भारत हेवी इलेक्ट्रिकल्स लिमिटेड
(भारत सरकार का उपक्रम)
BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)

TCN - 03

Ref: PSER:SCT:SNG-C1356:TCN-03 Date: 30-05-2012

| | | |
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| Sub | Tender change notice (TCN) 02. | |
| Job | (i) **PACKAGE-A:** Civil, Structural, architectural etc of Civil Superstructure work of 2x600 MW Unit#1 for Singareni Thermal Power Project<br>(ii) **PACKAGE-B:** Civil, Structural, architectural etc of Civil Superstructure work of 2x600 MW Unit # 2 for Singareni Thermal Power Project. | |
| Ref | 1.0 | Tender no PSER:SCT: SNG-C1356:12 |
| | 2.0 | BHEL's NIT, vide reference no PSER:SCT:SNG-C1356:2819, dated 15-05-2012. |
| | 3.0 | BHEL's TCN-01, vide reference no PSER:SCT:SNG-C1356:TCN-01, dated 17-05-2012. |
| | 4.0 | BHEL's TCN-02, vide reference no PSER:SCT:SNG-C1356:TCN-02, dated 29-05-2012. |
| | 5.0 | All other pertinent issues till date. |

With reference to above, following points/ documents, relevant to tender, may please be noted and complied with while submitting offer.

1.0 Additional requirement for 'Quality Assurance' is attached as per Annexure-A.
2.0 Clarification**/** Amendment/ Modification as per enclosed Annexure-B.
3.0 Revised `No deviation certificate' is attached. Bidder to submit `No deviation certificate' as per attached format only.
4.0 All other terms & conditions shall remain unchanged.

Thanking you,

Yours faithfully,
for BHARAT HEAVY ELECTRICALS LTD

ENGR (SCT)

Encl:
As above

पावर सेक्टर पूर्वी क्षेत्र (मुख्यालय)
POWER SECTOR EASTERN REGION, DJ-9/1, SECTOR-II, SALT LAKE CITY, KOLKATA - 700 091
फैक्स/Fax : (033) 23211960 फोन/Phone : बोर्ड/EPABX : 23211691/ 23211798/ 23211795

ANNEXURE-A TO TCN-03 FOR TENDER NO.
PSER:SCT:SNG-C1356:12

# SUB-SECTION – E-01

## CIVIL WORKS

## QUALITY ASSURANCE AND INSPECTION FOR CIVIL WORKS

**1.0.0 INTRODUCTION**

1.1.0 This part of the specification covers the sampling, testing and quality assurance requirement (including construction tolerances and acceptance criteria) for all civil and structural works covered in this specification.

1.2.0 This part of the technical specification shall be read in conjunction with other parts of the technical specifications, general technical requirements & erection conditions of the contract. Wherever IS code or standards have been referred they shall be the latest revisions.

1.3.0 The rate for respective items of work or price shall include the cost for all works, activities, equipment, instrument, personnel, material etc. whatsoever associated to comply with sampling, testing and quality assurance requirement including construction tolerances and acceptance criteria and as specified in subsequent clauses of this part of the technical specifications. The QA and QC activities in all respects as specified in the technical specifications/ drawings / data sheets / quality plans / contract documents shall be carried out at no extra cost to the owner.

1.4.0 The contractor shall prepare detailed construction and erection methodology scheme which shall be compatible to the requirements of the desired progress of work execution, quality measures, prior approvals if any and the same shall be got approved by the Engineer. If required, work methodology may be revised/ reviewed at every stage of execution of work at site, to suit the site conditions by the contractor at no extra cost to the owner.

**2.0.0 QUALITY ASSURANCE PROGRAMME**

2.1.0 The contractor shall adopt suitable Quality Assurance Programme (QAP) to ensure that the equipments and services under the scope of contract whether manufactured or performed within contractor's works or at his sub-contractor's premises or at the SCCL's site or at any other place of work are in accordance with the specifications. Such QAP shall be outlined by the contractor and shall be finally accepted by the SCCL or their authorized representative after discussions before the start of work. The QAP shall be generally in line with IS/ISO Systems.

The contractor shall furnish complete QA & QC programme for the work envisaged which may include the following

- Organization structure for the management and implementation of the proposed quality assurance programme
- Quality System Manual
- Design Control System

- Documentation and Data Control System
- Qualification data / details for Contractor's key personnel
- The procedure for purchase of materials, parts, components and selection of sub-contractor's services including vendor analysis, source inspection, incoming raw-material inspection, verification of materials purchased, etc.
- System for shop manufacturing and site erection controls including process, fabrication and assembly
- Control of non-conforming items and system for corrective actions and resolution of deviations
- Inspection and test procedure both for manufacture and field activities
- Control of calibration and testing of measuring testing equipment
- System for Quality Audits
- System for identification and appraisal of inspection status
- System for authorizing release of manufactured product to the SCCL
- System for handling, storage and delivery
- System for maintenance of records
- Quality plans for manufacturing and field activities detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of work/ equipment/component.

**3.0.0 QA AND QC MANPOWER**

3.1.0 The contractor shall nominate one overall QA coordinator for the contract detailing the name, designation, contact details and address at the time of post bid discussions. All correspondence related to Quality Assurance shall be addressed by the contractor's QA coordinator to SCCL. SCCL shall address all correspondence related to Quality issues to the contractor's QA coordinator. The contractor's QA coordinator shall be responsible for co-ordination of Quality activities between various divisions of the contractor and their sub-vendors on one hand & with SCCL on the other hand.

3.2.0 The contractor shall appoint a dedicated, experienced and competent QA&QC in-charge at site, preferably directly reporting to the Project Manager, supported as necessary by experienced personnel, to ensure the effective implementation of the

approved QAP. An indicative structure of contractor's QA&QC manpower required to be deployed at site is enclosed at Annexure-I. Based on the finalized L-2 network and the approved Field Quality plan, the contractor shall finalize and submit a deployment schedule of QA&QC personnel along with their details to SCCL for approval/ acceptance and further shall ensure their availability well before the start of the concern activity.

3.3.0 The QA&QC in-charge shall have the organizational freedom and authority to implement the requirements of these quality assurance arrangements, free from commercial and programme restraints. The QA&QC setup of the contractor shall consist of qualified and experienced Civil, Electrical, Mechanical Engineers and Laboratory assistants with their supporting staff both at their works and site.

3.4.0 The deployment of man power for QA & QC set up shall be affected on the basis of agreed manpower deployment schedule, which shall be prepared by the contractor based on the L-2 network and the same shall be submitted to the engineer-in-charge for acceptance.

**4.0.0 SAMPLING AND TESTING OF CONSTRUCTION MATERIALS**

4.1.0 The method of sampling for testing of construction materials and work / job samples shall be as per the relevant IS / standards / codes and in line with the requirements of the technical specifications / quality plans. All samples shall be jointly drawn, signed and sealed wherever required, by the contractor and the engineer or his authorized representative.

4.2.0 The contractor shall carry out testing in accordance with the relevant IS / standards / codes and in line with the requirements of the technical specifications / quality plans. Where no specific testing procedure is mentioned, the tests shall be carried out as per the best prevalent engineering practices and to the directions of the Engineer. All testing shall be done in the presence of the engineer or his authorized representative.

4.3.0 Before execution of any civil work the contractor shall conduct full-scale suitability tests on various construction and building material such as fine and coarse aggregates, cement, reinforcement, construction chemicals, supplementary cementitious materials and construction water to ascertain their suitability for use and the concrete mix designs conducted from reputed institutes such as NCB-Ballabhgarh, CSMRS-Delhi, IIT's, etc. as agreed by the engineer. The test samples for such full scale testing shall be jointly sampled and sealed by the engineer and contractor, thereafter these shall be sent to the concerned laboratory through the covering letter signed by field quality assurance (FQA) representative of the engineer.

4.4.0 The contractor shall timely initiate the action with regard to the evaluation of aggregates and other building material including concrete mix design, so as to ensure completion of these tests before start of civil works at site, thereby not affecting any project work. The test reports and recommendations for suitability of

the materials including concrete mix design shall be promptly submitted by the contractor to the engineer.

4.5.0 Evaluation of aggregate for potential alkali-aggregate reactivity shall be carried out as per following scope of work

A. Evaluation of Aggregates for Mechanical / Physical Properties

a) To carry out different tests on coarse aggregate sample i.e. specific gravity, water absorption, sieve analysis, deleterious material; soundness, crushing value, impact value, abrasion value, elongation index and flakiness index, as per IS: 2386.

b) To carry out different tests on fine aggregate sample i.e. specific gravity, water absorption, sieve analysis, deleterious material, soundness, silt content, clay content and organic impurities as per IS: 2386.

c) To prepare evaluation report based on test results of a) and b) above and to advise regarding suitability of fine and coarse aggregates.

B. Evaluation of Aggregates for Potential Alkali-Aggregate Reactivity:

a) To carry out petrographic analysis and accelerated Mortar bar Test on aggregate samples (1N NaOH at 80 deg. Centigrade for 14 days as per ASTM 1260, or the method established/ developed by CSMRS for 22days test).

b) If rock type is limestone, alkali carbonate reactivity test shall also be carried out wherein the parameters shall be reported in conjunction with the petrographic analysis. Additionally, X-Ray diffraction test (XRD) shall be carried out to determine critical clay mineral in the rock for preliminary conclusions. For limestone aggregates to be used in dynamic foundations like TG, BFP, Fans, mills and crushers, repeated temperature cycle test shall also be carried out, to determine residual expansion of aggregate for concrete.

c) To prepare a report based on test results of a) and b) above and to advise regarding suitability of aggregates to be used and further testing required if any.

**5.0.0 LABORATORY AND FIELD TESTING**

5.1.0 The field laboratory for QA and QC activities shall be constructed and set-up by the contractor in line with the indicative field QA&QC laboratory set-up enclosed at Annexure-II. The Laboratory building shall be constructed and installed with the adequate facilities to meet the requirement of envisaged test setup. Temperature and humidity controls shall be available wherever necessary during testing of

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| | samples. The quality plan shall identify the testing equipments/ instrument, which the contractor shall deploy and equip the field quality laboratory for meeting the field quality plan requirements. The contractor shall furnish a comprehensive list of testing equipments/ instrument required to meet the planned/scheduled tests for the execution of works for SCCL acceptance/ approval. The contractor shall mobilize the requisite laboratory equipment and QA&QC manpower at least 15 days prior to the planned test activity as per the schedule of tests. |
| 5.2.0 | All equipments and instruments in the field shall be calibrated before the commencement of tests and then at regular intervals, as per the manufacturer's recommendation and as directed by the SCCL The calibration certificates shall specify the fitness of the equipments and instruments within the limit of tolerance for use. Contractor shall arrange for calibration of equipments and instruments by an NABL / NPL accredited agency and the calibration report shall be submitted to SCCL. |
| 5.3.0 | The tests which cannot be carried out in the field laboratory shall be done at a laboratory of repute. This includes all IITs, NCB, CSMRS, reputed government / autonomous laboratories / organizations, NITs and other reputed testing laboratories. The test samples for such test shall be jointly selected and sealed by the engineer and thereafter these shall be sent to the concerned laboratory through the covering letter signed by SCCL engineer. The test report along with the recommendations shall be obtained from the laboratories without delay and submitted to SCCL. |
| 5.4.0 | Based on the schedule of work agreed with the engineer-in-charge and the approved FQP, the contractor shall prepare a schedule of tests and submit them to the engineer-in-charge and organize to carry out the tests as scheduled / agreed. |
| **6.0.0** | **PURCHASE AND SERVICE** |
| 6.1.0 | The major items/ equipments/ components to be manufactured in the shop of the contractor i.e. in-house items and those procured from sub-vendors / sub-manufacturer / sub-contractors i.e. bought out items (BOIs) shall be listed out by the contractor in their bid proposal. |
| 6.2.0 | An indicative list of major bought out items (not exhaustive) and services for civil works is enclosed at Annexure- III, for which the contractor shall submit the requisite details / lists of manufacturer's in their bid proposal. The list of manufacturers/ sub-vendors for all the BOIs envisaged in contract including shall be included in the bid proposal by the contractor which shall be discussed / reviewed by the SCCL during post bid discussions and the list of proposed manufacturers / sub-vendors for each of the BOIs shall be agreed/ approved. If any item is left out or gets included during detailed engineering, the contractor shall propose the manufacturer's / sub-vendor's details for review / approval of SCCL, prior to initiating the procurement of such materials. |
| 6.3.0 | Where the manufacturers are placed in details required ("DR") category, the details of the manufacturers / sub-vendors placed in the "DR" category shall be submitted to |

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| | the SCCL for approval in the prescribed SCCL format no. QA-01-QAI-P-04/F1-R0 (main supplier's evaluation report) and format no. QA-01-QAI-P-04/F2-R0 (sub supplier questionnaire) within the period agreed at the time of post bid discussions. The contractor's proposal shall include vendor's site facilities, expertise, facilities established at the respective works, the process capability, process stabilization, QC systems followed, experience list, etc. along with his own technical evaluation for identified sub-Contractors proposed. The formats for furnishing above details shall be given to the Contractor at post bid discussion stage. Monthly progress reports on sub-contractor detail submission / approval shall be furnished on format no. QS-01-QAI-P-02/F1. Such manufacturers / sub-vendors approval shall not relieve the contractor from any obligation, duty or responsibility under the contract. |
| 6.4.0 | To facilitate advance planning of material testing/ approval of bought out items, well before the start of activity as per L-2 network, representative samples shall be procured by the contractor from approved sub-vendors and submitted to the engineer for his approval before bulk procurement at least two months prior to start of works. In case of manufacturers test certificate (MTC) is submitted for acceptance, it shall be clearly traceable and correlated with the consignment received at site. MTC of all bought out items shall essentially contain all the test parameters / characteristics specified in the technical specifications / standards / codes. In case the manufacturer's test certificate does not mention these details, sample from each lot shall be tested for these properties at the third party lab acceptable to SCCL. Approval of material / sample by the engineer shall not relieve the contractor of his responsibility, for their conformance to the specification, as well as the requisite performance and quality of material. |
| 6.5.0 | Structural steel supply if in the scope of the contractor shall be procured from main steel producers like SAIL, TISCO, IISCO, RINL, Essar Steel, Ispat Industries, JSW Steel, Lloyds Steel, Jindal Steel & Power. In case of non-availability of some of the sections with main steel producers the contractor may propose to procure the sections from the re-rollers of the main steel producers, the name of such re-rollers will have to be cleared by corporate quality assurance of SCCL for which details such as BIS approval, main steel producer's approval, past experience for production of sections of specified material, details of machines plants testing facilities etc., Confirmation that the process control and manufacturing of steel sections by re-rollers shall be same as that of main steel producers, that billets for re-rolling will be sourced from main steel producers only shall be furnished with regards to re-roller. |
| 6.6.0 | Even after clearance of re-rollers, induction of billets with identified and correlated Mill test certificates (TC's) in the process of re-rolling, sampling of steel, quality checks thereof and stamping of final product for further identification and correlation with TC's prior to dispatch shall be the responsibility of the contractor and these shall be performed in presence of the authorized representative of the main Contractor. |
| 6.7.0 | Reinforcement steel supply if in the scope of the contractor shall be procured from main steel producers like SAIL, TISCO, IISCO, RINL, Essar Steel, Ispat Industries, JSW Steel, Lloyds Steel, Jindal Steel & Power and mill test certificates (TC) is to be obtained and submitted to SCCL for co-relation. In case any size /diameter specified is not available with main steel producers and are proposed to be supplied from the |

conversion agent of the main steel producer the name of such conversion agent / re-roller shall have to be approved by SCCL for which details such as BIS approval, Main steel producer's approval, Past experience for production of sections of specified material, details of machines, plants testing facilities etc., and confirmation that the process control and manufacturing of steel sections by re-rollers is the same as that of main steel producers, that billets for re-rolling are sourced from main steel producers only shall be furnished with regards to re-roller.

**7.0.0 MANUFACTURING QUALITY PLAN AND FIELD QUALITY PLAN**

7.1.0 All materials / components and equipment covered under the scope of work, shall be procured by the contractor for the purpose of the contract, after obtaining the written approval of the SCCL, which are to be manufactured at shop/ factory of the vendor/sub vendor shall be covered under a comprehensive quality assurance programme. The contractor's purchase specifications and inquiries shall call for Manufacturing Quality Plans (MQP) to be submitted by the sub-contractor/ sub-supplier/ sub-vendor. The MQP called for from the sub-contractor shall detail out for all the components and equipment, various tests / inspection, to be carried out as per the requirements of this specification and standards mentioned therein, quality practices and procedures followed by contractor's / sub-contractor's / sub-supplier's quality control organization, the relevant reference documents and standards, acceptance norms, inspection documents raised etc., during all stages of materials procurement, manufacture, assembly and final testing/ performance testing. Such quality plans of the vendors / sub-vendors shall be submitted to the SCCL for approval in the prescribed format no. QS-01-QAI-P-09/F1-R1 for MQP and such approved quality plans shall form a part of the purchase order / contract between the contractor and sub-contractor. The quality plans shall be submitted on electronic form e.g. CD or E-mail in addition to hard copy, for review and approval of SCCL. After approval the same shall be submitted in compiled form on CD in addition to hard copy.

7.2.0 The contractor shall furnish copies of the reference documents/ plant standards / acceptance norms/ tests and inspection procedure etc., as referred in quality plans. These quality plans and reference documents/standards etc. will be subject to SCCL approval without which manufacturer shall not proceed. These approved documents shall form a part of the contract. In these approved quality plans, SCCL shall identify customer hold points (CHP), i.e. test/ checks which shall be carried out in presence of the SCCL engineer or his authorized representative and beyond which the work shall not proceed without consent of SCCL in writing. All deviations to this specification, approved quality plans and applicable standards must be documented and referred to SCCL along with technical justification for approval and dispositioning.

7.3.0 Within three weeks of the release of the purchase orders /contracts for such bought out items /components, a copy of the same without price details but together with the detailed purchase specifications, quality plans and delivery conditions shall be furnished to the SCCL for reference / record by the contractor along with a report of the purchase orders placed so far for the contract.

| CLAUSE NO. | QUALITY ASSURANCE |
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| 7.4.0 | Well before the start of the work, the contractor shall prepare and submit the Field Quality Plans (FQP) on the format No. QS-01-QAI-P-09/F2-R1, and obtain approval of SCCL, which shall detail out for all the works, equipments, services, quality practices and procedures etc in line with the requirement of the technical specifications to be followed by the contractor at site. This FQP shall cover for all the items / activities covered in the contract / schedule of items required, right from material procurement to completion of the work at site. An Indicative Field Quality Plan for civil works is enclosed at Annexure – IV-A (Indicative FQP for civil works) & Annexure – IV-B (Indicative FQP for structural steel works). |
| 7.5.0 | Monthly progress reports on MQP / FQP submission / approval shall be furnished by the contractor on the format No. QS-01-QAI-P-02/F1-R0. List of items requiring quality plans and sub-supplier approval shall be finalized with the contractor on the format no. QS-01-QAI-P-01/F3-R1 during the post bid discussions. |
| **8.0.0** | **DISPOSITIONING OF NON CONFORMITIES** |
| 8.1.0 | The non-conformity for the site works on being detected / noted shall be reported by the contractor in the standard format no. QS-01-FQA-P-08/F1-R0 (Issue 2) of SCCL under the system of dispositioning of non conformity report (NCR) to the engineer. The dispositioning of the NCR relating to equipment, assemblies, materials condition or process during construction / erection shall describe the proposed correction and also include the preventive / corrective action plan for future. |
| **9.0.0** | **QUALITY AUDIT** |
| 9.1.0 | SCCL reserves the right to carry out quality audit and quality surveillance of the quality management and control activities, systems and procedures of the contractor or their sub-contractor. The contractor shall provide all necessary assistance to enable the SCCL carry out such audit and surveillance. The contractor shall also take necessary measures, raise NCRs wherever required based on the audit findings / observations. |
| **10.0.0** | **QA DOCUMENTATION PACKAGE** |
| 10.1.0 | The contractor shall be required to submit the QA documentation in two hard copies and two CD ROMs, as identified in respective quality plan with tick (√) mark. Typical contents of QA documentation pertaining to field activities as per approved MQP, FQP and other agreed manuals / procedures, prior to commissioning of individual system shall generally contain the Quality Plan, Material mill test reports, Non-destructive examination results / reports, Heat Treatment Certificate/Record, Non-conformance Reports, CHP, Certificate of Conformance (COC) and MDCC. |
| **11.0.0** | **GENERAL QA REQUIREMENTS** |
| 11.1.0 | The contractor shall ensure that the works, BOIs and services under the scope of contract whether manufactured or performed within contractor's works or at his sub-contractor's premises or at the SCCL's site or at any other place of work are in accordance with the SCCL technical specification, applicable standards / codes, |

approved drawings / data sheets / quality plans and BOQ. All the works, BOIs and services shall be carried out as per the best prevalent engineering practices and to the directions of the Engineer.

**11.1.1 STORAGE AND HANDLING OF CONSTRUCTION MATERIALS**

All materials shall be stacked and stored by the Contractor as per IS-4082 and as per the requirements specified in SCCL Technical Specification.

**11.1.2 EXCAVATION AND FILLING WORKS**

The contractor shall submit a work methodology covering various items of works for all stages of excavation and filling works. This methodology shall broadly include the quantity wise and classification wise identification of source of excavation and filling, suitability tests as per specification requirements, method of stockpiling, transportation, placement, spreading , compaction, equipment, list of protocols, in-situ tests, third party lab test if required, acceptance checks for final clearance.

For blasting work at site if required, the contractor shall associate themselves with the reputed specialized blasting agency such as CMRI, NIRM for trials blasts, design blasts, blasting pattern, monitoring of blast during the blasting operations at site. The contractor shall install and operate equipment (such as tri-axial seismograph) for continuous monitoring and control of blast induced vibrations, noise level/ air pressure, dust, silica and noxious gases during all blasting operations in line with the technical specification requirements in association with the specialized blasting agency. The contractor shall submit the un-priced copy of the award on the specialized blasting agencies to SCCL, highlighting the scope of services / work awarded to them by contractor. The services of such specialized blasting agency shall be available through out the period in which the blasting work is undertaken at site. The blasting operation shall remain in charge of a responsible, competent, authorized and experienced supervisor (man-in-charge) and thoroughly acquainted workmen. All blasting work shall be done as per approved blasting scheme/ design/ pattern in line with the technical specification requirements and all statutory laws, rules, regulations, relevant standards pertaining to the acquisition, transport, storage, handling along with use of explosives shall be strictly followed by the contractor.

Tolerance for finished surface level shall be within 20 mm of the level shown in the drawing. For an unimportant area, tolerance up to +75mm shall be acceptable at the discretion of the engineer. However, these tolerances shall be applicable for localized areas only.

Acceptance criteria shall be

a) When only one set of sample is tested, then all individual samples collected and tested should pass without any deviation

b) For retest of any sample two additional samples shall be collected and tested, and both should pass without any deviation.

c) Where a large number of samples are tested for a particular test then 9 samples out of every 10 consecutive samples tested shall meet the specification requirement.

**11.1.3 MASONRY AND ALLIED WORKS**

The execution, finishing, testing and acceptance of masonry related works shall be as per the provisions of technical specifications / relevant practices IS code. Local depressions on account of faulty workmanship, broken / chipped edges shall not be acceptable.

All masonry shall be built true and plumb within the tolerances prescribed as below. Care shall be taken to keep the perpends properly aligned. Unless specified otherwise the tolerances in construction of masonry works shall be as below:

| Sl. No. | Type of Check | Tolerance |
|---|---|---|
| | Deviation in verticality in total height of any wall of a building | Shall not exceed ± 12.5mm (more than one storey)<br><br>± 6mm per 3m height (within a storey) |
| | Deviation from the position shown on the plan of any brickwork | Shall not exceed 12.5mm (more than one storey) |
| | Relative displacement between load bearing walls in adjacent storeys intended to be in vertical alignment | Shall not exceed 6mm |
| | Deviation of bed joint from horizontal in any length, and it | Shall not exceed 6mm (upto 12m)<br><br>Shall not exceed 12.5mm total (in any length over 12m) |
| | Deviation from the specified thickness of bed-joints, cross-joints or perpends | Shall not exceed ± 3mm |
| | Finished plastered surface | Deviation not more than 4 mm when checked with a straight edge of 2 m length placed against the surface |

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| | The average thickness of plaster | Not be less than the specified thickness |
| | The minimum thickness over any portion of the surface | Not less than the specified thickness by more than 3 mm for plaster thickness above 12mm and 1 mm for ceiling plaster |

**11.1.4 CONCRETE WORKS**

For concreting works provisions of technical specifications and IS: 456 shall apply. A detailed methodology for concrete works shall be submitted by the contractor to SCCL for approval. The methodology may require change / modification based on the site conditions, for which suitable revisions shall be submitted.

The methodology for concrete works shall broadly contain the suitability of source of aggregates, cement, admixture, water and reinforcement steel, etc. The available concrete mix design recommended from a specialist institute, results of trial mix carried out at site, method / control of batching, mixing, transportation, layer wise placement, compaction, fixing / removal of form work, staging, fixing of water stops at appropriate locations along with specials, expansion joints, contraction joints and construction joints, cover blocks and method of curing, methodology of repair of newly placed hardened concrete, testing and sampling of concrete during production and placement and acceptance checks for final clearance.

The equipment, deployment of manpower and machinery shall arranged by the contractor to ensure the continuous rate of placement of specified grade of concrete so as to prevent segregation, bleeding, formation of cold joints, temperature control for concreting in extreme weather conditions and for mass concreting works.

Exposed surfaces of concrete shall be kept continuously in a damp or wet condition for at least seven days from the date of placing concrete in case of ordinary Portland cement, not be less than 10 days for concrete exposed to dry and hot weather conditions, at least 10 days or period may be extended to 14 days where mineral admixtures or blended cements are used. Approved curing compounds may be used in lieu of moist curing with the permission of engineer-in-charge.

Reinforcement steel shall conform to relevant IS codes. Lapping / spacing of reinforcement shall be so staggered that under no circumstances more than 50% of bars at any cross section shall be lapped. Corrosion resistance Steel shall be used for the foundations wherever specified in the technical specification. Sample test for 3% of the number of mechanical bars grips subject to a minimum of three, shall be carried out up to the yield strength of reinforcement of bars.

Ultrasonic pulse velocities (UPV) test as per IS 13311 Part I, for top deck and column of T.G. foundation, to ascertain the homogeneity and integrity of concrete. Test cubes @ 150 cum of concrete, subject to minimum of 6 cubes, shall be

additionally sampled for being used, for carrying out UPV test on cubes. UPV test shall be carried out by a specialized agency.

Test shall be conducted for the water tightness of the liquid retaining structures as per technical specifications, IS 3370 and IS 6494.

All the materials, equipments, processes used in pre cast concrete work shall conform to the requirements for the cast-in-situ concrete.

If fly ash is used in concrete, source of supply shall be checked for suitability as per IS 3812 (Part-I). Routine tests for retention of particles on 45µ sieve and loss on ignition shall be carried out on each lot of fly ash before its use. The storage of fly ash shall be similar to that of cement. Separate Silo for fly ash shall be provided in the batching plant. Validation of Mix design using fly ash shall be carried out by an approved specialist agency, before start of concrete production.

The acceptance criteria of concrete shall be in accordance with clause no.16 of IS 456. However in exceptional circumstances and that too in non-critical areas, the engineer may accept concrete work which is marginally unacceptable as per the criteria laid down in IS 456. For such accepted work, payment shall be made at a reduced rate pro rata to the concrete cube strength obtained, against that stipulated.

All records of concreting, reinforcement, testing of materials, as-built dimensions, the details of the rectification, etc, shall be maintained as given below. Four copies of such record in a bound form shall be submitted to owner for their record and future reference.

a. Testing data / report of aggregates including petrographic examination & potential reactivity of aggregate and repeated temperature cycle tests wherever specified

b. Mix design details and record of trial mixes carried out at site

c. Testing records of admixture as per IS-9103 / ASTM C494 including third party test reports.

d. Approved scheme for concreting

e. Hourly records of concreting including pour card

f. Protocol indicating the dimensional tolerance and details of inserts

g. Records giving the details of rectification giving the location of grouting, the quantity of grout used at each location, type of grout used

h. Bar bending schedule

i. Location and details of mechanical anchoring used for reinforcement

j. Protocol giving the details of checking of reinforcements before concreting and conformance to the reinforcement details as shown in the construction drawings

k. Photographs showing the areas where rectification works have been carried out. Photographs should be taken before and after rectification

l. Temperature control record of concrete at the time of placement if applicable

m. Details of curing, staging and fixing / removal of formwork, checklist for formwork as per Clause 9.9 and Annexure-C of IS 14687 including all machine foundations

n. Batching Plant shall be calibrated regularly at least once in a 3 months. Computerized output shall be taken for each batch of production of concrete. For concreting works of ash pipe pedestals, mixer with weight batcher may be used. Production and supply of concrete from batching plant shall conform to the provisions of IS 4926

o. Dimensions (length, cross sectional dimensions, straightness, squareness, and flatness) and tolerances for pre cast members as per SCCL Technical Specification. Load test on Pre cast members (except pre- cast tiles to be laid in the reservoir) shall be carried out @ 2% up to 1000 nos., @1% from more than 1000 nos. precast members of one type. The load test shall be carried out as per the provisions of IS-456

**TOLERANCES**

| | **Description of Item/ Structural Element** | **Max (mm)** | **Min (mm)** |
|---|---|---|---|
| | **Cast In Situ Concrete** | | |
| 1. | Faces of concrete in foundations and structural members against which back fill is placed | +25 | -10 |
| 2. | Eccentricity of footing as percentage of footing width in the direction of placement | 2% but limited to 50mm | |
| 3. | Top surfaces of slabs and of concrete to receive base plates to be grouted | +5 | -5 |
| 4. | Alignment of beams, lintels, columns, walls, slabs and similar structural elements | +5 | -5 |

**TOLERANCES**

| | Description of Item/ Structural Element | | Max (mm) | Min (mm) |
|---|---|---|---|---|
| 5. | Cross sectional dimensions of walls, slabs and similar structural elements | | +5 | -5 |
| 6. | Deviation from specified dimensions of cross-section of columns and beams | | +12 | -6 |
| 7. | Alignment of holding down bolts without sleeves | | +1.5 | -1.5 |
| 8. | Alignment of holding down bolts with sleeves | | +5 | -5 |
| 9. | Level of holding down bolt assemblies | | +10 | -10 |
| 10. | Embedded Parts (in any direction). | | +5 | -5 |
| 11. | Level of embedment for equipment support | | +1.5 | 0 |
| 12. | Level of embedment for other embedded parts | | +5 | -5 |
| 13. | Centers of pockets or holes with greatest lateral dimension not exceeding 150mm | | +10 | -10 |
| 14. | Variation in steps | | | |
| | • Riser | | +1.5 | -1.5 |
| | • Tread | | +3.0 | -3.0 |
| **Pre- Cast Concrete** | | | | |
| 15. | Length: | +/- 0.1 percent | +/- 5 | + 10 |
| 16. | Straightness or Bow | 1/750 of the length | +/- 5 | +/- 10 |
| 17. | Cross-sectional dimensions | +/- 3 mm or +/- 0.1 percent whichever is greater | | |
| 18. | Squareness: | When considering the squareness of the corner the length of the two adjacent sides being checked shall be taken as the base line. The shorter side shall not vary | | |

**TOLERANCES**

| Description of Item/ Structural Element | | | Max (mm) | Min (mm) |
|---|---|---|---|---|
| | | in length from the perpendicular by more than 5 mm. | | |
| 19. | Flatness: | The maximum deviation from a 1.5m straight edge placed in any position on a nominal plant surface shall not exceed 5 mm. | | |
| **Placing of reinforcement and for cover** | | | Clause 12.3.1 and 12.3.2 of IS 456 | |
| **Formwork** | | | Clause 9.6 of IS 14687 and 11.1 of IS 456 | |
| **Batching** | | | Clause 10.2.2 of IS 456 | |

**11.1.5 STRUCTURAL STEEL WORK**

For structural steel works provisions of technical specifications and IS: 800 shall apply. A detailed methodology for structural steel works shall be submitted by the contractor to SCCL for approval. The methodology may require change / modification based on the site conditions, for which suitable revisions shall be submitted.

The contractor shall submit the welding procedures specification (WPS), heat treatment procedures, NDT procedures etc. at least ninety days before scheduled start of erection work at site. All welding and brazing shall be submitted to the SCCL and carried out as per procedure drawn and qualified in accordance with requirements of ASME Section IX/BS-4870 or other International equivalent standard acceptable to the SCCL.

All brazers, welders and welding operators employed on any part of the contract either in the contractor's / sub-contractor's works or at site or elsewhere shall be qualified as per AWSD1.1/ASME Section-IX or BS-4871 or other equivalent International Standards acceptable to the SCCL.

The records of welding procedure qualification and welder qualification test results shall be furnished to the SCCL for approval. However, where required by the SCCL, the tests shall be conducted in presence of SCCL / authorized representative.

No welding shall be carried out on cast iron components for repair. All the heat treatment results shall be recorded on time temperature charts and verified with recommended regimes.

All Non-destructive examination shall be performed in accordance with written procedures as per International Standards and as mentioned elsewhere in the technical specification. The NDT operator shall be qualified as per SNT-TC-IA (of the American Society of non-destructive examination). NDT shall be recorded in a report, which includes details of methods and equipment used, result/evaluation, job data and identification of personnel employed and details of co-relation of the test report with the job. The records of RT (Films) and UT (inspection records or printed reports if possible) shall be documented and produced to SCCL.

Low hydrogen electrode (AWS E-7018) for welding of High/Medium tensile steel, for M.S (IS 2062 Gr. A/Gr. B, IS 8500) sections thickness above 20mm shall be used. Preheating and Post weld heat treatment requirements shall be complied as specified in the technical specification / approved WPS.

The requirements of pre-heating shall be

| Thickness of thickest part at the area of welding / heat affected zone | Welding using other than low hydrogen welding electrodes IS 2062 | Welding using low hydrogen welding electrodes or submerged arc welding IS 2062 |
|---|---|---|
| Upto 20 mm (including) | None | None |
| Over 20 mm to 40 mm (including) | Not allowed | $20^0$ C |
| Over 40 mm to 63 mm (including) | Not allowed | $66^0$ C |
| Over 63 mm | Not allowed | $110^0$ C |

The following tests / checks shall be carried out for structural steel works

| SL. NO. | TESTS / CHECKS | QUANTUM / STANDARD |
|---|---|---|
| 1. | Physical and chemical properties of material if supply in the scope of contractor | As per relevant codes, review of correlated mill test certificates or check testing in absence of MTC |
| 2. | Ultrasonic test on plates above 40mm | As per ASTM A435 |

| SL. NO. | TESTS / CHECKS | QUANTUM / STANDARD |
|---|---|---|
| 3. | Welding procedure & welders qualification test | AWSD1.1/ASME Section-IX or BS-4871 or other equivalent International Standards |
| Fillet Weld | | |
| 4. | Macro-etch examination on production test coupons for main fillet welds | Minimum one joint per built up beams, columns and crane girder etc. |
| 5. | tension member of crane girder | Dye penetration test on 25% weld length |
| 6. | All other fillet welds | DPT on 5% of weld length with minimum 300mm at each location |
| Butt Weld | | |
| 7. | DPT | 100% after back gouging on all butt welds except for coal bunker bins<br><br>10% after back gouging-For coal bunker bins |
| 8. | Mechanical testing of production test coupons | Minimum one joint per built up beam, column and crane girder. |
| 9. | Radiography test on butt welds<br><br>(In case of failure of any welds in SPOT/RT or UT the % of retesting shall be doubled at that particular location. Acceptance criteria of NDT on welds shall be as per AWS D1.1.<br><br>Wherever RT is not feasible UT to be carried out with the approval of the engineer) | 100% RT on butt welds of tension flange (bottom flange) of crane girders<br><br>10% RT weld length of each welder on butt welds, except for crane girders and coal bunker<br><br>5% spot RT on butt welds / at inaccessible locations UT on butt welds- For coal bunker bins |

| SL. NO. | TESTS / CHECKS | QUANTUM / STANDARD |
|---|---|---|
| 10. | Ultrasonic testing on full penetration welds (other than butt welds) | 100% UT on the web to flange joint of crane girder<br><br>10% UT on other full penetration joints |
| 11. | Control assembly check in shop before erection | 1st and further every 10th set of identical structure |
| 12. | Dimensional tolerances during fabrication and erection | as per IS-7215 and IS-12843 |
| 13. | Surface Preparation and Paint thickness | SA 2 1/2 , By elcometer random after each coat, each member |
| CW Liners site fabrication (Field shop) test | | |
| 14. | WPS,PQR& welder's Qualification | 100% |
| 15. | DPT on root run | 100% DPT for pipes upto 1200mm diameter |
| 16. | DPT after back gouging | 100% DPT for pipes above 1200mm diameter |
| 17. | UT | Not recommended. |
| 18. | RT | 5% RT |
| 19. | DPT on finished butt welds | 10% DPT |
| 20. | Hydraulic tests | 1.5 times the design pressure or 2 times the working pressure which ever is higher. |
| CW Liners erection site test | | |
| 21. | WPS,PQR& welder's Qualification | 100% |
| 22. | DPT on root run | 100% DPT for pipes upto 1200mm diameter |

| SL. NO. | TESTS / CHECKS | QUANTUM / STANDARD |
|---|---|---|
| 23. | DPT after back gouging | 100% DPT for pipes above 1200mm diameter |
| 24. | UT | Not recommended. |
| 25. | RT | 5% RT |
| 26. | DPT on finished butt welds | 10% DPT |
| 27. | Hydraulic tests | 1.5 times the design pressure or 2 times the working pressure which ever is higher.<br><br>In cases where hydraulic test is not possible the same may be substituted with 100%RT |
| 28. | Tolerances | As per approved drawings, as per IS : 7215 for fabrication and IS : 12843 for erection of steel structures |

**11.1.5.1** **STOPLOG AND TRASH RACKS**

Structural design shall be as per IS 5620 and IS 4622 and as per details given in technical specifications. The trash rack to be provided shall be Type-1 trash rack (removable section rack), conforming to IS: 11388 (latest). Filling valves shall be provided in the stop logs to balance the water pressure before lifting the stop log. Leakage test shall be carried out in the stop logs as per the methodology specified in the technical specification. The leakage measured shall not be more than 5 liters/ minute /meter of length of seal under maximum head. Radiographic examination or magnetic particle testing or other comparable tests shall be carried out for determining the soundness of steel castings and shall be conducted by the contractor as per the technical specification requirements. The contractor shall submit a manufacturing and field quality plans in SCCL format incorporating all the quality aspects mentioned in the technical specifications.

The lifting beam is to be tested for twice the weight of the heaviest component to be lifted by the beam. IS 13591 shall be referred for measurement of the deflection and acceptance criteria.

**11.1.5.2 COAL TAR ANTI-CORROSION TAPE**

Coal tar anti corrosion tape shall conform to the requirements of IS:15337. The Manufacturers test certificate for each lot of supply of the coal tar anti corrosion tape shall contain the softening point, needle penetration, filler content, breaking load in the longitudinal direction, service temperature, direct impact test, cathodic disbonding, microbiological tests and solubility. In case the manufacturer's test certificate does not mention these details, sample from each lot shall be tested for these properties at the third party lab acceptable to SCCL.

Tests for Adhesion, holiday test, mass, thickness shall be carried out randomly at site.

**11.1.6 PAINTING WORKS**

Painting works shall be carried out as per the provisions of technical specifications. A detailed methodology for painting works shall be submitted by the contractor to SCCL for approval. The methodology may require change / modification based on the site conditions, for which suitable revisions shall be submitted.

The methodology for painting works shall broadly contain the source of approved brand of paints, shot / sand blasting as specified, minimum acceptable size of shot used for blasting, application of primer, intermediate coat and final coat, experience of applicator, etc. testing of painting work and acceptance checks for final clearance. For PU coating works if specified, material shall be procured from SCCL approved source and the application of the PU coating shall be carried out by an experienced authorized applicator of the material supplier approved by SCCL. A separate quality plan and methodology for PU coating works shall be submitted by the contractor for approval of SCCL. Based on the approved quality plan, the tests on material and works shall be got conducted at specialist laboratories like IICT Hyderabad, CECRI Karaikudi.

**11.1.7 SHEETING WORKS**

All bought out items shall be procured from the manufacturer's approved by engineer and tested as per relevant IS Codes/ Specification. Raw material of colour coated sheets shall meet the chemical & physical properties as per relevant standards / codes referred in the approved data sheet. It shall be tested for bare metal thickness, thickness of coatings, type of coating/paint, hardness of painted surface as per IS14246 (2H pencil hardness), flexibility test, bend test as per ASTM D 328/ IS 14246 at 180 degree, dimensional check after profiling of sheets, cross hatch test, salt spray test as per ASTM B-117/ IS 9844 for minimum 1000 hrs one sample per batch at random. For true representative sampling, three samples shall be taken from each batch out of which one sample shall be sent for salt spray test as per IS14246, the samples may be chosen from the batches offered for inspection, one at the beginning of supply, another at the middle of supply and the third towards the end of the supply.

Bonded Mineral Wool Insulation shall meet the requirements of thickness, density, thermal Conductivity, all other tests as per the technical specifications and IS-8183.

For sheet installation no gas cut opening shall be allowed at the site, whenever opening is specified these shall be properly cut in the factory and shall be filled with lipping / flashing for true shape / dimension etc. The sheets/ packets shall be stacked neatly clear off the ground at an angle to the ground, over a base pallet to provide drainage. Water / moisture should not be allowed to stagnate on surface, or in between layers. This can damage the coating, and cause corrosion.

**11.1.8 TILE WORKS**

The execution, finishing, testing and acceptance of tile works shall be as per the provisions of technical specifications. The material for tile works shall be procured from the SCCL approved brand / source. Local depressions on account of faulty workmanship, tiles / natural stones with cracked or broken / chipped edges shall not be acceptable.

The tests shall be carried out on acid resistant bricks / tile- water absorption, compressive strength, resistance to acid, flexural strength, dimensions and all other tests as per IS 4860 and IS 4457, bitumastic ready mixed paint as per IS 158, bitumastic as per IS 9510, potassium silicate, resin type and sulphur type mortars as per IS 4832, part I, II and III, surface preparation for painting as per IS 2395, epoxy painting shall be carried for required coating thickness and dry film thickness.

**11.1.9 FIRE PROOF DOORS**

Fire Proof doors shall be tested for the requirements mentioned in IS-3614 Part-I&II and The Technical Specification. The type test of the doors shall be carried out at CBRI Roorkee for minimum 2 hours fire rating and its Fabrication drawing shall also be approved by CBRI, Roorkee. DFT of paint of Fire Proof Doors and its fittings and fixtures as per BOQ shall be checked. The doors shall be finished with suitable fire retardant painting system

**11.1.10 WATER PROOFING**

The execution, finishing, testing and acceptance of water proofing works shall be as per the provisions of technical specifications. The material for the works shall be procured from the SCCL approved brand / source and the works shall be executed by the authorized applicator of the supplier.

Water proofing shall be tested for water tightness by creating a pond of water minimum 25 mm height on area of 6 m x 6 m, for the period of 48 hrs on fully dried elastomeric membrane surfaces. Minimum 5% area of the roof shall be subjected to water tightness test. Such test necessarily be conducted on vulnerable areas like drain channel / drain head. No dampness shall be visible on the underneath side of roof (i.e. ceiling), parapet and well junctions etc. which have been subjected for testing. The above testing shall be carried out prior to application of wearing course.

**11.1.11 PILING WORK**

For piling works provisions of technical specifications, approved drawings, BOQs and relevant IS codes / standards shall apply. The piling works shall be executed by the agency meeting the qualifying requirements as specified. A detailed methodology for piling works shall be submitted by the contractor to SCCL for approval. The methodology may require change / modification based on the site conditions, for which suitable revisions shall be submitted.

The methodology for piling works shall broadly contain the method of boring, stability of bore hole, termination criteria, tests / checks for termination level, fabrication of cage, cage lowering, concrete batching / mixing, transportation, placing, recording of the time of construction operations, method of conducting initial and routine load tests, testing and sampling of concrete during production and placement and acceptance checks on piles for final clearance.

The equipment, deployment of manpower and machinery shall be arranged by the contractor to prevent the collapse of bore hole and to ensure continuous rate of placement of specified grade of concrete.

The piling works shall be executed as per the technical specifications, approved drawings, relevant codes / standards, FQP and BOQ. In addition to the requirements of technical specifications, the following shall also be ensured while execution of piling works:

a) Time gap between completion of pile boring and start of concreting should be kept to the minimum. However the maximum time gap shall not be more than 6 hours.

b) Muck Debris should be removed from the pile bore by air lift technique(by keeping the tremie & air pipe as close as to bottom of pile bore) i.e. after completion of boring, after completion of SPT(wherever applicable), after lowering reinforcement cage, but before start of concreting.

c) Density of bentonite slurry shall be checked from the sample taken from the bottom of pile bore( not at 1.0 m above the bottom of the pile bore)

d) Minimum two welding sets shall be kept ready to join the two cages of reinforcement by engaging 3 or more welders. This will ensure the lowering of R/F cage in minimum time.

e) While lowering the R/F cage into the pile bore, two hooks shall always be used to ensure balanced/symmetrical insertion of cage into the pile bore.

f) Concrete cover blocks at the junction of two R/F cage shall be ensured before lowering the second segment.

g) Surge concreting of about 1.0 cum shall be ensured at the start of concreting (i.e. in the first pour), by suddenly allowing to fall through the tremie pipe from the funnel. This will help in displacing left out muck/debris in the pile bore (by the impact).

h) Continuous feeding of concrete shall be ensured by deploying at least two transit concrete mixers (if required to be deployed) and mixing done through concrete batching plant (if deployed). Cold joints in the pile shall be avoided.

i) In a pile group, SPT shall be carried out at termination level in the pile, taken up first.

j) Bentonite slurry circulation to be ensured from start of boring to start of concreting. Flushing of bentonite slurry will only ensure maintaining of density of bentonite slurry uniformly and will not allow bentonite jelly to settle at the bottom, whereas air lift technique with bentonite circulation will ensure removal of muck debris from the bottom of pile bore.

k) Properties of drilling mud shall be checked prior to commencement of the piling work and thereafter, minimum once per week or as found necessary by the engineer. One sample consisting of 3 specimens shall be tested for the above.

l) Low strain pile integrity test on all job piles and test piles shall be conducted as specified in the Technical Specification. This test shall be suitably used to identify the piles for routine tests. High Strain dynamic test shall be done as per the technical specification. The frequency of the test shall be as per the BOQ

m) For Working Piles: Minimum one sample consisting of 6 test cubes shall be made for first ten piles. Out of these 3 shall be tested for 7 days cube strength and 3 for 28 days cube strength. Minimum one sample of 6 test cubes for every 25 nos. of piles shall be tested, out of these 3 shall be tested for 7 days cube strength and 3 for 28 days cube strength

PILE LOAD TEST

Pile load testing shall conform to the requirements of IS-2911 (Part IV) and the technical specification. Initial load tests as specified in the contract documents shall be conducted to assess the safe load carrying capacity of pile before start of work. To verify the load carrying capacity of the working piles, routine load test shall be conducted.

Pile load-testing procedure and the test setup / scheme shall be submitted for approval of SCCL. The contractor shall use the test setup having arrangement for anchor piles / rock anchors alone or combination of anchor piles / rock anchors and kentledge for both vertical compression and uplift (tension) Load test (initial) on piles. The cost of reaction system / piles shall deem to be included in the cost of test piles

All the gauges and instruments shall be calibrated before the start of the tests on test piles and working piles and the calibration record shall be verified before start of execution of the test.

**11.1.12 WATER SUPPLY, DRAINAGE & SANITATION**

Material used for sanitary and plumbing fittings and fixtures shall conform to and be tested as per the requirements of relevant IS Codes specified in SCCL technical specification.

The obstructions in sewer lines shall be checked by inserting a smooth ball, of diameter 13 mm less than the pipe bore at the high end of the sewer or drain. If absence of any obstructions, such as yarn or mortar projecting through the joints, ball shall roll down the invert of the pipe and emerge at the lower end. The straightness shall be checked by means of a mirror at one end of the line and lamp at the other. If the pipeline is straight, the full circle of the light may be observed. The mirror will also indicate obstruction in the barrel, if the pipeline is not straight.

The service pipes shall be slowly and carefully charged with water, allowing all air to escape avoiding all shock or water hammer. The service pipe shall then be inspected under test / working condition of pressure and flow, when all draw-off taps are closed. The service pipes shall be checked for satisfactory support and protection from damage, corrosion and frost.

**11.1.13 ARCHITECTURAL & MISC. WORKS**

Material used for sanitary and plumbing fittings and fixtures, floor finishes and allied work shall conform and tested as per the requirements of relevant IS Codes specified in SCCL technical specification.

Fabricated item like metal doors, windows, ventilators, louvers, rolling shutters and grills etc. shall be checked for correctness of locations and smoothness of operation and fixtures. All controls and locking devices shall give fault free performance. Door and window shutters shall operate without jamming. The clearance at head and jamb for door shutters shall not exceed 1.5 mm. For double leaf doors, the gap at the meeting stiles shall not be more than 2.5 mm.

Materials used in glass and glazing shall be procured from source approved by SCCL and shall conform to the requirements of the Technical Specification and IS Codes.

False ceiling panels shall be best quality material in thickness and properties called for in the specification / schedule of items. Material Test Certificate to be submitted before bulk supply.

All bought items covered in the scope of contract shall be procured from sources approved by SCCL and shall conform to the requirements of the technical specifications and referred standards /codes.

| CLAUSE NO. | QUALITY ASSURANCE |
|---|---|
| **11.1.14** | **ROAD WORK**<br><br>Quality Assurance and testing requirements for roadwork shall be as per the MOSRTH-Specification (Section 900), IRC specifications or CPWD specifications as specified in the technical specifications and BOQ of the contract.<br><br>The testing and sampling shall include the checks on earth work for embankment and subgrade, sub bases and bases and bituminous constructions. The sampling and testing of concrete pavements shall be as per the respective items of earthwork, subgrade / sub-base, concrete, etc. |
| **12.0.0** | **SHOP TEST EOT Cranes,Other cranes & Hoist**<br><br>1.0 HOOKS<br><br>1.01 ALL TESTS INCLUDING PROOF LOAD TEST AS PER RELEVANT IS/BS/DIN SHALL BE CARRIED OUT.<br><br>1.02 MPI/DPT SHALL BE CARRIED OUT AFTER PROOF LOAD TEST.<br><br>2.0 STEEL CASTING<br><br>2.01 DPT ON MACHINED SURFACE SHALL BE CARRIED OUT.<br><br>3.0 GIRDERS, END CARRIAGE,CRAB, GEAR BOX AND ROPE DRUM<br><br>3.01 THE PLATES OF THICKNESS 25MM AND ABOVE SHALL BE ULTRASONICALLY TESTED.<br><br>3.02 NDT REQUIREMENTS ON WELDMENTS SHALL BE AS FOLLOWS:<br><br>a) BUTT WELDS IN TENSION:- 100% RT AND 100% DPT<br><br>b) BUTT WELDS IN COMPRESSION:- 10% RT AND 100% DPT<br><br>c) BUTT WELDS IN ROPE DRUM:- 100% RT AND 100% DPT<br><br>d) FILLET WELDS:- RANDOM 10% DPT<br><br>4.0 FORGING (WHEEL, GEARS, PINIONS, AXLE, HOOKS & HOOK TRUNION)<br><br>**4.01** ALL FORGINGS GREATER THAN OR EQUAL TO 50 MM DIAMETER OR THICKNESS SHALL BE SUBJECTED TO ULTRASONIC TESTING.<br><br>**4.02** DPT/MPI SHALL BE DONE AFTER HARDFACING AND MACHINING. |

5.0 WIRE RPOE SHALL BE TESTED AS PER RELEVANT STANDARD.

6.0 REDUCTION GEARS SHALL BE TESTED FOR REDUCTION RATIO, BACKLASH & CONTACT PATTERN. GEAR BOX SHALL BE SUBJECTED TO NO-LOAD RUN TEST TO CHECK FOR OIL LEAKAGE, TEMPERATURE RISE, NOISE AND VIBRATION.

7.0 THE CRANES SHALL BE COMPLETELY ASSEMBLED AT SHOP FOR FINAL TESTING. ALL TESTS FOR DIMENSION, DEFLECTION, LOAD, OVERLOAD, HOISTING MOTION, CROSS TRAVEL ETC. AS PER IS-3177 SHALL BE CARRIED OUT AT SHOP.

8.0 ALL ELECTRIC HOISTS SHALL BE TESTED AS PER IS-3938 AND CHAIN PULLEY BLOCKS SHALL BE TESTED AS PER IS-3832.

**13.0.0 CATHODIC PROTECTION**

Quality of cathodic protection system shall be as per given table.

| | |
|---|---|
| JOB | (i) **PACKAGE-A:** Civil, Structural, architectural etc of Civil Superstructure work of 2x600 MW Unit#1 for Singareni Thermal Power Project<br>(ii) **PACKAGE-B:** Civil, Structural, architectural etc of Civil Superstructure work of 2x600 MW Unit # 2 for Singareni Thermal Power Project. |
| TENDER NO | Tender no PSER:SCT: SNG-C1356:12 |

| **SL NO** | **CLARIFICATION/ AMENDMENT/ MODIFICATION** | | |
|---|---|---|---|
| **1.0** | **VOLUME-IIIA** | | |
| | CLAUSE NO | QUERY | **CLARIFICATION/ AMENDMENT/ MODIFICATION** |
| 1.1 | ST.No.303A of Vol-IIIA for Pkg-A & Pkg-B | It is observed that the quantity of ST.No.303A of Price Schedule of Package-A & Package-B are different for Formwork of TG Deck and column above FFL. As the unit rating of Unit#1 & Unit#2 are same, please clarify this ambiguity towards quantity of ST. No.303A as shown in Price Schedule of Package-A & Package-B at the earliest. | In the respective package of PB1 and PB2, BOQ quantity may be different as the total scope of package in unit #2 is slightly more than that of unit #1. Hence quantity have been kept slightly more in unit #2. However payment shall be made after taking actual measurement and no revision in BOQ qty is required at now. |

ANNEXURE - 2

FORMAT FOR NO DEVIATION CERTIFICATE
(To be submitted in the bidder's letter head)

BHARAT HEAVY ELECTRICALS LIMITED,
Power Sector - Eastern Region,
Plot no 9/1, DJ Block, Sector – II, Salt Lake City,
Kolkata – 700 091

| | | |
|---|---|---|
| Sub | No Deviation Certificate. | |
| Job | (i) **PACKAGE-A:** Civil, Structural, architectural etc of Civil Superstructure work of 2x600 MW Unit#1 for Singareni Thermal Power Project<br>(ii) **PACKAGE-B:** Civil, Structural, architectural etc of Civil Superstructure work of 2x600 MW Unit # 2 for Singareni Thermal Power Project. | |
| Ref | 1.0 | Tender no PSER:SCT: SNG-C1356:12 |
| | 2.0 | BHEL's NIT, vide reference no PSER:SCT:SNG-C1356:2819, dated 15-05-2012. |
| | 3.0 | BHEL's TCN-01, vide reference no PSER:SCT:SNG-C1356:TCN-01, dated 17-05-2012. |
| | 4.0 | BHEL's TCN-02, vide reference no PSER:SCT:SNG-C1356:TCN-02, dated 29-05-2012. |
| | 5.0 | BHEL's TCN-03, vide reference no PSER:SCT:SNG-C1356:TCN-03, dated 30-05-2012. |
| | 6.0 | All other pertinent issues till date. |

Dear Sirs,

With reference to above, this is to confirm that as per tender conditions, we have visited site before submission of our offer and noted the job content & site conditions etc. We also confirm that we have not changed/ modified the tender documents as appeared in the website/ issued by you and in case of such observance at any stage, it shall be treated as null and void.

We hereby confirm that we have not taken any deviation from tender clauses together with other references as enumerated in the above referred NIT. We hereby confirm our unqualified acceptance to all terms & conditions, unqualified compliance to technical specification, integrity pact (if applicable) and acceptance to reverse auctioning process.

In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null & void.

We confirm to have submitted offer in accordance with tender instructions and as per aforesaid references.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized representative of the bidder)