreement No.		Structure:	
Name of Contractor:		Subsidiary:	
SI No.	Particulars	Remarks	
1.0	Quality Control Aids:		
1.1	Is site equipped with		
	(a) Copy of agreement		
	(b) Applicable CPWD Specification/ approved specification along with (up to date) correction slips:		
	(c) Approved drawings available at site ?		
	(d) Provision of QAP in agreement? Whether approved QAP is available on site?		
	(e) List of ISI marked /approved materials to be used		
	(f) Guard File containing inspection reports of CTE/OCTA/AE/OC/ CE/SE etc.		
	(g) Testing facilities to check conformations to acceptance criteria		
	(h) Relevant Circulars on Quality Control		
1.2	Is field laboratory existing and well equipped?		
2.0	Departmental procedure aspects:		
2.1	Maintenance of inspection register		
2.2	Highlights of inspection by senior officers requiring compliance.		
2.3	Are test registers maintained in standard forms?		
2.4	Are test register reviewed by senior officers with dates?		
2.5	Site Order Book and Schedule of defects		
	(a) Is Site Order Book properly maintained?		
	(b) Is the Site Order Book reviewed by EIC. (Mention details)		

Engineer-in-Charge (Subsidiary)

Quality Engineer (Contractor)

Project Manager (Contractor)

CONDITION SURVEY (APP 1.1)

	(c) Have timely notices been issued to the contractor with the schedule of defects/damages and date of compliance? In case of failure to rectify defects/ damages whether action under relevant clause of agreement initiated?	
3.0	Process control aspects:	
3.1	Is soil investigation done? (give brief details)	
3.2	Suitability of water for construction	
	(a) What is the source of water?	
	(b) Has water been tested and approved by Engineer-in-charge before construction?	
	(c) Has water been tested subsequently (i.e after every 3 months) and found fit for use in works?	
3.3	Are 10% (25% for concrete) of all samples for testing taken in presence of EIC.	
3.4	Are all mandatory tests carried out at stipulated frequency?	
3.5	Are materials approved by Engineer-in-charge? If so, are samples available at site?	
3.6	Are sample units/items completed and approved by EIC before start of mass finishing work?	
3.7	Specific control on RCC work like centering /shuttering, design mix concrete/RMC, checking of slump and filling of cubes, placing/compaction with vibrators:	
3.8	Any other particular comments on adequacy of process control:	
4.0	Site Inspection	
4.1	Observations and comments on QAP (Quality Assurance Plan), Quality Control system in place: Attached separate sheet, if required	
4.2	Observations on foundations, periodical site inspection made and recorded in the register	

CONDITION SURVEY (APP 1.1)		
4.3	Observation on QC for concrete, physical verification, anchor bolts, base plate position. If faults noticed, then state locations and probable reasons.	
4.4	Samples collected by QC Core/Cell by first tier and second tier quality assurance	
4.5	Structural steel test conducted from site, welding test conducted	
4.6	Welding rods used, weld thickness test conducted on specific locations. If faults found, state the location and probable reasons	
5.0	Observations on site material QC aspects. (Keeping in view the requirement of contract specifications, BIS marked / CPWD/ approved products etc.) (Attached separate sheet, if required)	
5.1	Observations	
6.0	Observations on workmanship QC aspects. (Attached separate sheet for each non-compliance, if required)	

CONDITION SURVEY (APP 1.2)

Name of Work:		Date:	
Agreement No.		Structure:	
Name of Contractor:		Subsidiary:	

4 Material Tests

Material	Name of Test	Field/Lab test	Volume/ Batch/ MT	Test Procedure/ S Code provision	Mandatory Requirements as per IS Codes/Manuals/ QAP (Nos.)	Actual tests performed by Contractor (Nos.)	Actual tests performed by Subsidiary (Nos.)	Nos. of tests within permissible limits	% of tests conducted	% of tests results within permissible limits	Remarks
Water											
Cement											
Fine aggregate											
Coarse Aggregate											
Reinforced cement concrete											

CONDITION SURVEY (APP 1.2)

Name of Work:		Date:	
Agreement No.		Structure:	
Name of Contractor:		Subsidiary:	

4 Material Tests

Material	Name of Test	Field/Lab test	Volume/ Batch/ MT	Test Procedure/ S Code provision	Mandatory Requirements as per IS Codes/Manuals/ QAP (Nos.)	Actual tests performed by Contractor (Nos.)	Actual tests performed by Subsidiary (Nos.)	Nos. of tests within permissible limits	% of tests conducted	% of tests results within permissible limits	Remarks
Tor											
Grout											
Bricks											
Structural Steel											
Profile Sheet											
Weld											

CONDITION SURVEY (APP 1.3)			
Name of Work:	.....	Date:	.....
Agreement No.	.....	Structure:	.....
Name of Contractor:	.....	Subsidiary:	.....
Sl No.	Particulars	Remarks	
5	Deviations from Approved Drawing/Design		
a	Approved Drawings Nos.		
i)	System Drawings		
ii)	Civil/Structural Drawings		
b	Is there any deviations from Approved drawings/Design		
c	If yes, Specify		
6	Maintenance History		
7	Visible signs of Distress		
a	RCC		
i)	Cracks		
ii)	Spalling of Concrete		
iii)	Honeycombing		
iv)	Loss of Cover		
v)	Corrosion Stains		
vi)	Reinforcement Steel Exposed		
vii)	Reinforcement Steel Exposed & Corroded		
viii)	Seepage		
ix)	Deflection		
x)	Any other visible distress		
b	Structural Steel		
i)	Rusting		
ii)	Member Missing		
iii)	Member Bent/Deflected/Cut		
c	Vibrations in Structure		
d	Any other visible distress		

CONDITION SURVEY (APP 1.0)			
Name of Work:	.....	Date:	.....
Agreement No.	.....	Structure:	.....
Name of Contractor:	.....	Subsidiary:	.....
SI No.	Particulars	Remarks	
1	Date of Condition Survey:		
2	Name & Designation of Inspecting Officials:		
a	Subsidiary		
i)	Name		
ii)	Designation		
b	Contractor		
i)	Name		
ii)	Designation		
c	Any other		
i)	Name		
ii)	Designation		
3	Progress Details:		
a	Photographs, Videos etc.		
b	RCC quantity		
i)	Quantity executed Till Date (cum)		
ii)	Total Quantity(cum)		
iii)	% execution		
c	Structural Steel		
i)	Quantity executed Till Date (T)		
ii)	Total Quantity(T)		
iii)	% execution		

Engineer-in-Charge (Subsidiary)

Quality Engineer (Contractor)

Project Manager (Contractor)