SUB-SECTION-V-QC4

CONTROL DESK PLC PANEL SMOKE DETECTOR FIRE ALARM & CONTROL SYSTEM

CONTROL DESK, PLC PANEL, SMOKE DETECTOR, FIRE ALARM & CONTROL SYSTEM

ITEMS \ TESTS	Visual ®	GA, BOM ,Lay Out of components ®	Dimensions ®	Paint Shade/Thickness/Adhesion ®	Alignment of Section ®	Component Rating/ Make / Type ®	Wiring ®	IR & HV ®	Review of TC for instruments/ Devices/ Recorders, Indicators/ osaic Items/ Transducers ®	Accessibility of TBS/ Devices ®	Illumination ®	Functional Check for Control Element ,	Mimic ®	Test as per IEC 1131 ® *	Test as per Std ® & (A)
1. Control Desk	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
2. Annunciation/ Control/ PLC Panel	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y			Y	Y
3.Smoke Detectors (UL-268,EN-54 PT-7), Heat Detectors(UL-521/EN 54 PT-5) Annunciation/ Control Panel (UL -864, EN-54, PT-2)															Y

Note: 1) Detailed procedure of Environmental Stress Screening test shall be as per Quality Assurance Programme in General Technical Conditions

2) This is an indicative list of test/ checks. The manufacturer is to furnish a detailed quality plan indicating the Practice and Procedure alongwith relevant supporting documents.

- *Applicable for PLC
- Y - Test Applicable , ® - Routine Test (A) - Acceptance Test

SUB-SECTION-V-QC5

POWER SUPPLY SYSTEM

POWER SUPPLY FOR C&I SYSTEMS (UPS/BATTERY/BATTERY CHARGER/ACDB/DCDB)

ITEMS \ TESTS	Visual/dimension/rating/ Paint Adhesion/ Thickness (R)	General arrangement/BOM/make of components /Mimic®	Efficiency ,regulation(R)	Input voltage variation (A)	Out put voltage and frequency adj.range(A)	Premilinary light load test(R)	Load transfer retransfer test (R) *	AC input faliure and return test (R)	Parralel operation and current divison(R)	Relative harmonic content(R)	Restart with PRI A.C and battery (separately)(R)	System transfer and retransfer (R)*	Asynchronous transfer(R)	Ripple content(R)	Load limiter operation (R)	IR/HV(R)	Tests as per standard &specification (R)&(A)
UPS/CONVERTER (IEC-146 PT-4)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VOLTAGE STABILISER	Y	Y	Y	Y	Y					Y		Y				Y	
LEAD ACID BATTERY(TUBLAR)-IS-1651																	Y
LEAD ACID BATTERY (PLANTE)-IS-1652																	Y
NICKEL CADMIUM BATTERY(IS-10918/IEC-623)																	Y
SMF BATTERY																	Y
ACDB/DCDB	Y	Y														Y	Y
BATTERY CHARGER	Y	Y	Y	Y	Y				Y					Y	Y	Y	Y

R-Routine Test A- Acceptance Test Y – Test applicable

* Transfer time and Over shoot /under shoot during load & system transfer shall be recorded .

Note: 1) Detailed procedure of Environmental Stress Screening test shall be as per Quality Assurance Programme in General Technical Conditions

2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted alongwith relevant supporting documents.

SUB-SECTION-V-QC6

CONTROL VALVE ACTUATORS AND ACCESSORIES

CONTROL VALVE ACTUATORS AND ACCESSORIES.

TESTS / ITEMS	Make,model, tag (r)	Dimension®	Surface finish®	Heat treatment®	Material test certificates®	Ibr certificates®	Hydraulic test®	Ut/radiography for >900 lb rating®	Mpi/dp®	Pressure resistance®	Seat leakage®	Timing open/close®	Linearity/hysterisis®	Functional test, review for make and tc of accessories®
CONTROL VALVE AND ACTUATOR														
Overall	Y	Y	Y			Y	Y				Y	Y	Y	Y
Body		Y	Y	Y	Y			Y	Y	Y				
Bonnet		Y	Y	Y	Y									
Trim		Y			Y			Y*						
Pneumatic actuator	Y	Y								Y				
Electro pneumatic positioner	Y													Y

R- ROUTINE TEST A - ACCEPTANCE TEST Y - TEST APPLICABLE

Y* - **UT ON SPINDLE DIA >= 40 MM.**

NOTE : 1) Detailed procedure of environmental stress screening test shall be as per quality assurance programme general technical conditions

2) This is an indicative list of tests/checks. the manufacture is to furnish a detailed quality plan indicating his practice & procedure along with relevant supporting documents during QP finalisation for all item.

SUB-SECTION-V-QC7

ELECTRICAL ACTUATOR WITH INTEGRAL STARTERS

ELECTRICAL ACTUATOR WITH INTEGRAL STARTER

Test/Attributes Characteristics / ITEM/ COPONENT/ SUB SYSTEM ASSEMBLY/ TESTING	RPM ®	No Load Current ®	IR & HV Test®	Mounting Dimension®	All routine Test as per Standard & Specification®	Correct Phase Sequence®	Operation & Setting of limit Switch/Torque Switch®	Stall Torque/Current (A)	Hand Wheel operation/ Auto de clutch function (A)	Function of Aux. like Potentiometer, space heater, position indicator	EPT output ®	Grease leakage ®	Local/ Remote (Open-Stop-Close) Operation® Safety check (Single phasing, Phase correction, Tripping etc.) (A)
ELECTRICAL ACTUATOR WITH INTEGRAL STARTER(IS_9334)													
Motor	Y	Y	Y	Y	Y								
Final Testing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note: 1) Detailed procedure of Environmental Stress Screening test shall be as per Quality Assurance Programme in General Technical Conditions. Requirement of test and procedure finalized during QP finalization

2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the practices and procedure adopted along with relevant supporting documents.

® - Routine Test **(A) - Acceptance Test** **Y - Test applicable**

(CIVIL WORKS)

SUB-SECTION-V-QD1

SAMPLING, TESTING AND QUALITY ASSURANCE 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 including excavation and filling, cast in situ concrete and allied works, fabrication and erection of structural steel works, masonry / sheeting and allied works, finishing items etc.

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 All tests required for all materials (bought by Contractor) and workmanship shall be done / got done by the contractor at his own cost. 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.

1.4.0 The Contractor shall provide the facilities whatsoever required and also bear the cost for all sampling, testing and quality assurance in the field and in the laboratory. The Contractor shall carry out all sampling and testing in accordance with the relevant Indian standards and / or international standards and this technical specification. 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 sampling shall be done in the presence of the Engineer or his authorised representative. The Contractor shall establish the QA&QC laboratory at site and all field tests shall be done in the presence of the Engineer and / or his authorised representative. The tests which cannot be carried out in the field laboratory shall be done at a laboratory of repute such as CSMRS, NCBM, IITs, National Test House, Kolkata etc. as agreed by the Engineer. 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 FQA representative of the engineer. The cost of transportation and other associative cost including the test charges shall be borne by the contractor. These cost shall deemed to be included in the respective item of work in the contract. If the Engineer desires to witness such tests at laboratory, Contractor shall arrange to conduct the test in his presence.

1.5.0 The recommendations and suitability of material for concreting and other building materials like brick, cement, aggregates etc., shall be ascertained by contractor prior to start of work.

Preliminary evaluation of aggregate and its evaluation for potential alkali-aggregate reactivity as per following scope of work shall be done:-

A. Evaluation of Aggregates:

I. 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.

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

III. To prepare evaluation report based on test results of I) and ii) above and to advise regarding suitability of fine and coarse aggregates.

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

Evaluation for Potential Alkali-Aggregate reactivity as per following scope of work:

I. 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.

II. To prepare a report based on test results of I) above and to advise regarding suitability of aggregates and further testing required if any.

The contractor shall initiate the action with regard to the above mentioned evaluation of aggregates and other building material, so as to ensure timely completion of these tests thereby not affecting any project work. All records shall be submitted, unless specified otherwise, as per the format developed by the Contractor and approved by the Engineer.

1.6.0 The Contractor shall enclose a comprehensive list of bought out items (BOIs) envisaged in the contract for carrying out fabrication/ manufacturing/ erection/ construction/ commissioning activities, procurement of forged, cast, semi-finished and finished components/equipment etc and shall indicate the names of reputed manufacturers for each of them in their bid proposal. The items envisaged by the Contractor to be procured from these manufacturers shall meet the specification requirement. An indicative list of major bought out items (not exhaustive) for civil works is enclosed at **Annexure-I**, for which the contractor shall submit the requisite details / lists of manufacturer's in their bid proposal.

1.7.0 The list of manufacturers / sub-vendors of each of the BOIs identified / indicated by the Contractor shall be discussed / reviewed by the NTPC during post bid discussions and the list of proposed manufacturers / sub-vendors for each of the BOI shall be agreed/ approved. The list of manufacturers for all the BOIs envisaged in contract shall be included in the bid proposal and the same shall be discussed for finalization during the post bid discussions before placement of award. Where the manufacturers are placed in "DR" (Details required) category, the details of the manufacturers / sub-vendors placed in the "DR" category shall be submitted to the NTPC for approval 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. The NTPC shall furnish other relevant formats for information/ clarification for manufacturers / sub-vendors approval to the Contractor at the time of post bid discussions (Main supplier's evaluation report Format No:

QA-01-QAI-P-04/F1-R0 and Sub supplier questionnaire Format no: QA-01-QAI-P-04/F2-R0). Such manufacturers / sub-vendors approval shall not relieve the Contractor from any obligation, duty or responsibility under the contract.

1.8.0 Structural steel and Reinforcement steel supply if in the scope of the contractor shall be procured from Main Steel Producers enlisted by NTPC from time to time. Currently, Main Steel Producers enlisted by NTPC are SAIL, JSW Steel Ltd, Jindal Steel & Power, Tata steel Ltd. (for Reinforcement steel/TMT bars), RINL (for long products/Rolled sections and Reinforcement steel/TMT bars), Essar Steel India Ltd. (for Flat products/ Steel Plates), Electosteel steel Ltd. (for Reinforcement steel/TMT bars) and Monnet Ispat and Energy Ltd. (for long products/Rolled sections and Reinforcement steel/TMT bars). Subsequent, if any new Main Steel Producer/s are enlisted, they may also be considered for procurement during execution of the contract if proposed by the Contractor.

1.9.0 The Field Quality Plans shall detail out all the equipment, the quality practices and procedures etc. to be followed by the Contractor's "Site Quality Control Organisation", during various stages of site activities starting from receipt of materials/equipment at site.

The contractor shall furnish complete QA & QC programme (QAP) for the work envisaged which may include the following:-

- The organisation structure for the management and implementation of the proposed Quality Assurance Programme.
- Documentation Control System
- The procedure for procurement of materials and source inspection.
- System for site controls including process controls.
- Control of non-conforming items and systems for corrective action
- Inspection and test procedures for site activities
- System for indication and appraisal of inspection status
- System for maintenance of records
- System for handling, storage and delivery.
- Quality Plan detailing out quality practices and procedures, relevant standards and acceptance levels for all types of work under the scope of this contract.

The Contractor shall appoint a dedicated, experienced and competent quality management representative on site, preferably directly reporting to the Project Manager, supported by experienced personnel, to ensure the effective implementation of the approved quality assurance programme.

The onsite quality management representative shall have the organisational 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 engineers, with their supporting staff. The QA&QC set up in addition to requisite mechanical & electrical engineers shall consist sufficient graduate civil engineers & supervisors to take care of quality assurance activities of both site & laboratory. An

indicative QA & QC organization chart is attached at **Annexure-III**. 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.

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 organise to carry out the tests as scheduled/ agreed.

The QA&QC laboratory shall have all necessary equipment, instruments and shall be managed by a qualified / experienced person. An indicative list of test equipment is attached at **Annexure-II**. All these testing equipment shall be provided by the contractor at his own cost. The contractor shall maintain the equipment in good working condition along with valid calibration certificates, for the duration of the contract. Any other equipment though required for testing but not listed in the equipment list shall be provided / arranged by the contractor at his own cost.

QA&QC laboratory building shall be constructed by the Contractor at their own cost. The laboratory building shall be constructed and installed with the appropriate facilities. Temperature and humidity controls shall be available wherever necessary during testing of samples.

1.10.0 The contractor shall prepare and obtain approval of the Owner of the Field Quality Plan (FQP) well before the start of the work. This FQP shall cover for all the items / activities covered in the contract/schedule of items and required for completion of the work.

1.11.0 All materials / components and equipment covered under the scope of work which are to be manufactured at shop/ factory of the vendor/subvendor shall be covered under a comprehensive quality assurance programme. The detailed quality plan for manufacturing shall be drawn up by the contractor and will be submitted to the owner for approval in the prescribed format for manufacturing quality plan.

Manufacturing Quality Plan (MQP) shall detail out all the components and equipment, various test/inspection, to be carried out as per the requirements of this specification and standards mentioned therein. The quality practices and procedures followed by Bidder's/Sub-Bidder's/ sub-supplier's Quality Control Organization shall include , the relevant reference documents and standards, acceptance norms, inspection documents raised etc., during all stages of material procurement, manufacture, assembly and final testing / performance testing . The quality plan shall be submitted in electronic media e.g. CD or E-mail in addition to hard copy, for review and approval. After approval the same shall be finally submitted in compiled form on CD.

1.12.0 The contractor shall store and handle the materials as per the requirements of the relevant standards at his own cost.

1.13.0 All the equipment shall be duly calibrated by NABL/ NPL accredited laboratories/accreditation agencies.

1.14.0 The Contractor shall submit to the NTPC Field Welding Schedule for field welding activities in the format No.: QS-01-CQA-W11/F1, this format shall be furnished to the Contractor at pre-award stage. The field-welding schedule shall be submitted

to the NTPC along with all supporting documents, like welding procedures, heat treatment procedures, NDT procedures etc. at least ninety days before schedule start of erection work at site. The Contractor shall submit Welding Procedure Specification (WPS) in the format No: QS-01-QAI-W-06/F1 for NTPC approval/ acceptance, this format shall be furnished to the Contractor during post bid discussion stage.

All welding and brazing shall be 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 NTPC.

All welding/brazing procedures shall be submitted to the NTPC or its authorized representative for approval prior to carrying out the welding/brazing.

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 NTPC.

Welding procedure qualification and Welder qualification test results shall be furnished to the NTPC for approval. However, where required by the NTPC, tests shall be conducted in presence of NTPC/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 NTPC.

1.15.0 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 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.

The Contractor shall install and operate equipments (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 NTPC, 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.

1.16.0 **ASSOCIATED DOCUMENT FOR QUALITY ASSURANCE PROGRAMME:**

i. Field Quality Plan Format No.: QS-01-QAI-P-09/F2-R1
ii. Indicative list of Field Quality Laboratory and Survey equipment list (Annexure-II)
iii. Indicative QA&QC Manpower requirements (Annexure-III)
iv. Indicative Field Quality Plan for Civil Works (Annexure-IV)
v. Indicative Field Quality Plan for Structural Steel Works (Annexure-V)
vi. Manufacturing Quality Plan Format No.: QS-01-QAI-P-09/F1-R1
vii. Status of items requiring Quality Plan and sub supplier approval. Format No.: QS-01-QAI-P-02/F1-R0
viii. List of items requiring quality plan and sub supplier approval. Format No.: QS-01-QAI-P-01/F3-R0
ix. Field Welding Schedule Format No.: QS-01-CQA-W-11/F1-R0
x. Welding Procedure Specification (WPS) Format No.: QS-01-QAI-W-06/F1-R0
xi. Main supplier's evaluation report Format No: QA-01-QAI-P-04/F1-R2
xii. Sub supplier questionnaire Format no: QA-01-QAI-P-04/F2-R1

(Note: The field quality plan attached is indicative and the contractor shall prepare the field Quality plan covering the entire scope of work in the contract and submit the same to corporate QA for acceptance/approval. However any addition or deletion in the scope of work, during detailed engineering shall be accordingly added/ deducted from the Field Quality Plan)

2.0.0 GENERAL QA REQUIREMENTS

2.1.0 **STORAGE AND HANDLING OF COMMON BUILDING MATERIALS**

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

2.2.0 **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 NTPC, 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.

2.3.0 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) ± 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) 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
	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

2.4.0 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 NTPC 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.

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.

i. Testing data / report of aggregates including petrographic examination & potential reactivity of aggregate and repeated temperature cycle tests wherever specified
ii. Mix design details and record of trial mixes carried out at site
iii. Testing records of admixture as per IS-9103 / ASTM C494 including third party test reports.
iv. Approved scheme for concreting
v. Hourly records of concreting including pour card
vi. Protocol indicating the dimensional tolerance and details of inserts
vii. Records giving the details of rectification giving the location of grouting, the quantity of grout used at each location, type of grout used
viii. Bar bending schedule
ix. Location and details of mechanical anchoring used for reinforcement
x. Protocol giving the details of checking of reinforcements before concreting and conformance to the reinforcement details as shown in the construction drawings
xi. Photographs showing the areas where rectification works have been carried out. Photographs should be taken before and after rectification
xii. Temperature control record of concrete at the time of placement if applicable.

xiii. 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

xiv. 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

xv. Dimensions (length, cross sectional dimensions, straightness, squareness, and flatness) and tolerances for pre cast members as per NTPC Technical Specification. Load test on Pre cast members (except pre- cast tiles to be laid in the reservoir) shall be carried out @ 1% up to 1000 nos., @0.5% from more than 1000 nos. precast members of one type. The load test shall be carried out as per the provisions of IS-456 and relevant IS code.

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
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 • Tread		 +1.5 +3.0	 -1.5 -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		

TOLERANCES				
Description of Item/ Structural Element			**Max (mm)**	**Min (mm)**
		taken as the base line. The shorter side shall not vary 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 (Cover blocks shall be of same grade of concrete in which these would be embedded)		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	

2.5.0 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 NTPC 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 NTPC 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 NTPC.

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 NTPC.

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

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	200 C
Over 40 mm to 63 mm (including)	Not allowed	660 C
Over 63 mm	Not allowed	1100 C

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

SL. NO.	TESTS / CHECKS	QUANTUM / STANDARD
	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
	Ultrasonic test on plates above 40mm	As per ASTM A435
	Welding procedure & welders qualification test	AWSD1.1/ASME Section-IX or BS-4871 or other equivalent International Standards
Fillet Weld		
	Macro-etch examination on production test coupons for main fillet welds	Minimum one joint per built up beams, columns and crane girder etc.
	Tension member of crane girder	Dye penetration test on 25% weld length
	All other fillet welds	DPT on 5% of weld length with minimum 300mm at each location
Butt Weld		
	DPT	100% after back gouging on all butt welds
	Mechanical testing of production test coupons	Minimum one joint per built up beam, column and crane girder.
	Radiography test on butt welds (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. Wherever RT is not feasible UT to be carried out with the approval of the	100% RT on butt welds of tension flange (bottom flange) of crane girders 10% RT weld length of each welder on butt welds,

SL. NO.	TESTS / CHECKS	QUANTUM / STANDARD
	engineer)	
	Ultrasonic testing on full penetration welds (other than butt welds)	100% UT on the web to flange joint of crane girder 10% UT on other full penetration joints
	Control assembly check in shop before erection	1st and further every 10th set of identical structure
	Dimensional tolerances during fabrication and erection	as per IS-7215 and IS-12843
	Surface Preparation and Paint thickness	SA 2 1/2 , By elcometer random after each coat, each member

2.6.0 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 NTPC 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.

2.7.0 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 colour match, bare metal thickness, weight of Z/AZ coating, thickness of painting system, reverse impact, T-Bend adhesion, scratch resistance, salt spray test for 1000 Hrs and any other test / properties as specified in the technical specifications. Colour coated sheets shall be marked with video jet printing at the interval not more than 2m bearing manufacturer's name, date and time of manufacturing. Fasteners shall also be tested for 1000 hrs salt spray test as per the requirement of technical specifications.

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.

2.8.0 TILE WORKS

The contractor shall submit the work methodology which shall include the type, grade and make of materials along with their technical data sheets, details, etc, clearance from E-I-C regarding leak proofness and damp proofness of parent concrete surface, surface preparation, the procedure of application, curing, testing and acceptance.

The agencies having adequate experience to execute the acid / alkali resistant lining works shall be engaged for executing the acid / alkali resistant lining works after obtaining the approval from the E-I-C.

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 NTPC 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.

2.9.0 FIRE PROOF DOORS

Fire Proof doors shall be tested for the requirements mentioned in 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

2.10.0 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 NTPC 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.

2.11.0 PILING WORK (If Applicable)

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 NTPC 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 NTPC. 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.

2.12.0 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 NTPC 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.

2.13.0 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 NTPC 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 NTPC 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 NTPC and shall conform to the requirements of the technical specifications and referred standards /codes.

2.14.0 PRE CAST CONCRETE WORKS

1. All the materials used in Pre cast Concrete work shall be tested and conform to the requirements of IS codes and NTPC Tech. Specification.
2. Concrete mix for Pre cast members shall conform to IS-456-2000.
3. All relevant QA requirements pertaining to cast insitu concrete shall be applicable.
4. Pre Cast Concrete member shall be checked for dimensions (length, cross sectional dimensions, straightness, squareness, and flatness) and tolerances shall be as per NTPC Technical Specification.

2.15.0 FABRIC EXPANSION COMPENSATOR:

Each layer of fabric Compensator shall be checked for thickness, unit weight, tensile strength & elongation, composite layer of the expansion joint shall be tested for temperature withstandability test.

Thermal Insulation shall be checked for thickness, density, thermal conductivity test and all other tests as per IS:8183.

Tests and checks on all other items shall be carried out as per relevant codes.

2.16.0 SLIPFORM SHUTTERING

1. The monitoring of the leveling of the yoke and the platform of the slip form shuttering to be done in each shift to avoid tilt during the casting of the chimney shell.

2. Manning of each shift shall be done by at least two experienced operators and a foreman particularly in night shift.

3. Suitable removal/ reduction of overhung / excess yoke beam length shall be affected with the decrease in the diameter of Chimney shell, as per the approved plan.

4. The laser centering method to be deployed for chimney alignment and Monitoring of chimney centre should be done by laser instruments at least two points. Monitoring/Recording of the same shall be done in each shift of 8 hours

5. Shuttering plates to be used for slip form shall be new and the grade of steel shall conform to the specification requirements.

6. The outage of the alignment of chimney centre shall be prevented by creating a counterbalance for alignment purpose to avoid differential loading, arising out of placement of reinforcement bars at one side or unloading of concrete in a hopper at one side of the platform for slip form shuttering.

एनटीपीसी NTPC	PROJECT:	LIST AND STATUS OF ITEM REQUIRING QP AND SUB-SUPPLIER APPROVAL				NTPC DOC NO	
	PACKAGE: FLUE GAS DESULPHURISATION SYSTEM PACKAGE					REV. NO.	0
	MAIN SUPPLIER:					DATE	
	CONTRACT NO.:						
SR. NO.	**ITEM**	**QAP / INSP. CAT**	**QAP NO.**	**PROPOSED SUB SUPPLIER**	**PLACE OF MANUFACTURING**	**APPROVAL STATUS**	**REMARKS**
1	CEMENT						
2	CONSTRUCTION CHEMICALS - ADMIXTURES, PLASTISIZERS, RETARDERS, WATER PROOFING COMPOUNDS, GROUTS, RESINS, EPOXY ETC.						
3	COLOUR COATED SHEET(FOR COIL)						
4	PROFILERS FOR DECKING/CLADDING SHEETS						
5	ELECTROFORGED GRATING						
6	PAINT AND PAINTING SYSTEM						
7	GI PIPES						
8	INSULATION WOOL						
10	PVC WATER STOP						
11	PLASTIC/ PVC PIPES						
12	FLOOR TILES						
13	FIRE PROOF DOORS						
14	PARTICLE BOARDS, PLYWOOD, MDF						
15	ROOF WATER PROOFING						
16	RCC PIPES						
17	FALSE CEILING - GLASS REINFORCED GYPSUM						
18	BITUMEN ASPHALT						
19	BITUMEN IMPREGNATED FIBER BOARD JOINT						
20	SANITARY ITEMS						
21	CP BRASS TAP AND OTHER SANITARY FITTINGS						
22	POLYTHENE WATER STORAGE TANKS - IS 12701						
23	CHIMNEY ELEVATOR						
24	PTFE BEARING / ELASTOMERIC BEARING						
25	FOUNDATION BOLTS						

LEGENDS:
1. SYSTEM SUPPLIER/SUB-SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)
A – For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list along with the condition of approval, if any.
DR – For these items "Details required" for NTPC review. To be identified with letter "DR" in the list.
'N' NOTED – For these items vendors are approved by Main Supplier and accepted by NTPC without specific vendor approval from NTPC. To be identified with 'NOTED.'

2. QP/INSPN CATEGORY:
CAT-I : For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC.
CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved
CAT-III : For these items Main Supplier approves the Quality Plans. The final acceptance by NTPC shall be on the basis certificate of conformance by the main supplier.
UNITS/ WORKS : Place of manufacturing Place of Main Supplier of multi units/works.

NOTE: For the items placed in CAT-III for Civil Works, the review and final acceptance shall be done by NTPC-EIC/ FQA on the basis of certificate of conformance submitted by the main supplier/ main contractor.

Annexure – II

INDICATIVE FIELD QA&QC LABORATORY SET-UP

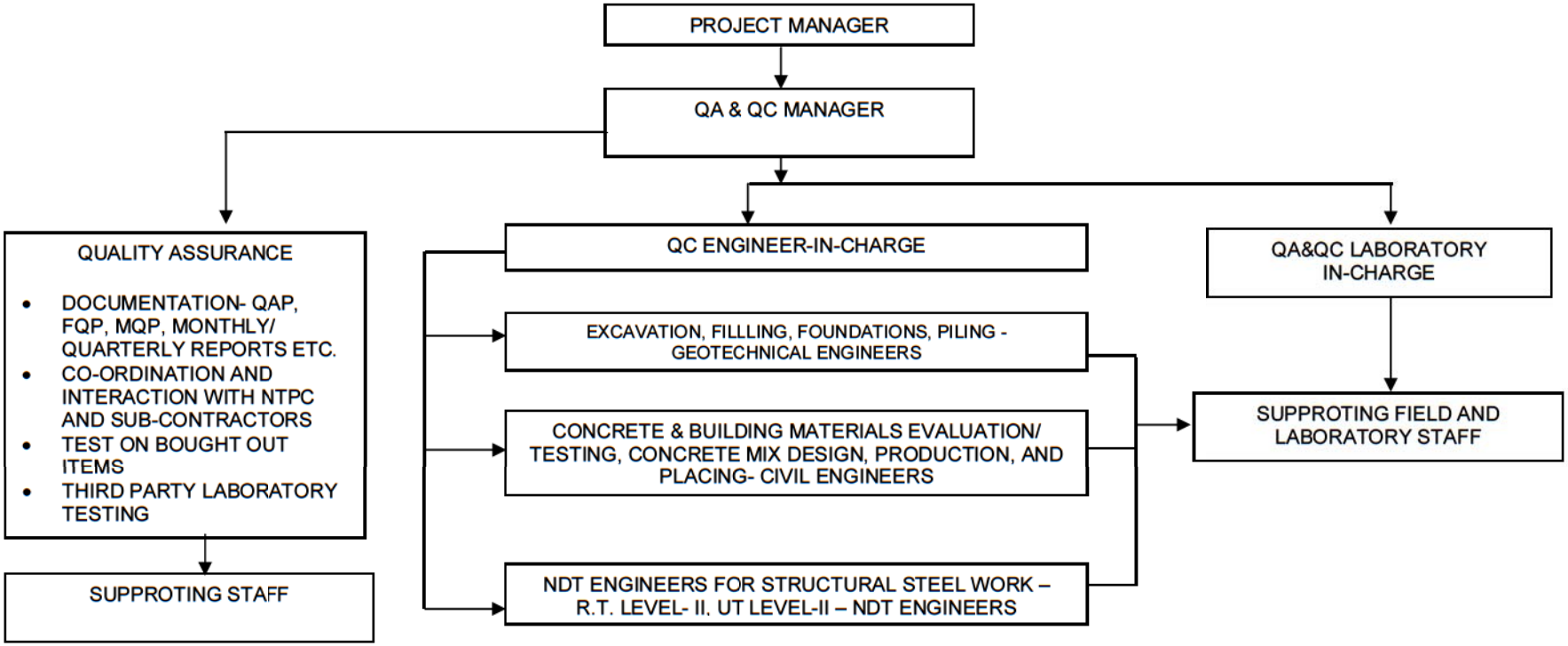
S.No	Equipment	Nos.
1	Vicat Apparatus with deskpot	2
2	Le Chatelier flask	2
3	Le Chatelier Mould	2
4	Cube Moulds for cement testing	12
5	Vibration Machine	1
6	Length comparator	2
7	Shrinkage Bar mould	2
8	Sieve shaker	1
9	Sieves for sand, coarse & fine aggregate	1 set for each
10	Sieves for coarse aggregate for Road	1 set
11	Proctor testing equipment	2 sets + 18 cores
12	Slump testing equipment	6 sets
13	Oven	2
14	Physical balance	1
15	Rapid moisture meter	2
16	Thermometer	4
17	Burret	2
18	Measuring cylinders	9
19	Measuring flasks	3
20	Compression testing machine	2 sets
21	Cube moulds	30
22	Electronic balance	2 (12 kg capacity), 2 (200 mg capacity)
23	pH balance	As per requirement
24	Radiographic facilities	As per requirement, Party should deploy BARC approved agency for carrying out RT
25	Mechanical weighing machine	1 (100 kg capacity)
26	Ultrasonic testing machine	As per requirement
27	D.P. Test kit	10
28	Vernier 300 mm, 600 mm	2
29	Micrometer (0.25 mm) out side (25.00)	2
30	Radiography film viewer	2
31	Inside Micrometer 25-750 dia	2
32	Digital elcometer for paint thickness	2
33	Baking oven for electrode	3
34	Portable ovens	2
35	Rebar detector to locate the reinforcement before core cutting operation	1
36	Concrete coring machine (55mm, 60mm upto 150 mm dia core bit)	1
37	Rebound hammer	1
38	Ultrasonic pulse velocity tester	May be arranged from specialist laboratory.

Note :

1. The equipments listed above are indicative and required to be mobilised as minimum requirement. additional equipment if any ,required for successful completion of work shall be provided /arranged by the contractor.
2. All test reports/ inspection reports have to be computerized and maintained on LAN with an access to the owner
3. Computers - 2 Nos shall be deployed with Windows operating system and connected to the NTPC server
4. Based on the schedule (L2/L3 Network), Quality control & Quality Assurance work plan shall be finalized by the contractor and the same shall be submitted to the engineer-in-charge for acceptance/approval. The Finalized work plan shall be maintained on the computer to be accessed by the owner for database and day to day monitoring.

Annexure – III

INDICATIVE FIELD QA & QC MANPOWER STRUCTURE



NOTE:

1. The above organization setup is minimum, however their deployment shall be as per the agreed deployment schedule. The contractor shall prepare a manpower deployment schedule in line with the finalized work plan and the same shall be submitted to the engineer-in charge for acceptance/ approval.
2. The contractor shall mobilize the QA& QC manpower in line with the finalized manpower deployment schedule and shall ensure their availability well in advance (15 days approx.) of the beginning of the concerned activity/ work.
3. The contractor shall further mobilize required number of skilled & supporting staff and additional resources, if any to meet the work schedule.

LOGO	SUPPLIERS NAME AND ADDRESS:	INDICATIVE FIELD QUALITY PLAN						ANNEXURE- IV			
		ITEM : CIVIL WORK SUB-SYSTEM : Foundations, Excavation & Fill, Concrete, Building, Masonry Etc.		QP NO. : REV. NO .: DATE : PAGE :		1 0	PROJECT: PACKAGE: CONTRACT NO. MAIN CONTRACTOR	FLUE GAS DESULPHURISATION SYSTEM PACKAGE			
Sl. No	Activity and operation	Characteristics / instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record		Remarks
1	2	3		4	5	6	7	8	9	D*	10
1.00	**GENERAL REQUIREMENTS**										
A	Setting up of Field QA&QC laboratory		As agreed / required	A	Physical	Once prior to start of work	Tech Specs and Const. Drawings		SR	√	Functioning of laboratory equipment in proper working condition to be verified on monthly basis
B	Avialablility of requisite laboratory set up and equipment in good working condition well before commencement of concerned activity		As agreed / required	A	Physical	Once prior to start of work and thereof monthly	Tech Specs and Const. Drawings		SR	√	
C	Submission of QA & QC manpower deployment schedule based on agreed L-2 network .		-	A	Physical	Once prior to start of work	Tech Specs and Const. Drawings			√	
D	Availability of QA& QC manpower based on deployment schedule .		-	A	Physical	Once prior to start of work and thereof monthly	Tech Specs and Const. Drawings		SR	√	
E	Sampling for testing of buliding materials, concrete mix design etc.		As agreed / required	A	Physical	Once per each source prior to start of concern work	Tech Specs and Const. Drawings		SR	√	Test report along with the recommendations from specialist agency to be submitted to NTPC.
F	Submission of schedule of tests to be done monthly / quaterly and maintenace of the same on a computer connected to LAN of NTPC for monitoring		-	A	Physical	Once prior to start of work and thereof monthly	Tech Specs and Const. Drawings		SR	√	
2.00	**EXCAVATION AND FILLING IN FOUNDATION WORKS**										
	Excavations-										
1		Check for the Nature, type of soil/rock before and during excavations	As agreed / required	B	Visual	Random in eah shift	Tech Specs and Const. Drawings		SR		
2		Check for the Initial ground level before start of excavations	As agreed / required	B	Measurement	100%	Tech Specs and Const. Drawings		SR		
3		Check for the final shape and Dimensions of excavations.	As agreed / required	B	Measurement	100%	Tech Specs and Const. Drawings		SR		
4		Check for the Final excavation leivels	As agreed / required	B	Measuement	100%	Tech Specs and Const. Drawings		SR		
5		Check for the Side slope of final excavation	As agreed / required	B	Measurement	Random in eah shift	Tech Specs and Const. Drawings		SR		
6		Excavation in Hard Rock.									
i		Receipt, Storage, accountability of Explosive	As agreed / required	B	Physical	Random in each week	Indian Explosive Act 1940/all statutory norms, Tech Specs and Const. Drawings		SR	√	NTPC approved specialist blasting agency such as CMRI, NIRM shall be deployed at site for trial blasts, design blasts, blast vibration monitoring etc. Seismographs shall be deployed at site for monitoring of blast operation vibrations.
ii		Execution of Blasting Operation	As agreed / required	B	Physical	Random in eah shift	IS:4081, Tech Specs and Const. Drawings		SR	√	
iii		Submission of Blasting report to EIC	As agreed / required	C	Physical	Each blast	Tech Specs and Const. Drawings			√	
7		Excavation in Hard Rock (Blasting Prohibited)	As agreed / required	B	Physical	100%	As per approved drawing/ scheme, Tech Specs and Const. Drawings		SR	√	
	Fill/ Backfill -										
8	**Suitability of fill material**										
i		Grain size analysis	As required/ agreed	B	Physical	One in every 2000 cum for each type and source of fill materials subject to a min. of 2 samples	IS:2720 (Pt.IV), Tech Specs and Const. Drawings		SR/TR	√	
ii		Liquid & plastic limit	As required/ agreed	B	Physical	One in every 2000 cum for each type and source of fill materials subject to a min. of 2 samples	IS:2720 (Pt.IV) , Tech Specs and Const. Drawings		SR/TR	√	
iii		Shrinkage limit	As required/ agreed	B	Physical	One in every 5000 cum for each type and source of fill materials subject to a min. of 2 samples	IS:2720 (Pt.IV), Tech Specs and Const. Drawings		SR/TR	√	
iv		Free Swell Index	As required/ agreed	B	Physical	One in every 5000 cum for each type and source of fill materials	IS:2720 (Pt.XI), Tech Specs and Const. Drawings		SR/TR	√	
9	**Standard proctor Test**	Optimum moisture content and max. dry density before fill	As required/ agreed	A	Physical	One in every 2000 cum for each type and source of fill materials	IS 2720 (Pt.VII), Tech Specs and Const. Drawings		SR/TR	√	
10	**Moisture content**	Moisture content of fill before compaction	As required/ agreed	A	Physical	One in every 2000 cum for each type and source of fill materials	IS 2720 (Pt.II), Tech Specs and Const. Drawings		SR/TR	√	
11	**Degree Of Compaction Of Fill / Backfill**										
i		Dry density by core cutter method --- OR--- Dry density in place by sand displacement method	As required/ agreed	A	Physical	i) For foundation fill/ backfill one for every 10 foundations for each compacted layer.	IS 2720 (Pt. XXIX), Tech Specs and Const. Drawings		SR/TR	√	
						ii) For area filling, one every 1000 SQM area for each compacted layer.	IS 2720 (Pt. XXVIII), Tech Specs and Const. Drawings		SR/TR	√	
ii		Relative density (Density Index)	As required/ agreed	A	Physical	----do---- (i) & (ii) above	IS 2720 (Pt. XIV), Tech Specs and Const. Drawings		SR/TR	√	

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Sl. No	Activity and operation	Characteristics / instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record		Remarks
1	2	3		4	5	6	7	8	9	D*	10
iii		Dry Density by proctor needle penetration	As required/ agreed	B	Physical	Random checks to be carried out for each compacted layer	Tech Specs and Const. Drawings		SR/TR	√	
3.00	CAST-IN-SITU CONCRETE										
	MATERIALS										
1	Cement										
i		Initial & Final Setting Time	as per IS:4031	A	Physical	Each Lot	IS:4031	As per relevant IS Codes	SR/LB/ Test Report	√	Each consignment of cement shall be duly correlated with manufactureres TC, If cement is stored more than 90 days in godown of contractor same shall be retested for comp. Strength & setting time.
ii		Compressive strength @ 3, 7 & 28 days	as per IS:4031	A	Physical	Each Lot	IS:4031	As per relevant IS Codes	SR/LB/ Test Report	√	
2	Coarse Aggregate										
i		Moisture content	.	B	Physical	Once for each stack of 100 Cum. or part there of Except during monsoon when this has to be done every day before start of concreting	IS:2386 Part-III, IS : 456, IS : 383/Tech Spec, Tech Specs and Const. Drawings		SR/LB		Accordingly water content of the concrete will be adjusted
ii		Specific gravity, bulk density, voids, water absorption,	As required/ agreed	B	Physical	Once for each source & for every change of source	IS:2386 Part-III, IS : 456, IS : 383/Tech Spec, Tech Specs and Const. Drawings		SR/TR		These tests will be carried out white establishing design mix and the results to be intimated to NTPC.
iii		Particle, size & Shape-(Sieve analysis, determination of material finer than 75 micron, flakiness index, elongation index, angularity number)	As required/ agreed	B	Physical	One per 100 cum., or part thereof/change of source whichever is earlier	IS:2386 Part-I, IS : 456, IS : 383/Tech Spec, Tech Specs and Const. Drawings		SR/LB		-do-
iv		Deleterious materials & organic impurities (determination of clay lumps, fine silt, fine dust , light weight pieces , soft particle & estimation of organic impurities.)	As required/ agreed	B	Physical	Once per source/ on every change of source	IS:2386 Part-II, IS : 456, IS : 383/Tech Spec, Tech Specs and Const. Drawings		SR/TR		Experts opinion regarding suitability of the aggregates shall be obtained from the specialist agency such as NCB BallbhGarh etc. finalised during preaward. Results will be reported nearest to 0.1% of clay lumps.
v		Soundness	As required/ agreed	B	Physical	Once per source/ on every change of source	IS: 2386 Part-V, IS:383 , Tech Specs and Const. Drawings		SR/TR		Experts opinion regarding suitability of the aggregates shall be obtained from the specialist agency such as NCB BallbhGarh etc. finalised during preaward.
vi		Alkali aggregate reactivity	As required/ agreed	A	Physical	Once per source/ on every change of source	ASTM C 1260 , Tech Specs and Const. Drawings		SR/TR	√	the quantity of dissolved silica , and reduction in alkalinity to be reported and hence the aggregate type (deleterious /innocuous)result should be supported by petrographic examination
vii		Petrographic examination	As required/ agreed	A	Physical	Once per source/ on every change of source	IS: 2386 Part-VIII, IS:383 , Tech Specs and Const. Drawings		SR/TR	√	Reporting of petrographic examination shall be done as illustrated in IS 2386 (part-VIII)-1963. petrographic report shall be supported by the analysis and recommendation by a specialist instute.
viii		Crushing value abrasion value and impact value	As required/ agreed	A	Physical	Once per source/ on every change of source	IS:383, IS-2386 Part IV/, Tech Specs and Const. Drawings		SR/TR		-do-
3	Fine Aggregate										
i		Moisture content	As agreed / required	B	Physical	To be done every day before start of work	IS: 2386 Part-III IS:383 , Tech Specs and Const. Drawings		SR/TR		Weight of sand and weight of water shall be adjusted as per moisture content.
ii		Silt, Clay content and organic impurities	As agreed / required	B	Physical	Once per source& for on every change of source	IS: 2386 Part-II, IS:383 , Tech Specs and Const. Drawings		SR/TR		Acceptance limit as per relevant IS code
iii		All other tests similar to coarse aggregates as mentioned above.	As agreed / required	B	As above	Refer S.No. 2.01.02	IS-2386, IS-383, Tech Specs and Const. Drawings		SR/TR		
4	Water										
i		Test for sulphates and chlorides	As required/ agreed	B	Testing	Once per each source thereof yearly.	IS:3025 part 22 and 23 (for test procedure), IS:456(for acceptance criteria) , Tech Specs and		SR/TR		
ii		Tests for ascertaining limit of solids	As required/ agreed	B	Physical	Once per each source thereof yearly.	IS:3025 part 18 (organic),IS:456 , Tech Specs and Const. Drawings		SR/TR		
iii		Tests for pH Value	As required/ agreed	B	Testing	Once per each source thereof yearly.	IS:3025, IS:456, Tech Specs and Const. Drawings		SR/TR		
iv	Check for initial set time for used water and distilled water	vicat appratus		A	Physical	See Remarks	See Remarks, Tech Specs and Const. Drawings		See Remarks	√	Initial set time with used water should not be less than that with distilled water. This check is to be carried out only if the results of the tests mentioned at sl. no. 3.00, .4 i),ii)& iii) mentioned above

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Sl. No	Activity and operation	Characteristics / instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record	D*	Remarks
1	2	3		4	5	6	7	8	9	D*	10
v	Check for Concrete compressive strength with used water and distilled water	standard sand and compression testing machine	As agreed / required	A	Physical	See Remarks	See Remarks, Tech Specs and Const. Drawings		See Remarks	√	This check is to be carried out only if the results of the tests mentioned at sl. no. 3.00, .4 i),ii)& iii) mentioned above
5	CONCRETE PRODUCTION										
i		Check for the proportaions of materials for nominal mix concrete as per Table-9 of IS 456	As agreed / required	B	Physical	Random in each shift	IS:456, Tech Specs and Const. Drawings		SR/TR		
ii		Trial mix (Cubes compressive strength) as per Mix Design	As agreed / required	A	Physical	Min. 4 Trial Mixes with admixtures and Without admixtures With fly ash.	IS: 516 & IS:456, IS:10262, Tech Specs and Const. Drawings		SR/TR	√	For trial mix min. of 6 cubes for each mix, 3 specimen shall be tested at 7 days remaining 3 shall be for 28 days comp. Strength. Mix design shall carried out at agency finalised during pre award)
iii		Crushing strength (works Tests cubes)	As agreed / required	A	Physical	One set of 6 cubes per 50 M3 or part thereof for each grade of concrete per shift whichever is earlier.	IS:516, IS:456, Tech Specs and Const. Drawings		SR/TR	√	Min. of 6 cubes for each mix, 3 specimen shall be tested at 7 days remaining 3 shall be for 28 days comp. Strength.
iv		Workability - slump test	As required/ agreed	B	Physical	One sample every 2 hrs. from every mixing plant	IS:456, Tech Specs and Const. Drawings		SR/TR		Slump test for medium and high workability, Compaction factor test for medium and low workability, V.B. test for low to Very low workability
v		Cement content	As agreed / required	B	Physical	At random at the time of batching.	IS:1199 , Tech Specs and Const. Drawings		SR/TR		
vi		Admixtures for Concrete from approved sources	As agreed / required	A	Review of MTC	Random in each shift	IS:456 , Tech Specs and Const. Drawings		SR/TR	√	Admixture of appd. Brand and tested quality shall be used.
vii		Water Tightness Test for Water Retaining Structures	As agreed / required	B	Physical	100%	IS:3370 (Tanks and Revision) , Tech Specs and Const. Drawings		SR	√	
viii		Dimensions and visual exa-mination of finished structure	As agreed / required	B	Physical/ visual	100%	As per Tech. Specification./Appd. Drg./IS-456		SR		
6	CONCRETE CONVEYING, PLACING& COMPACTION										
i	Mixing of concrete	mixing of concrete shall be done in a approved mixer such as to produce a homogenous mix	As required/ agreed			To be calibrated at the time of starting and subsequently once in three months, and shall confirm to IS:4925	Review of calibration chart/ Certificate, IS 457, Tech Specs and Const. Drawings				time of mixing will be as given in IS 457
ii		Calibration of Batching Plant	As required/ agreed	A	Physical	To be calibrated at the time of starting and subsequently once in three months, and shall confirm to IS:4925	Review of calibration chart/ Certificate, Tech Specs and Const. Drawings		SR/TR	√	Cement consumption at batching plant shall also be obtained through comp. Output.Provision of online printer is manadatory
iii		Handling and Transportation of concrete	As required/ agreed	B	Physical	Random in each shift	IS:456, Tech Specs and Const. Drawings		SR		Free fall or drop shall be limited to 150 cm unless permitted concrete should be placed within 30 min of its removal from mixure . Construction methodology to be approved one week prior to start of work.
iv		Placement of concrete	As required/ agreed	B	Physical	Random in each shift	IS:456, Tech Specs and Const. Drawings		SR		No concrete shall be placed until the place of deposit has been throughly inspected and approved, the concrete shall be deposited in such a manner to maintain, until completion of unit, a plastic horizontal surface throughout
v		Check for compaction and Curing	As required/ agreed	B	Physical	Random in each shift	Check for period of curing as per IS 456 , Tech Specs and Const. Drawings		SR		Exposed concrete surface shall be protected against heating and drying for atleast 72 hrs after placement, curing compound may be used
vi		Cleanliness, provision of chute and arrangement for transportation & placement of concrete.	As agreed / required	C	Visual	100%	IS:456, Tech Specs and Const. Drawings		SR		
x		check for segregation	As agreed / required	C	Visual	100%	IS:456, Tech Specs and Const. Drawings				
7	TEST/CHECK ON RCC STRUCTURE IN HARDENDED CONDITIONS										
i		Core Test	As agreed / required	A	Physical	As required by NTPC Engineer.	As per IS:456, IS 516, Tech Specs and Const. Drawings		SR/LB/ Test Report	√	Acceptable if average equivalent cube strength of the cores is equal to at least 85% of the cube strength of the grade of concrete specified for the corresponding age and no indivisual conc has result less than 75%`
ii		Dimensional check on finished structures & Dimensional tolerances	As agreed / required	B	Measurement	Approved Drawing	As per IS:456, Tech Specs and Const. Drawings		SR/LB		
iii		Rebound Hammer test	As agreed / required	A	physical	As required by the NTPC engineer	Tech Specs and Const. Drawings		SR/LB	√	
8	REINFORCEMENT STEEL										
i		Physical and Chemical Properties for each lot as per relevant IS codes	As required/ agreed	A	Review of MTC	Each batch of delivery	IS : 1786, IS:432, IS:1566, Tech Specs and Const. Drawings		MTC	√	Applicable if steel is procured by Contractor
ii		Cutting tolerance	As agreed / required	B	Measurement	Random in each shift	IS : 1852, IS: 432, IS:1786, Tech Specs and Const. Drawings		SR/LB		Tolerance as per specifications

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iii		Freedom form cracks surface flaws, Lamination.	As agreed / required	B	Visual	Random in each shift	IS: 1852, IS:432, IS:1786, Tech Specs and Const. Drawings		SR/LB		To be checked at site. Steel collected from source should be free from excessive rust. To be stored as per Technical Specs.
9	PLACEMENT OF REINFORCEMENT STEEL										
i		Check for bar bending schedule with necessary laps. Spacers & Chairs	As agreed / required	B	Visual & Measurement	Random in each shift	Approved Drawings, Tech Specs and Const. Drawings		SR		
ii		Check for cover, spacing of bars	As agreed / required	B	Visual & Measurement	Random in each shift	Approved Drawings, Tech Specs and Const. Drawings		SR		
iii		Check for bending of bars	As agreed / required	B	Visual & Measurement	Random in each shift	Approved Drawings, Tech Specs and Const. Drawings		SR		
iv		Check for spacers and chairs after the reinforcement cage is put inside the formwork	As agreed / required	B	Visual & Measurement	Random in each shift	Approved Drawings, Tech Specs and Const. Drawings		SR		
v		Acceptance of placement od reinforcement before start of concreting	As agreed / required	B	Visual & Measurement	beofre start of each concreting	IS : 456/ Drawings & approved bar bending, Tech Specs and Const. Drawings schedule		SR		
10	STAGING AND FORMS										
i		Materials and accessories	As agreed / required	B	Visual	Once before start of work	As per relevant IS, Tech Specs and Const. Drawings		SR		Proper care should be taken in order to combat corrosion. Proper care should be taken while cleaning, moving and stacking the scaffolds
ii		Soundness of staging, shuttering and scaffolding	As agreed / required	B	Visual	Once before start of work	As per manufacturer's spec.and as per 3696,4014, 4990, Tech Specs and Const.		SR		
iii		Acceptance of formwork before start concreting		B	Physical / visual	beofre start of each concreting	As per provisions and tolerances, Tech Specs		SR		
11	EMBEDDED PART(INCLUDING LAYING OF RAILS & ANCHOR FASTENERS)										
i		Position and levels of embedded parts	As agreed / required	B	Physical/ measurement	100%	As per drawing, Tech Specs and Const. Drawings		SR		Exposed surfsce of the embeded parts other than holding down bolts are to be painted with primer ,chlorinated , rubber baed zinc phosphate
ii		Position depth and size of bolt hole	As agreed / required	B	Physical/ measurement	Random in each shift	As per drawing, Tech Specs and Const. Drawings		SR		
iii		Location verticality of pipe sleeve/opening of bolt hold	As agreed / required	B	Physical/ measurement	Random in each shift	As per drawing, Tech Specs and Const. Drawings		SR		
iv		Laying of rails under supervision of NTPCs specilised agency.	As agreed / required	B	Physical/ measurement	Random in each shift	As per drawing, Tech Specs and Const. Drawings		SR		
v		Welding / tieing of embeddment to reinforce-ment	As agreed / required	B	Physical/ measurement	Random in each shift	As per drawing, Tech Specs and Const. Drawings		SR		
12	PRE-CAST CONCRETE										
i		Crushing strength	As required/ agreed	A	Physical	one sample of six cubes per 50 cum or part thereof	IS:516&IS; 456, Tech Specs and Const. Drawings		SR/LB	√	a minimum of three specimen shall be tested for 28 days comp. strength
ii		Workmanship free from visual defects	As required/ agreed	B	Physical	100%	Tech Specs and Const. Drawings		SR		The precast units shall be free from defects like honeycombing, reinforcement exposure and should have good finish. All relevant tests like workability, cube test shall be carried out as per IS 456-2000 Same as applicable to cast in situ concrete.
iii		Dimension of finish structure	As required/ agreed	B	Measurement	100%	As per IS:456, Tech Specs and Const. Drawings		SR		If the material already tested of the cast-in-situ concrete and part of the same is used for precast concrete, further testing is not required, otherwise testing is required for every 50 Cum. Of Concrete.
iv		Workability	slump test apparatus	B	Physical	one sample every two hrs from mixing plant	IS:1199 &IS:456, Tech Specs and Const. Drawings		SR/LB		According to the mix design
v		Water cement ratio	As agreed / required	B	Physical	At random at the time of batching	IS:1199 , Tech Specs and Const. Drawings		SR/LB		According to the mix design
vi		Cement content	As agreed / required	B	Physical	At random at the time of batching	IS:1199 /tech spec, Tech Specs and Const Drawings		SR		According to the mix design
vii		Load Test	As agreed / required	A	Physical	5% or as desired by EIC	IS:456/ As decided by NTPC Site Engr. Incharge., Tech Specs and Const. Drawings		SR	√	These tests shall also be carried out, in case of doubt regarding grade of concrete and poor quality.
13	JOINTS IN CONCRETE										
i		Check for the joint material - bitumen impregnated fibre board, PVC water stops, Sealing compound, Expanded polystyrene board, Hydrophillic strip, Acrylic polymer etc.	As per manufacturer Standards	A	Review of MTC	Each batch of delivery	Tech Specs and Const. Drawings, IS 1838, IS 1834, IS12200		MTC	√	
ii		Acceptance of installation of materials for Joints in concrete	As agreed / required	B	Acceptance	Each installation randomly	As per technical specifications and construction drawings				
14	DAMP PROOF COURSE										
i		Check for the material - Hot bitumen and water proffing materals etc	As agreed / required	A	Review of MTC	Each batch of delivery at site	Tech Specs and Const. Drawings, IS 702		SR	√	
ii		Acceptance of damp proof course	As agreed / required	B	Acceptance	100%	As per technical specifications and construction drawings		SR		

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15	GROUTING										
i		Check for the material	As agreed / required	A	Review of MTC	Each batch of delivery	As per technical specifications and construction drawings		SR	√	Check for chemical, epoxy, resin grouts etc
ii		Check for the type of mix - fluid mix, plastic mix, stiff mix etc.	As agreed / required	B	Physical	Prior to start of work	As per technical specifications and construction drawings				
iii		Check for the mixing, placement, application and grout pressure	As agreed / required	B	Physical	Random in each shift	As per technical specifications and construction drawings		SR		
iv		Check for the compressive strength	As agreed / required	A	Physical	Each batch of delivery	As per technical specifications and construction drawings		SR	√	
v		Acceptance of the grouts	As agreed / required	B	Physical	Each grout section	As per technical specifications and construction drawings		SR		
16	SLIPFORM SHUTTERING										
i		Submission of Slipform Work system to be used	-	B	Submission	Before Comencement of work	As per specifications		SR		
ii		Check for the Slipform shutters	As required	B	Physical	Before Comencement of work	As per specifications		SR		Check for water level system, Controls, Walkways etc.
iii		Details Positions and arrangement of Jack rods	-	B	Approval	Before Comencement of work	As per specifications		SR		Submitted to Engineer for approval
iv		Details of Proposed arrangement for continuous readings	-	B	Approval	Before Comencement of work	As per specifications		SR		Submitted to Engineer for approval
v		Check for All type of openings, Chases, Fixing of Blocks and similar built-up features	As required	B	Physical	100% during execution	Construction Drawings and specifications		SR		No any type of openings ,chases , blocks other than shown in the construction drawings or approved by Engineer shall be executed in the concrete.
vi		Details of proposed method for concrete curing and protection	-	B	Approval	Before Comencement of work	Construction Drawings and specifications		SR		Submitted to Engineer for approval
vii		Check of Concrete Curing and Protection	As required	B	Physical	At Random	Construction Drawings and specifications		SR		Concrete shall not remain uncured for period longer than 12 hours
viii		Check for Sliding Operation	As required	B	Physical	Each Sliding	As per specifications		SR		Rate of Sliding, Delays in sliding, Discontunity or *stop strat sliding to be checked*
		Monitoring of Sliding Portion									
ix		Progress Height	As required	B	Physical	Six hourly intervals	As per specifications		SR		To be recorded in tabular form and on graphs immediately after each monitoring
x		Centre line in relation to the centers at the base	As required	A	Physical	Six hourly intervals	As per specifications		SR	√	To be recorded in tabular form and on graphs immediately after each monitoring
xi		Internal wall faces in relation to the concrete at the base	As required	B	Physical	Six hourly intervals	As per specifications		SR		To be recorded in tabular form and on graphs immediately after each monitoring
xii		Wall thickness	As required	B	Physical	Six hourly intervals	As per specifications		SR	√	To be recorded in tabular form and on graphs immediately after each monitoring
xiii		Twist	As required	B	Physical	Six hourly intervals	As per specifications		SR	√	To be recorded in tabular form and on graphs immediately after each monitoring
xiv		Verticality of the structure	Optical Theodolight	B	Physical	Every day in morning	As per specifications		SR		To be recorded in tabular form and on graphs immediately after each monitoring
xv		Check for Tolerances for chimney construction	As required	B	Physical	For every day monitoring	As per specifications		SR		
4.00	BRICK MASONARY										
1	Test on Bricks										
i		Check for Dimensions , shape	As required/ agreed	A	Measurement/ Physical Test	As per relevant IS Code/ One Sample for 30,000 Nos. or part thereof	IS: 1077, Tech Specs and Const. Drawings		Inspection Report	√	Efflorescence shall be checked at each source.
ii		compressive strength, water absorption, warpage efflorescence.	As required/ agreed	B	Measurement/ Physical Test	As per relevant IS Code/ One Sample for 30,000 Nos. or part thereof	IS: 1077, IS:3495 part I (Compressive Strength) Part II (Water Absorbtion) Part III(Efflorescence) Part IV (War page), Tech Specs and Const.			√	Preconditioning of brick shall be done as per IS. For comperssive strength, warpage and water absorbtion
2	Test on Mortar	Compressive strength, consistency and water retentivity for each portion of walls, plasters and ceilings.	As required/ agreed	B	Test	At random	IS 2250-1981, Tech Specs and Const. Drawings		LB		Cement used in mortar shall confirm to either IS 269: 1976 or IS 455- 1976 sand shall confirm to IS 2116 -1980
3	Masonry construction	Acceptance of Workmanship, verticality and alignment	As agreed / required	B	Visual/ Physical	100%	IS 2212, IS 1905 , Tech Specs and Const. Drawings		SR/LB		
5.00	FINISHING AND ALLIED WORKS										
1	MATERIALS- FINE SAND, SAND FOR PLASTERING										
i		Deleterious Material	As agreed / required	B	Physical	Once per source	IS : 2386 (Part-I &II) & IS :2116, Tech Specs and Const. Drawings		SR		
ii		Grading	As agreed / required	B	Physical	50 Cum./or part thereof	IS:3150,1542& Apprd. drgs, Tech Specs and Const. Drawings		SR		Table –I of IS:2116

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iii		Galvanized hexagonal wire netting for lath plastering	As agreed / required	B	Review of MTC	Each batch of delivery	, Tech Specs and Const. Drawings		SR		
iv		Check for the thickness and finishing of plaster	As agreed / required	B	Visual/ Measurement	Random in each shift	As per IS 1661 , Tech Specs and Const. Drawings		SR/LB		
2	PLASTERING										
i		Check for defects and the remedial measure for bond filler , blistering , cracking and crazing , efflorescence and irregularity of surface texture	As agreed / required	B	Visual/ Physical	Random in each shift	Tech Specs and Const. Drawings, IS: 1661		SR		
ii		Truness of plastering system	As agreed / required	B	Visual/ Physical	Random in each shift	Tech Specs and Const. Drawings		SR		finished plaster surface shall not show any deviation more than 4 mm when checked with straight edge of 2 m length
iii		Acceptance of Grooves and finishing	As agreed / required	B	Acceptance	100%	Tech Specs and Const. Drawings		SR		
3	STONE GRIT PLASTER/ GRANULAR TEXTURED COAT FINISH										
i		Check for Preparation of surface	As agreed / required	B	Physical	Random in each shift	Tech Specs and Const. Drawings		SR		
ii		Check for material - Size of chips	As agreed / required	B	Physical	Random in each shift	Tech Specs and Const. Drawings		SR		
iii		Acceptance of Grooves and finishing	As agreed / required	B	Acceptance	100%	Tech Specs and Const. Drawings		SR		
4	WATER PROOFING SYSTEM										
i		Check for the material	As agreed / required	A	Physical and Review of MTC	Each lot of delivery	Tech Specs and Const. Drawings,		SR/ MTC	√	
ii		Acceptance of water proofing system - Application, fixing, laying	As agreed / required	B	Physical	100%	Tech Specs and Const. Drawings		SR		Water pounding test shall be done
5	FALSE CEILING										
i)		Check for the Materials - Glass Reinforced Gypsum (GRG), Pre-painted coil coated steel false ceiling system etc.	As agreed / required	A	Physical and MTC Review	Each batch of delivery	As per relevant IS and Tech. Specs / Manufacturer's TC		-do-	√	
ii)		Acceptance of installation	As agreed / required	B	Physical / measurements	Each installation	-do-		-do-		All supports , hangers , accessories shall be as per *Tech. Specifications/ approved manufacturer's* recommendations
6.00	PAINTING SYSTEM - All surfaces										
1	Check for the Materials and accessories	White wash, Distemper and all types of Primer and Paints - Check for Shade, type from brand and manufacturer as approved by NTPC EIC	As agreed / required	A	Review of MTC	Each batch of delivery	Tech Specs and Const. Drawings		SR/MTC	√	Mfr.'s T.C. shall be correlated with the consignment received.
2	Check for Surface prepration		As agreed / required	B	Physical /visual	Random in each shift	Tech Specs and Const. Drawings		SR		
3	Check for DFT of painted surfaces		As agreed / required	B	Physical	Each surface at random	Tech Specs and Const. Drawings		SR		
4	Acceptance of painted surfaces		As agreed / required	B	Physical	Each surface at random	Tech Specs and Const. Drawings		SR		
6.10	CHIMNEY PAINTING										
i		Requirements for Steel Surfaces	As Required	B	Physical	Randomly	Tech Specs and Const. Drawings		SR		No of Coats applied and DFT/WFT to be checked as per specified
ii		Requirements for Cast Iron Surfaces	As Required	B	Physical	Randomly	Tech Specs and Const. Drawings		SR		No of Coats applied and DFT/WFT to be checked as per specified
iii		Requirements for Concrete Surfaces	As Required	B	Physical	Randomly	Tech Specs and Const. Drawings		SR		No of Coats applied and DFT/WFT to be checked as per specified
iv		Material Requrements	As Required	B	Physical	Randomly	Tech Specs and Const. Drawings		SR		Requirement of DFT to be checked as per Specifications. Procurement to be done from approved/acceptable manufacturer/source
v		Preparation of Surfaces	As Required	B	Physical	Randomly	Tech Specs and Const.		SR		
vi		Application of Paint	As Required	B	Physical	Randomly	Tech Specs and Const. Drawings		SR		AS per recommendations by Manufacturer along with Relevant IS Codes and Specification requirements
7.00	DOORS , WINDOWS VENTILATORS & GRILL										

LOGO	SUPPLIERS NAME AND ADDRESS:	INDICATIVE FIELD QUALITY PLAN						ANNEXURE- IV			
		ITEM : CIVIL WORK SUB-SYSTEM : Foundations, Excavation & Fill, Concrete, Building, Masonry Etc.		QP NO. : REV. NO .: DATE : PAGE :		1 0	PROJECT: PACKAGE: CONTRACT NO. MAIN CONTRACTOR	FLUE GAS DESULPHURISATION SYSTEM PACKAGE			
Sl. No	Activity and operation	Characteristics / instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record		Remarks
1	2	3		4	5	6	7	8	9	D*	10
1	Check for the material/ items for all type of timber, flush doors, Particle doors, wire guage, Aluminium doors, Fire proof doors, windows fittings, Anodized aluminium works, Mortice locks, Automatic operating system etc received at site	Review of MTC / make or/and Physical checks, tests report (if MTC is not available)	As agreed / required	A	Review of MTC/ Physical	for each batch of delivery	Tech Specs and Const. Drawings		SR	√	
2	Wood work in frames	Wood work in frames - Check for dimensions, surface finish and rebating etc.	As agreed / required	B	Physical	Random for each installation	Tech Specs and Const. Drawings		SR		
3	Wardrobe shutter and show cases										
i		Check for material as per IS 3087 and 3097 - from NTPC approved source	As agreed / required	B	Physical	one sample for each section for each lot of delivery	Tech Specs and Const. Drawings, IS 3087 and 3097		SR		
ii		Acceptance of fixing after completion	As agreed / required	B	Acceptance	100%	Tech Specs and Const. Drawings, IS 3087 and 3098		SR		
4	Pelmets										
i		Check for material as per IS 3087/ 3097 - from NTPC approved source	As agreed / required	B	Physical	one sample for each section for each lot of delivery	Tech Specs and Const. Drawings, IS 3087/ 3097		SR		
ii		Acceptance of fixing after completion	As agreed / required	B	Acceptance	100%	Tech Specs and Const. Drawings, IS 3087/ 3098		SR		
5	MS Grills										
i		Check for the material for section and weight from NTPC approved source	As agreed / required	A	Physical	one sample for each section for each lot of delivery	Tech Specs and Const. Drawings		SR	√	
ii		Check for fabrication done at approved workshop	As agreed / required	B	Physical	Random	Tech Specs and Const. Drawings		SR		
		Acceptance of fixing of MS Grills	As agreed / required	B	Acceptance	Random	Tech Specs and Const. Drawings		SR		
6	Fitting and fixtures - MS sliding door bolts, tower bolts, pull bolt lock, MS handles, Safety Chains, brass locks, brass latch, hydraulic floor springs & door closers, etc	Check for fitting items as per relavent IS codes, tech specifications and BOQ- from NTPC approved source	As agreed / required	B	Physical and acceptance	Five samples for each item for each lot of delivery	Tech Specs and Const. Drawings		SR		
7	Fitting and fixtures - Aluminium sliding door bolts, tower bolts, pull bolt locks, handles, door stoppers etc.	Check for fittirg items as per relavent IS codes, tech specifications and BOQ- from NTPC approved source	As agreed / required	B	Physical and acceptance	Five samples for each item for each lot of delivery	Tech Specs and Const. Drawings		SR		
8	Fire proof doors										
i		a) Check for the Fire Proof Doors	As required/ agreed	A	Review of MTC	Each lot	As per Technical Specifications and approved drawings, IS 3614 Part (I &II), TAC		MTC	√	
ii		b) Check for DFT and Fire Retardency of Paint	As required/ agreed	B	Physical	Each Door	As per Technical Specifications and approved drawings, IS 3614 Part (I &II)		SR/LB		
9	Acceptance of all type fittings after fixing	Acceptance of fittings after completion	As agreed / required	B	Physical and acceptance	Random for each type of fitting	Tech Specs and Const. Drawings		SR		
8.00	GENERAL STEEL WORK										
1	Check for Material	Review of MTC/ make / Physical checks, tests (if MTC is not available)	As agreed / required	A	Review of MTC for each delivery	For each batch of delivery	Tech Specs and Const. Drawings		SR	√	
2	Rolling shutters										
i		Check for surface finish and thickness of plate of rolling shutters of approved make and DFT	As agreed / required	B	Physical	Random for each batch of delivery	Tech Specs and Const. Drawings		SR		
ii		Acceptance of rolling shutters after fixing	As agreed / required	B	Physical and acceptance	Random	Tech Specs and Const. Drawings		SR		
3	Steel Glazed doors and T-iron frames sections										
i		Check for shape, tolerances, thickness, welding and finishing of sections (Check MTC whereever applicable)	As agreed / required	A	Review of MTC for each delivery	Random for each delivery	Tech Specs and Const. Drawings		SR	√	
ii		Acceptance of Steel Glazed doors and T-iron frames sections after fixing	As agreed / required	B	Physical and acceptance	Random for each installation	Tech Specs and Const. Drawings		SR		
4	Pressed steel pressed frames/ doors										
i		Check for shape, tolerances, thickness, welding and finishing (Check MTC whereever applicable)	As agreed / required	A	Review of MTC for each delivery	Random for each delivery	Tech Specs and Const. Drawings, IS4351, IS2202		SR	√	
ii		Acceptance of Pressed steel pressed doors after fixing	As agreed / required	B	Physical and acceptance	Random for each installation	Tech Specs and Const. Drawings		SR		
5	Fencing and Gates										

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Sl. No	Activity and operation	Characteristics / instruments		Class# of check	Type of Check	Quantum Of check		Reference Document	Acceptance Norms	Format of Record		Remarks
1	2	3		4	5	6		7	8	9	D*	10
i)	Check for Materials for fencing and gates	PVC coated chain link fencing (IS 2720), Welded wire mesh (IS 1566), Reinforced barbed tape galvanised (IS 2629) etc.	As agreed / required	A	Review of MTC	Each batch of delivery		Tech Specs and Const. Drawings		SR/MTC	√	Mfr.'s T.C. shall be correlated with the consignment received.
ii)	Check for alignments, erection painting, DFT etc.		As agreed / required	B	Physical / measurements	Each installation		Tech Specs and Const. Drawings		SR		Erection shall be as per NTPC Tech. Specs.
ii)	Acceptance of the installation and working		As agreed / required	B	Physical / measurements	Each installation		Tech Specs and Const. Drawings		SR		Erection shall be as per NTPC Tech. Specs.
6	**Galvanised Chicken Wire Mesh**	Check for Guage and Dimensions from NTPC approved Source	As agreed / required	B	Acceptance	Random for each delivery		Tech Specs and Const. Drawings		SR		
9.00	**FLOOR FINISHES AND ALIED WORKS**											
1	**Cement Concrete Flooring**											
i		Check for execution of concreting	As agreed / required	B	Physical	Random in each shift		Tech Specs and Const. Drawings		SR		
ii		Check for providing and fixing glass/ PVC strips in joints	As agreed / required	B	Physical	Random in each shift		Tech Specs and Const. Drawings		SR		
iii		Check for laying, polishing, curing, finishing for terrazzo, marble chip flooring	As agreed / required	B	Physical	Random in each shift		Tech Specs and Const. Drawings		SR		
iv		Acceptance of lines, levels and finishing	As agreed / required	B	Acceptance	100%		Tech Specs and Const. Drawings		SR		
10.00	**SANITORY INSTALLATIONS**											
1		Check for size and surface finish of all sanitory items and fixtures from NTPC approved sources, (Check MTC whereever applicable)	As agreed / required	A	Physical / review of MTC	Each lot of delivery as per Specifications		Tech Specs and Const. Drawings		SR	√	To be procured from NTPC approved source
2		Acceptance of installations of all sanitory items and fixtures	As agreed / required	B	Acceptance	100%		Tech Specs and Const. Drawings		SR		
3	**SCI, CI, S&S Pipes & Fittings etc**											
i		Check for Work man ship and finish	As agreed / required	B	Visual	Random		Tech Specs and Const. Drawings		SR		
ii		Check for Unit weight and Dimensions	As agreed / required	B	Physical	Random		Tech Specs and Const. Drawings		SR		
iii		Hydrostatic test	As agreed / required	A	Review of MTC for each delivery	Each lot of delivery as per Specifications		Tech Specs and Const. Drawings		SR	√	
11.00	**WATER SUPPLY AND ALL TYPES OF FITTINGS**											
1		Check for size and surface finish of all water supply, GI/ MS pipes and fittings, Photo Voltaic Control System etc from NTPC approved sources (Check MTC whereever applicable)	As agreed / required	A	Physical / review of MTC	each delivery as per Specifications		Tech Specs and Const. Drawings		SR	√	To be procured from NTPC approved source
2		Acceptance of installations of all water supply, GI pipes and fittings	As agreed / required	B	Acceptance	100%		Tech Specs and Const. Drawings		SR		
3	**CI, S&S Pipes & Fittings**											
i		Check for Work man ship and finish	As agreed / required	B	Visual	Random as per Specifications		Tech Specs and Const. Drawings		SR		
ii		Check for Unit weight and Dimensions	As agreed / required	B	Physical	Random		Tech Specs and Const. Drawings		SR		
iii		Hydrostatic test	As agreed / required	A	Physical / review of MTC	Each lot of delivery as per Specifications		Tech Specs and Const. Drawings		SR	√	
4	**Polyethylene Water Storage Tanks**											
i		Check for material of tanks from NTPC approved sources	As agreed / required	A	Physical / review of MTC	Each lot of delivery as per Specifications		Tech Specs and Const. Drawings		SR	√	
ii		Aceptance for instllation and fitting (IS 12701)	As agreed / required	B	Acceptance	100%		Tech Specs and Const. Drawings		SR		
12.00	**DRAINAGE AND SANITATION**											
1	**Sanitary appliances**											
i		Check for Viterous China, Glazed, ceramic sanitary appliances (Water closets, Wash basins, urinals) etc.	As agreed / required	A	Physical / review of MTC	each delivery as per Specifications		Tech Specs and Const. Drawings		SR	√	To be procured from NTPC approved source
ii		Acceptance of installation of Viterous China, Glazed, ceramic sanitary appliances (Water closets, Wash basins, urinals) etc.	As agreed / required	B	Acceptance	100%		Tech Specs and Const. Drawings		SR		
2	**SW Pipes and RCC Pipes**											
i		Check for size and surface finish of Pipes from NTPC approved sources	As agreed / required	A	Physical	100% after delivery		Tech Specs and Const. Drawings, IS458, IS 1536		SR	√	
ii		Testing of Joints	As agreed / required	B	Physical	100%		Tech Specs and Const. Drawings		SR		

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Sl. No	Activity and operation	Characteristics / instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record		Remarks
1	2	3		4	5	6	7	8	9	D*	10
i		Acceptance of installations of Pipes	As agreed / required	B	Acceptance	100%	Tech Specs and Const. Drawings		SR		Acceptance tests shall be done as per specifications
3	CI Pipes, Covers and Frames										
i		Check for CI and SFRC covers and frames as per IS 1726 and IS 12592 from NTPC approved sources (Check MTC whereever applicable)	As agreed / required	A	Physical / review of MTC	Each lot of delivery	Tech Specs and Const. Drawings, IS 1536, IS 12592		SR	√	
ii		Acceptance of installations of CI Pipes, Covers and Frames	As agreed / required	B	Acceptance	1	Tech Specs and Const. Drawings		SR		
4	RCC manholes	Acceptance of RCC manholes after completion	As agreed / required	B	Acceptance	1	Tech Specs and Const. Drawings , IS 4111		SR		
13.00	FOUNDATION SYSTEM										
1	SHALLOW FOUNDATIONS										
i		Check for the foundation excavation - Location, Layout, size, depth etc	As required / agreed	B	Physical	Each location	As per technical specifications and construction drawings		SR	√	lines and levels to be checked
ii		Check for the foundation casting - Layout, Shape, dimensitions, Reinforcement, concreting, curing etc	As required / agreed	B	Physical	Each foundation	As per technical specifications and construction drawings		SR		lines and levels to be checked. Concrete Grade to be checked as per Mix Design
14.00	SHEETING AND OTHER WORKS										
1		Check for Material like modular areated panel, permanently colour coated sheets , metal decking , pre-engineered buildings, AC sheeting, Fire proof doors and insulations (all tests as per tehcnical Specifications)	As per manufacturer Standards	A	Review of MTC	Each batch of delivery	Tech Specs and Const. Drawings		MTC	√	1)FQP for structural steel shall also be applicable.2) For aluminium door/windows, check for anodisation as per Tech. Spec. 3) Fire proof doors shall be procured from TAC Approved parties as per relevant IS/Tech. 4) For aluminium cladding grade of alminium to be checked.
2		Check for Storage at Site	As agreed / required	B	Visual	Random in each shift	Tech Specs and Const. Drawings		SR		
3		Installation, lap alignment & workmanship.	As agreed / required	B	Visual/ Physical	Random in each shift	Tech Specs and Const. Drawings		SR		No gas cutting of sheets acceptable . Profile sheets will be kept covered in weather proof storage &stored at accurate height to avoid any exposure of actual water. Principle of first in and first out shall be apply for erecting the sheets.
4		Installation of lining &insulation &check thermal insulationfor wall clading for thickness , density , thermal conductivityn at 50 deg c and all other tests as per IS:8183	As agreed / required	B	Testing	100%	Tech Specs and Const. Drawings		SR	√	
5		Check for the nstallation, alignments, finishing etc	As agreed / required	B	Visual/ Physical	Random in each shift	Tech Specs and Const. Drawings		SR/LB		
6		Fasteners for sheeting work	As agreed / required	B	Review of TC including 1000 hrs salt spray test	100%	Tech Specs and Const. Drawings		SR/LB		
7		Acceptance of each type of installation	As agreed / required	B	Visual/ Physical	Each installation	Tech Specs and Const. Drawings		SR/LB		
15.0	PILING WORK (IF APPLICABLE)										
15.1	Execution										
i		100 mm Dia Borehole	As required	A	Physical	100%	NTPC Tech. Specs		SR/LB	√	If carried out by the contractor
ii		Pile layout	Total station	B	Measurement	100%	As per appd. Drawings and technical specification		SR/LB	√	
iii		Recording ground level	As required	B	Measurement	Random	IS:2911, as per appd. Drawings and technical		SR/LB	√	
iv		Cleaning/Flushing of pile bore	As required	B	Visual	Random	As per appd. Drawings and technical specification		SR/LB	√	
v		Size of bore and During boring of pile record commencement of SPT/ core recovery to ensure socketing length equivalent in terms of the Diameter of the pile below the socketing horizon.	As required	B	Measurement	100%	As per appd. Drawings and technical specification		SR/LB	√	
vi		Trial mix to ascertain the workability and cube strength	After receiving the recommended mix design from specialist agency,	B	Physical	One for each mix proportion	NTPC tech specification		SR/LB	√	Necessary correction for moisture content and water absorption according to mix design recommendation may be carried out during the trial mix
vii		Cement content	As required	B	Physical	Once per shift	As per approved design mix.		SR/LB	√	At batching plant
viii		Pouring of concrete to project above cutoff level.	As required	B	Measurement	100%	As per appd. Drawings and technical specification		SR/LB	√	
ix		Pile termination level	SPT & core recovery	A	Soil data	As per NTPC specifications	As per appd. Drawings and technical specification		SR	√	
15.2	Testing										
i		Bentonite	IS:2720	A	Physical / testing	Once per source	As per IS:2720 / tech. Specs.		SR/LB	√	Review of test report
ii		Density check on sample of mud collected from pile bore bottom	Sample collection	A	Physical	As per Tech. Spec.	As per NTPC Tech Spec.		SR/LB	√	Tests to be done before placing concrete. Samples to be collected from pile bore bottom.

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		ITEM : CIVIL WORK SUB-SYSTEM : Foundations, Excavation & Fill, Concrete, Building, Masonry Etc.		QP NO. : REV. NO .: DATE : PAGE :		1 0	PROJECT: PACKAGE: CONTRACT NO. MAIN CONTRACTOR	FLUE GAS DESULPHURISATION SYSTEM PACKAGE			
Sl. No	Activity and operation	Characteristics / instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record		Remarks
1	2	3		4	5	6	7	8	9	D*	10
iii		Slump test of concrete	IS:1199	B	Physical	Every 2 hrs at pouring point of concrete	IS:2911, As per appd. Drawings and technical specification		SR/LB	√	
iv		Cube sampling for works cube test	IS:456	B	Physical	One set of 6 cubes per 50 CuM or part thereof for each grade of concrete per shift whichever is earlier.	IS:2911, As per appd. Drawings and technical specification		SR/LB	√	
v		Initial pile load test, Vertical (Compression), Lateral (horizontal) and pullout (tension).	IS:2911 / as required	A	Testing	100% for 3 nos. for each type or as specified in BOQ / Tech. Spec.	IS:2911, As per appd. Drawings and technical specification		SR/LB	√	In case of compression test method the loading shall be cyclic.
vi		Routine pile tests, compression and horizontal	Calibrated dial gauges etc. as required.	A	Testing	100% for 0.5% of the total number of piles provided for each type of test/Tech. Spec.	IS:2911, As per appd. Drawings and technical specification		SR/LB	√	Routine Test shall be conducted by direct loading method.
vii		Integrity Tests	PEM	A	Testing	100%	IS:2911, As per appd. Drawings and technical specification and suppliers manual		Test Report	√	CHP
16.0	SPECIAL ITEMS										
16.1	Earthing Mat (Grounding System)										
i	Material	Earthing mat	As agreed / required	A	EIC Approved source and review of MTC/ test reports	Each lot of delivery as per Specifications	As per relevant IS and Tech. Specs / Manufacturer's, IS 3043		SR/MTC	√	
ii		Weld sizes & length	Visual/Tape	B	Visual/ Measurement	1	Tech Specs and Const. Drawings				NTPC approved electrodes shall be used
iii		D P test	DP test Kit	A	Physical	10% at random of the offered lot	Tech Specs and Const. Drawings		TR	√	
iv		Earth test	Earthing test kit	A	Physical	1	Tech Specs and Const. Drawings,		SR	√	
16.2	Bitumen layer for tank foundation										
i	Material	Grade of bitumen	As agreed / required	A	EIC Approved source and review of MTC/ test reports	Each lot of delivery as per Specifications	As per relevant IS and Tech. Specs /MTC		SR/MTC	√	
ii	Acceptance and workmanship	Application / workmanship	As agreed / required	B	Physical	Random	Tech Specs and Const. Drawings		SR		
16.3	Composite Aluminium Panels and structural glazing										
i	Material	Type of aluminium panels / structural glazing / fasteners and fixtures / silicon sealant	As agreed / required	A	EIC Approved source and review of MTC/ test reports	Each lot of delivery as per Specifications	Technical specifications / drawings		SR/MTC	√	MTC shall cover all the properties / parameters as per technical specifications
ii	Acceptance and workmanship	Installation / workmanship	As agreed / required	B	Physical	Random	Technical specifications / drawings		SR		
		LEGEND: D * Records, indentified with "Tick" (√) shall be essentially included by supplier in QA documentation.						DOC. NO.: CS-4140-109-2 REV:			
		Legend to be used: Class # : A = Critical, B=Major, C=Minor; SR, TR, MTC, LB									
Manufacturer/ Sub-supplier	Main-supplier	Categorization Witnessing & Accepting (As per NTPC QA&I System) Category 'A' FQA Engineer in association with Executing Engineer, Category 'B' Executing Engineer, Category 'C' Executing Engineer ;SR = Site Register , TR= Test Report, MTC = Manufacturer's Test Certificate					For NTPC USE				
Signature		This document shall be read in conjunction with NTPC Tech. Specifications, BOQ, Drawings						REVIEWED BY	APPROVED BY		APPROVAL SEAL

LOGO	SUPPLIERS NAME AND ADDRESS:	INDICATIVE FIELD QUALITY PLAN					ANNEXURE- V				
		ITEM : STRUCTURAL STEEL WORK		QP NO. :		2	PROJECT:	FLUE GAS DESULPHURISATION SYSTEM PACKAGE			
				REV. NO .:		0	PACKAGE:				
		SUB-SYSTEM : FABRICATION & ERECTION		DATE :			CONTRACT NO.				
				PAGE :			MAIN CONTRACTOR				
Sl. No	Activity and operation	Characteristics / instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record		Remarks
1	2	3		4	5	6	7	8	9	D*	10
1.00	MATERIALS										
i		Structural steel procured from NTPC approved sources-Mechanical (YS, UTS, Elg, UT if specified),,and Chemical properties (CE as per IS)		A	Review	For each batch of each section delivered at site	Technical Specification and Construction Drawings, IS 2062		SR	√	Correlated MTC shall be verified. In the event of non submission of MTC , sample shall be selected by FQA for testing
2.00	FIT-UP										
2.01		Marking and Cutting	As agreed / required	B	Visual & Measurement	Each plate/ Section	Tech Specs and Const. Drawings/ Approved cutting plan		SR		
2.02		Match markings for trial assembled components	As agreed / required	B	Physical	Each fit-up	Tech Specs and Const. Drawings		SR		
2.03		Weld Fit Up	As agreed / required	B	Physical	Each fit-up	Tech Specs and Const. Drawings		SR	√	Edge Preparation/ Gap/ Alignment
3.00	PRE HEATING (wherever applicable)										
3.01		Pre-Heating Temperature	As agreed / required	B	Measurement	Each pre-heating	Tech Specs and Const. Drawings, Approved WPS		SR	√	
3.02		Post Weld Heat Treatment (PWHT), if required	As agreed / required	A	Time & Temperature	Each PWHT	Tech Specs and Const. Drawings, Approved WPS		SR	√	
4.00	WELDING REQUIREMENTS										
4.01		PQR and Welder's Qualification	As agreed / required	A	Physical	Each welder	Approved WPS/ PQR, AWS-D1.1/ASME IX, Tech Specs and Const. Drawings		Test Report	√	
4.02		Welding consumables	As agreed / required	B	Physical	Random in each shift	Approved WPS/ Owner Rationalized list of Electrodes.		SR	√	
4.03		Sequence of welding	As agreed / required	B	Physical	Random in each shift	Tech Specs and Const. Drawings, Agreed scheme		SR		
4.04		Removal/ grinding of temporary attachments	As agreed / required	B	Measurement	All cleats/ attachments	Tech Specs and Const. Drawings, IS-7215/Approved Drg.		SR		
4.05		Completeness after welding-Dimensions/ distortion	As agreed / required	B	Visual	Each structure component	Tech Specs and Const. Drawings		SR		
5.00	NON DESTRUCTIVE AND DESTRUCTIVE TESTING										
5.01	Fillet Welds										
5.01.01		Visual	As required/ agreed	B	Visual/ Measurement	Each welded joint	As per technical specifications and construction drawings		SR		As per requirement of Owner Engineer
5.01.02		Macro-Etch Examination	As required/ agreed	B	Physical	Main fillet weld with min one joint per built up beam, columns and crane girders	As per technical specifications and construction drawings		SR	√	

LOGO	SUPPLIERS NAME AND ADDRESS:	INDICATIVE FIELD QUALITY PLAN						ANNEXURE- V			
		ITEM : STRUCTURAL STEEL WORK		QP NO. :		2	PROJECT:	FLUE GAS DESULPHURISATION SYSTEM PACKAGE			
				REV. NO .:		0	PACKAGE:				
		SUB-SYSTEM : FABRICATION & ERECTION		DATE :			CONTRACT NO.				
				PAGE :			MAIN CONTRACTOR				
Sl. No	Activity and operation	Characteristics / instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record		Remarks
1	2	3		4	5	6	7	8	9	D*	10
5.01.03		Dye Penetration Test (DPT)	As required/ agreed	B	Physical	25% weld length of tension member of crane girder- For crane girder 5% of Weld length with min. 300mm at each location - Except Crane Girder, for all other Fillet Welds	As per technical specifications and construction drawings		SR	√	
5.02	**Butt Welds**										
5.02.01		Visual	As required/ agreed	B	Visual	Random in each shift	As per technical specifications and construction drawings		SR		
5.02.02		Dye Penetration Test	As required/ agreed	B	Physical	100% DPT after back gouging on all butt welds except for coal bunker bins 10% DPT after back gouging-For coal bunker bins	As per technical specifications and construction drawings		SR		All butt welds to be back gouged before DPT
5.02.03		Mechanical testing on production test coupons	As required/ agreed	A	Physical	Min. one joint per built up beams, coloums and crane girder.	As per technical specifications and construction drawings		SR	√	Test on production test coupons
5.02.04		Radiography Test (RT)	As required/ agreed	A	Physical	100% RT on butt welds of tension flange (bottom flange) of crane girders 5% spot RT on butt welds / at inaccessible locations UT on butt welds- For coal bunker bins 10% RT weld length of each welder on butt welds, except for crane girders and coal bunk	As per technical specifications and construction drawings		SR	√	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. Wherever RT is not feasible UT to be carried out with the approval of the Engineer
5.03	**Full Penetration Welds (Other than butt welds)**										
5.03.01		Ultrasonic Testing (UT)	As required/ agreed	A	Physical	100% UT on the web to flange joint of crane girder 10% UT on other full penetration joints	As per technical specifications and construction drawings		IR	√	In case of failure of any welds in SPOT/RT or UT the % of retesting shall be doubled at that particular loaction. Acceptance criteria of NDT on welds shall be as per AWS D1.1.

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Sl. No	Activity and operation	Characteristics / instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record		Remarks
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5.04	NON DESTRUCTIVE AND DESTRUCTIVE TESTING FOR CHIMNEY STEEL LINER										
i		Visual examination	As required/ agreed	B	Visual	100%	As per technical specifications and construction drawings, IS 822, AWS D 1.1		SR	√	As per requirement of NTPC Engineer
ii		DPT	As required/ agreed	B	Physical	100%	As per technical specifications and construction drawings, IS 822, AWS D 1.1		IR	√	
iii		RT	As required/ agreed	A	Physical	10% FOR SHOP BUTT WELD AND 15% FOR SITE BUTT WELDS	As per technical specifications and construction drawings, IS 822, AWS D 1.1				
6.00	FOUNDATION CHECKS										
6.01		Dimensions and levels	As agreed / required	B	Physical/ Measurement	Each Foundation	Tech Specs and Const. Drawings		SR	√	Shape, lines (including diagonal checks)
6.02		Foundation Bolts and Embedments	As agreed / required	B	Physical/ Measurement	Each Foundation	Tech Specs and Const. Drawings		SR	√	Measurement of Verticality, Levels, pitch distance
7.00	PRE-ASSEMBLY CHECKS										
7.01		Punch Erection marks and match marks on members	As agreed / required	B	Visual/ Physical	Each structural member	Tech Specs and Const. Drawings				Markings for - Assembly designation, Part number, Weight, Any other important identifications.
7.02		Pre-assembly as per match mark	As agreed / required	B	Visual/ Physical	Each structural member	Tech Specs and Const. Drawings				
7.03		Camber, sweep and total length after trial assembly of structure.	As agreed / required	B	Visual/ Physical	Each structural member	Tech Specs and Const. Drawings		SR	√	
7.04		Control assembly check at shop	As agreed / required	B	Visual/ Physical	Every first and tenth set of identical structure	Tech Specs and Const. Drawings				
8.00	ERECTION CHECKS										
8.01		Alignment, slopes, level, tolerances of erected member	As agreed / required	B	Measurement	Each structural member	Tech Specs and Const. Drawings		SR	√	
8.02		Tightening of bolts including foundation bolts with lock nuts	As agreed / required	B	Visual/ Physical	Each structural member	Tech Specs and Const. Drawings		SR	√	
8.03		Acceptance of erected structure	As agreed / required	B	Visual/ Physical	Each erected structure	Tech Specs and Const. Drawings, IS 7215 and IS 12843		SR	√	
9.00	INSTALLATION AND ALIGNMENT OF STEEL LINER										
i		Submission of Installation/ Erection Scheme/ methodology for all structures	-	B	Approval	Once prior to erection of each structure	Approved drawings and Technical Specifications		SR	√	
ii		Check for Erection Marks	-	B	Visual	100%	Approved drawings and Technical		SR		
iii		Check for Installation of Steel Liners	As required	B	Visual/ Acceptance	100%	Approved drawings and Technical Specifications		SR		
iv		Check for Site Joints	As required	B	Visual/ Acceptance	100%	Approved drawings and Technical Specifications		SR		
v		Check for Installation of Inlet Transition Ducts	As required	B	Visual/ Acceptance	100%	Approved drawings and Technical Specifications		SR		

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vi		Check for Installation of Insulations and Expansion Compensators	As required	B	Visual, Physical, Acceptance	100%	Approved drawings and Technical Specifications		SR		Each layer of expansion Compensator tobe checked at shop for thickness, unit weight, tensile strength & elongation along with temp. withstandability for composite joints
vii		Ensure the Erection of all steel structures along with permissible tolerances and their acceptance	As required	B	Visual/ Acceptance	100%	Approved drawings and Technical Specifications		SR		
viii		Check and approval for Dismantling, Modification and Re-erection, if required for any reason	As required	B	Visual/ Acceptance	100%	Approved drawings and Technical Specifications		SR		
10.00	PAINTING SYSTEM										
10.01		Paining Materials and accessories	As agreed / required	A	Review of MTC	Each batch of delivery	Tech Specs and Const. Drawings		SR/MTC	√	Mfr.'s T.C. shall be correlated with the consignment received.
10.02		Surface prepration	As agreed / required	B	Physical /visual	Random in each shift	Tech Specs and Const. Drawings, Relevant code/ standards		SR	√	
10.03		DFT of paint - Over steel surface	As agreed / required	B	Physical	Each surface at random	Tech Specs and Const. Drawings		SR	√	
10.04		Acceptance of painted surfaces	As agreed / required	B	Physical	Each surface at random	Tech Specs and Const. Drawings		SR		
11.00	PERMANENT BOLTS AND NUTS AND WASHERS										
11.01		Material	As agreed / required	A	Physical and MTC Review	Once for each lot of delivery	Tech Specs and Const. Drawings		SR/MTC	√	Permanent mild steel Bolts, mild steel Nuts, Mild steel Washers, High strength structural Bolts, Washers-Dimensions, properties, storage along with MTC
11.02		Contact surfaces before bolting	As agreed / required	B	Physical	Random before asembly for bolting	Tech Specs and Const. Drawings, IS 4000		SR		
11.03		Inspection of the assembled bolts	As agreed / required	B	Physical	Randomly in each shift for assembeled bolts	Tech Specs and Const. Drawings, IS 4000		SR		
11.04		Tensioning	As agreed / required	B	Physical	Randomly during snug tight test and after full tensinoning	Tech Specs and Const. Drawings, IS 4000		SR	√	
11.05		Acceptance of installed bolts	As agreed / required	B	Physical	Each bolt	Tech Specs and Const. Drawings		SR		
12.00	STAINLESS STEEL HAND RAILS										
12.01		Material	As agreed / required	A	Physical/MTC Review(In case procured by contractor)	Once for each lot of delivery	Tech Specs and Const. Drawings		SR/MTC	√	Also check grade of steel
12.02		DPT for welding	As agreed / required	A	Physical	Random for each fabrication	AWS D1.1 / 'Tech Specs and Const. Drawings		SR/LB	√	WPS shall be submited for Owner approval , electrodes used shall be as specified in WPS

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12.03		Acceptance of stainless steel hand rails	As agreed / required	B	Physical	Each installation	Tech Specs and Const. Drawings		SR		
13.00	PTFE SLIDING BEARINGS AND ELASTOMERIC BEARINGS										
13.01		Material from approved source	As agreed / required	A	Physical and MTC Review	Once for each lot of delivery	Tech Specs and Const. Drawings		SR/MTC	√	
13.02		Acceptance of installation of bearings	As agreed / required	B	Physical	Each installation	Tech Specs and Const. Drawings		SR		
		LEGEND: D * Records, indentified with "Tick" (√) shall be essentially included by supplier in QA					For Owner USE	DOC. NO.:	REV: 0		
		Legend to be used: Class # : A = Critical, B=Major, C=Minor; SR, TR, MTC, LB									
Manufacturer/ Sub supplier	Main-supplier	Categorization Witnessing & Accepting (As per Owner QA&I System) Category 'A' FQA Engineer in association with Executing Engineer, Category 'B' Executing Engineer, Category 'C' Executing Engineer ; SR = Site Register , TR= Test Report,MfrTC = Manufacturer's Test Certificate									
Signature		This document shall be read in conjunction with Owner Tech. Specifications, BOQ, Drawings						REVIEWED BY	APPROVED BY		APPROVAL SEAL

CUSTOMER SPECIFICATION: FUNCTIONAL GUARANTEES

SUB-SECTION-VI

FUNCTIONAL GUARANTEES & LIQUIDATED DAMAGES

FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES FOR SHORTFALL IN PERFORMANCE AND PERFORMANCE GUARANTEE TESTS

1.00.00 GENERAL

The term "Performance Guarantees" wherever appears in the Technical Specifications shall have the same meaning and shall be synonymous to "Functional Guarantees". Similarly the term "Performance Tests" wherever appears in the Technical Specifications shall have the same meaning and shall be synonymous to "Guarantee Test(s)".

2.00.00 PERFORMANCE GUARANTEES / PERFORMANCE TESTS

2.01.00 **General Requirements**

2.01.01 The Contractor shall guarantee that the equipment offered shall meet the ratings and performance requirements stipulated for various equipment covered in these specifications.

2.01.02 The guaranteed performance parameters furnished by the Bidder in his offer, shall be without any tolerance values whatsoever. All margins required for instrument inaccuracies and other uncertainties shall be deemed to have been included in the guaranteed figures. No tolerance or allowance on the test result will be permitted for instrument errors or inaccuracy, the method of testing or any other causes.

2.01.03 The Contractor shall conduct performance test and demonstrate all the guarantees covered herein. The various tests which are to be carried out during performance guarantee tests are listed in this Sub-section. The guarantee tests shall be conducted by the Contractor at site in presence of Employer on each unit individually.

2.01.04 All costs associated with the tests including cost associated with the supply, calibration, installation and removal of the test instrumentation shall be included in the contract price.

2.01.05 The performance tests shall be performed using only the normal number of Employer supplied operating staff. Contractor, vendor or other subcontractor personnel shall be used only for instructional purposes or data collection. At all times during the Performance Tests the emissions and effluents from the Plant shall not exceed the Guaranteed Emission and Effluent Limits.

2.01.06 It shall be responsibility of the Contractor to make the plant ready for the performance guarantee tests.

2.02.00 **Test Instrumentation, Flow Measurement and their Calibration**

2.02.01 All instruments required for performance testing shall be of the type and accuracy required by the code and prior to the test, the Contractor shall get these instruments calibrated in an independent test Institute approved by the Employer and submit the same to Employer prior to commencement of test. All test instrumentation required for performance tests shall be supplied by the Contractor and shall be retained by him upon satisfactory completion of all such tests at site. All calibration procedures and standards shall be subject to the approval of the Employer prior to commencement of test. The protecting tubes, pressure connections and other test connections required for conducting guarantee test shall conform to the relevant codes.

Tools and tackles, thermowells (both screwed and welded) instruments/devices including flow devices, matching flanges, impulse piping & valves etc. and any special equipment, required for the successful completion of the tests, shall be provided by the Contractor free of cost.

The Performance test shall be carried out as per the agreed procedure. The detailed PG test procedure shall be submitted within 90 days of the date of Notification of Award and finalization of the PG test procedure shall be done within 180 days from the date of Notification of Award.

2.02.02 The P&G test procedures shall be submitted for equipments/system & subsystem under Contractor's scope for all Guarantees as mentioned below, as per latest International codes / standard including correction curves, meeting the specification requirements along with sample calculations & detailed activity plan of preparation (including test instrumentation), conductance and evaluation of Guarantees.

2.02.03 The Contractor shall submit for Employer's approval the detailed Performance Test procedure containing the following:

(a) Object of the test.

(b) Various guaranteed parameters & tests as per contract.

(c) Method of conductance of test and test code.

(d) Duration of test, frequency of readings & number of test runs.

(e) Method of calculation.

(f) Correction calculations & curves.

(g) Instrument list consisting of range, accuracy, least count, and location of instruments.