



VOLUME – IA Part I & II

TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED



TECHNICAL CONDITIONS OF CONTRACT (TCC)

CONTENTS

SI No.	DESCRIPTION	Chapter	No. of Pages
Vol I A	Part-I: Contract specific details		
1	Project Information	Chapter-I	2
2	Scope of works	Chapter-II	12
3	Facilities in Scope of Contractor / BHEL (Scope Matrix)	Chapter-III	8
4	T&Ps and MMEs to be deployed by Contractor	Chapter-IV	7
5	T&Ps to be deployed by BHEL on sharing basis	Chapter-V	3
6	Time Schedule	Chapter-VI	4
7	Terms of Payment	Chapter-VII	5
8	Taxes and other Duties	Chapter-VIII	2
9	Bill of Quantity	Chapter-IX	8
10	General	Chapter-X	9
11	Progress of work	Chapter-XI	2
12	Material Handling, Transportation and Site Storage	Chapter-XII	4
13	Painting	Chapter-XIII	4
14	Accounting of materials	Chapter-XIV	2
15	Foundation and Grouting	Chapter-XV	3
16	Electrical, C&I and Illumination – Detailed scope of work and technical specifications	Chapter-XVI	42
Vol IA	Part-II: Technical specifications		
1	CORRECTIONS / REVISIONS IN SPECIAL CONDITIONS OF CONTRACT, GENERAL CONDITIONS OF CONTRACT AND FORMS & PROCEDURES	Chapter 1	3
2	T&P Hire Charges	Chapter 2	12
3	Drawings (For information & Tendering purpose only)	Chapter 3	391

TECHNICAL CONDITIONS OF CONTRACT (TCC)

4	HSE Plan for Site Operations by Subcontractor	Chapter 4	131
5	Painting Specification	Chapter 5	8
6	Technical Specification	Chapter 6	371
7	Erection conditions of contract	Chapter 7	44
8	Technical Specification of BOIs	Chapter 8	12

VOLUME - IA PART – I CHAPTER – I

PROJECT INFORMATION

INTRODUCTION

1.1	Project Title	:	Ennore SEZ project of 2 x 660 MW Coal Based Super Critical Thermal Power Project at Ash Dyke of NCTPS
1.2	Plant capacity	:	1320 MW (2 units of 660 MW each)
1.3	Type of project	:	Green field
1.4	Owner	:	Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO)
1.5	Consultant	:	DESEIN, New Delhi
1.6	Plant site location	:	Ash dyke of North Chennai Thermal Power Station (NCTPS)
1.7	Location co-ordinates	:	80° 18' E to 80° 19' E Longitude 13° 17' N to 13° 18' N Latitude
1.8	Nearest Village	:	Vayalur
1.9	Nearest Town & City	:	Chennai (35 Km)
1.10	State Capital	:	Chennai (35 Km)
1.11	Nearest Railway Station	:	Athipattu Pudunagar (~ 5 Km) on Chennai – Vijayawada Line
1.12	Nearest Airport	:	Chennai (~ 60 Km)
1.13	Nearest Seaport	:	Ennore (~ 3 Km)
1.14	Nearest Road access	:	All weather road from Pattamandri on the Thiruvottiyur – Ponneri highway
2.0	Meteorological Condition		
2.1	Climate	:	Tropical, very dry and hot summer, dry and cold winter and good rain-fall in monsoon accompanied with strong wind
2.2	Site Elevation	:	(+) 10.0 Meter above Mean Sea Level
2.3	Ambient Temperature		
a.	Annual Maximum Mean Temperature	:	32 °C
b.	Annual Minimum Mean Temperature	:	24 °C
c.	Design ambient temperature	:	35 °C
2.4	Relative Humidity		

TECHNICAL CONDITIONS OF CONTRACT (TCC)

a.	Maximum	:	100 %
b.	Minimum	:	36 %
c.	Design	:	75 %
2.5	Annual Rainfall		
	Maximum	:	2540 mm
	Average	:	1600 mm
	Minimum	:	1175 mm
2.6	Basic Design Wind Pressure	:	As per IS: 875 (Latest Edition)
2.7	Wind Speed	:	11.8 kmph (Avg), 50 m/s (max)
2.7	Seismic zone	:	Zone: III as defined in IS:1893-2002
2.8	Design ambient temperature for Electrical equipment	:	50 °C

VOLUME-IA PART-I CHAPTER – II

1.2.0 SCOPE OF WORKS

- 1.2.1 Erection, Testing, Commissioning, Trial Operation & PG Test of balance works of Pipe Conveyor system from New TP 2 (outside plant boundary of Ennore SEZ) to Crusher House (inside Ennore SEZ) of 2X660MW Ennore SEZ Supercritical Thermal Power Project at Ash Dyke of NCTPS, Tamilnadu. Entire scope of works of this package has to be executed under the supervision of OEM – M/s FLSmidth Private Limited (FLSmidth).
- 1.2.2 **The scope of works for shall comprise of but not limited to the following:**
(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)
- 1.2.2.1 FLSmidth has two storage yards inside Ennore SEZ plant premises. Further they also have 4 nos (3 nos closed and 1 no semi-closed storage sheds). The scope of works of this contract includes taking over of the entire materials from FLSmidth Private Limited under the presence of BHEL along with yards and sheds. The materials have to be diligently identified, check for its healthiness and recorded in a register both in soft and register format. Protocols for the same have to be done Triparty between the contractor, FLSmidth and BHEL. Rate quoted for this tender includes cost of this also and no separate payment shall be done for this account.
- 1.2.2.2 The contractor should also take over the entire storage yard, sheds from FLSmidth in 'As Is Where Is' condition. Scope of work of this contract also includes maintaining the aforesaid structures and yard till handing over of the same as per contract.
- 1.2.2.3 Scope of work of this contract includes complete installation services like transportation to erection site from closed / open stores, erection, alignment, testing, commissioning, trial run (no load as well as with load), independent & integrated performance guarantee test, adequate deployment of resources (man & machine, tools & tackles) as per the specification, requirement, successful completion and handing over

TECHNICAL CONDITIONS OF CONTRACT (TCC)

upon successful completion to TNPGL of items/systems for coal handling plant and the auxiliary system.

- sourcing of certain Materials at contractor's cost,
- Fabrication of already sourced materials / newly sourced material by contractor,
- assembly at stores / site as per site conditions,
- Handling of already fabricated Materials at BHEL / Contractor's Stores / Storage Yard,
- Transportation of fabricated material to site of erection,
- Inspection, preparation of foundation.
- Broadly following equipment will be in the scope of erection for pipe conveyor system and technological structures in TPs, Conveyor Gallery and crusher house
 - - Technological structures like
 - PSK Panels, standard Modules, Stringers & short post assemblies including all the bracings & fixing accessories along with its alignment in gallery
 - Deck plate, seal plates
 - Head frames, Tail frames with tail frame guard
 - Bend Pulley Frames
 - Parking station for Maintenance trolleys
 - Maintenance Trolleys
 - Discharge Hoods
 - Drive Base Frame
 - Pulleys (head, tail, bend, snub, take-up)
 - Chutes with liners and gasket
 - Skirt Boards with sealing rubbers
 - Complete VGTU assembly consisting of guide pipes, ropes, guards, counter weight, Capstan brake, winch etc. Frames, guards etc.
 - Counter weights
 - Complete drive chain equipment like drive HT VFD Motors, LT motors including testing at site, brakes, couplings with oil, gearbox with oil & their alignment
 - Fixing brackets, frames and fixing accessories, Access platform
 - Inspection/ access ladders etc.
 - External (Primary & secondary) & internal scrappers,

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- Complete Idler assemblies (on carrying side as well as return side) with brackets and all the fixing accessories as per the approved GA drawing
- Electric and Manual Hoists
- Belt laying for Pipe conveyors including arrangement of wire rope for belt pulling, winch machine, sheave pulleys etc. and other tools & tackles required for laying
- Belt splicing, joining & Hot vulcanizing including arrangement of jointing agency, vulcanizing machine, DG set and all tools and tackles.
- - Foundation bolts & nuts, stools, embedment, anchor fasteners, other fixtures etc.
- Minor Site Fabrication and modification of misc. structures related to conveyor system if any Required Supply of grouting cement (GP-2/ equivalent) & Grouting of mechanical equipment, Drive base frames, pockets etc. as per requirements.
- Closure of any openings in floor CRH drive floor with chequered floor after erection.\
- Supply & Application of paint
- - Any other erection activities not specifically mentioned but required for satisfactory system completion (for this the weight shall be taken from the drg weight)
- Supply of consumables required for the above scope of work.
- Supply and erection of roof / side cladding sheets of galleries,
- Erection, Testing and commissioning of LT panels, Dry Type transformer, Lighting panels, control panels, VFD panels, etc.,
- Erection and commissioning of All Types of Field Instruments like switches, RTDs, etc.,
- Erection & Testing of all types of power/control/instrumentation cables etc.
- Fabrication and installation of steel supports wherever required.
- Commissioning of the entire Pipe conveyors PC 1A/ 1B system from crusher house to New TP 2
- Trial operation & PG Test of entire Pipe conveyor system from crusher house to New TP 2.
- Conducting PG test under the supervision of BHEL/ FLS engineer and providing all manpower (skilled and unskilled) during the test

TECHNICAL CONDITIONS OF CONTRACT (TCC)

and attending the recommended modifications to achieve desired PG parameters.

1.2.2.4 **OPERATION AND MAINTENANCE TILL HANDING OVER**

- 1.2.2.4.1 The Bidder shall be responsible to carry out the “round the clock trouble free operation” of the complete pipe conveyor system related to the unit (2x660 MW) for a period of **300 shifts**. Number of shifts may be increased or decreased based on the requirement. Each shift shall be of 8 hrs. The time calculation shall be based on plant in operation and the shift will not be counted when power plant is not in operation.
- 1.2.2.4.2 Prior intimation for start of coal firing/coal unloading from ship shall be given to bidder two days before. The above stated 300 shifts shall not be continuous and shall be unequally distributed over a span starting from completion of load trial till handing over of system to TNPGL. If the pipe conveyor system is handed over to customer before completion of 300 shifts the bidder will be paid only for the completed shifts on prorata basis. Per shift charges shall remain same for day shift & night shift. The price quoted shall be valid till the completion of the project.
- 1.2.2.4.3 Bidders to specifically note that the manpower engaged during initial commissioning till load trial shall be in the scope of bidder and shall not be treated as O&M shifts. No extra payment shall be payable on this account.
- 1.2.2.4.4 Bidders to note that all consumables/ tools tackles/ manpower required during the period of O&M shall be included in the scope of Bidder and no additional payment will be made by BHEL in this regard.
- 1.2.2.4.5 All other consumables (gasket, rope, diesel, rustoline, waste cloth, lapping paste, jute, emery papers, welding electrodes, grinding wheel, hacksaw-blade, cutting gas, Electric items like Insulation Tape, Lugs, Fuses, Push Buttons, Electrical contact cleaner etc.) required shall be in the scope of the bidder and includes in the cost. No extra cost would be payable for this.
- 1.2.2.4.6 All tools, tackles, via chain pulley block, pulling & lifting equipment, Trolley, Crane, Hydra, Truck, Trailer, winch, wire rope, grinding machine, sling, D-shackle, Coupler etc. including precision measuring instruments, welding machine & single phase portable welding machine that may be essential to execute the job shall be arranged by the bidder at no extra

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- cost to BHEL. Portable diesel generator machine will have to be arranged by the bidder for carrying out maintenance job outside the plant.
- 1.2.2.4.7 Necessary shifting of materials, spares, equipments etc. from store to work site and unserviceable materials from work site to store/yard, is to be done by the bidder at their own cost.
- 1.2.2.4.8 The bidder must have adequate resources to undertake routine, preventive maintenance jobs of Pipe conveyor system. They should have adequate resources to mobilize the site for carrying out three to four jobs simultaneously without any delay.
- 1.2.2.4.9 Bidder has to compulsorily maintain log book for the O & M staff engaged for O&M jobs and submit to Engineer in charge for certification for realization of the bills. After certification of the bill by Engineer in charge of BHEL, bidder shall claim the amount after completion of minimum 25 shifts.
- 1.2.2.4.10 Top up of oil/grease/lubricant as required during operation of plant shall be done by the bidder. Any oil leakage till handing over and during operation & maintenance shall be replenished by the bidder.
- 1.2.2.4.11 Housekeeping: Cleaning of all equipment and housekeeping to be carried out dedicatedly in total Coal Handling Plant area and its office premises.
- 1.2.2.4.12 All routine, preventive, predictive and breakdown maintenance of equipments of Coal Handling Plant inclusive of BHEL supplied equipments.
- 1.2.2.4.13 Fabrication and erection of platform/extra support for CHP area if felt necessary during operation and maintenance of the plant has to be done by the bidder. Materials like channels, beam, angle etc as required shall be supplied by bidder.
- 1.2.2.4.14 To maintain the daily Maintenance log book in which details of overhauling / breakdown/maintenance of any equipment including replacement of spares/components to be recorded. Recording of any abnormality of equipments, malfunctioning of system of the CHP also to be noted in the Log book and informed to the Engineer-in-charge of BHEL ISG for initiating immediate corrective action by the vendor.
- 1.2.2.4.15 In case the bidder does not engage required O&M staff with tools/tackles/qualification as specified in the specification, alternate O&M staff shall be engaged by BHEL in line with relevant Breach of contract clauses of the contract.
- 1.2.2.4.16 Minimum Manpower requirement for O&M of the Internal Coal Handling Plant:

TECHNICAL CONDITIONS OF CONTRACT (TCC)

S No.	Manpower	Nos.
1	Engineer (Mech.& /Elect.)	2
2	Mechanical & Electrical Supervisor	2
3	Console Operator	1
4	Field Operator	2
5	Electrician	1
7	Technician /Fitter (Mech.)	2
8	Rigger Skilled	1
9	Helper	2
10	Welder	1

Note:

The above list is minimum manpower required for O&M. In case additional manpower required for carrying out O&M, same shall be supplied by the vendor without any extra cost implication to BHEL.

- The vendor shall take approval from Engineer-in charge of BHEL by submitting organization Chart of O&M staff for this site clearly indicating man power deployment with their educational background& experience with supporting documents.
- The vendor shall be solely and wholly responsible for safety and security of workers engaged in the job and the BHEL property. In case of any accident the vendor shall pay proper compensation to the workers as per workmen's compensation act and repair/replace BHEL property at their own cost & arrangement. The bidder shall also make adequate provision of insurance for their workers at their own cost to cover them against the risk of accident.
- The vendor and their workers engaged in the job shall follow all safety rules at the time of execution of work. It shall be responsibility of the bidder to supply all safety equipment as necessary to its O&M staff.
- Beyond general shift if any trouble/breakdown occurs in the plant, Maintenance team must reach the plant without any delay along with Engineer/Site Incharge.
- No Person from the list of manpower shall leave the plant site without prior permission from the Engineer in charge of BHEL.
- However, in operation part, if any person is absent, substitute must be given

TECHNICAL CONDITIONS OF CONTRACT (TCC)

immediately otherwise proportionate deduction will be made.

- The replacement / substitute personnel for maintenance, manpower shall have the same educational qualification and experience.
- If any additional manpower is required during O&M whatsoever under the scope of contract the same shall be made available by bidder in time within the cost. To cater the need of time bound maintenance jobs, the bidder shall depute additional manpower without any cost implication to BHEL
- During execution of work if any personnel is found not suitable for the job or his presence inside powerhouse premises is felt undesirable, the personnel has to be replaced within 15 days.
- BHEL will not be responsible for payment towards idle labour charges.

- **Minimum qualification & experience of personnel & manpower required**

S No.	Category.	Educational qualification.	Work experience.
01.	Engineer (Mech /Elect.)	Degree / Diploma in Mech. & Elect Engg. from a recognized University/ college.	Min. Two(2) years of work experience for Degree holders and Min. Five (5) years of work experience for Diploma holders in material handling plant having a working experience in DCS/PLC based material handling plant.
02.	Supervisor (Mech. /Elect.)	Diploma in Mech./Elect Engg. from a recognized University.	Min. two (2) years of working experience in material handling plant.
03.	Console Operator.	Degree / Diploma in Mech. & Elect Engg. from a recognized University/ college.	Min. One (1) year of work experience for Degree holders and Min. Three (3) years of work experience in DCS/PLC based material handling plant.
04.	Field Operators.	ITI (Mech.)/Elect trade institute certificate from recognized institute.	Min. two (2) years of working experience in material handling plant.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

S No.	Category.	Educational qualification.	Work experience.
05.	Technician/ Fitter(Mech.)	ITI (Mech.) trade institute certificate from recognized institute.	Min. two (2) years of working experience in material handling plant.
06.	Rigger	-----	Min. two (2) years of working experience in industry.
07.	Welder	-----	Min. two (2) years of working experience in industry.
08.	Gas cutter	-----	Min. two (2) years of working experience in industry.
09.	Electrician	-----	Min. five(5) years of working experience in Electrical and C&I.
10.	Helper	-----	

NOTE:

In case Vendor fails to maintain the manpower/site staff with above said quantity, qualification and experience at site till the O&M completion, suitable pro-rata deductions as per BHEL prevailing rates, shall be recovered from the vendor.

Separate line items are included for above scope of work in BOQ. However, commissioning, Trial operation & PG Test payment are part of Terms of payment of the package.

- 1.2.2.5 Safety at work place is of paramount importance. A separate chapter is included in this tender for HSE Plan for Site Operations by Subcontractor which has be strictly adhered to while execution of works of this contract.
- 1.2.2.6 The above provided list is indicative only for the bidder's guideline. Any other work not mentioned above, but required for completion of the package in total, deemed to have been included in the bidder's scope under this contract. Such work will be executed under this contract by bidder as per the direction of Engineer in charge. If any item of work not available in the rate schedule of this contract, the rate will be fixed in line with clause 2.15.7 of GCC.
- 1.2.2.7 The works to be performed under this contract, consist of providing all labour, supervision, material, scaffolding, construction equipment's, tools and plants,

TENDER SPECIFICATION NO: BHEL PSSR SCT 2233

TECHNICAL CONDITIONS OF CONTRACT (TCC)

temporary works, supplies including POL (Petroleum, oil & lubricants), transportation and all incidental items not shown or specified but reasonably implied or necessary for the proper completion of work in all respects. Testing of all materials, preparation of fabrication drawings as required etc. are included in the rates of items of work. Works shall only be carried out with approved structural fabrication drawings.

- 1.2.2.8 The area of work shall be cleared of all vegetation, rubbish and other objectionable matter and materials removed shall be burnt or otherwise disposed of as directed by the Engineer-in-Charge. No separate payment for these operations shall be made. The cost of all these operations shall be deemed to have been included in the unit rates rendered for the different items under bill of quantities.
- 1.2.2.9 All the works areas shall be adequately flood lighted to the satisfaction of the Engineer-in-Charge when the work is in progress during the night shifts.
- 1.2.2.10 The unit rates shall include all material equipment, fixtures, labour construction plant, temporary works and everything whether of permanent or temporary nature necessary for the completion of job in all respects.
- 1.2.2.11 The unit rates for various items of B.O.Q shall include all the stipulations mentioned in technical specifications and nothing extra over B.O.Q rates shall be payable
- 1.2.2.12 Drawings showing enough details for the construction as per the specification shall be furnished to the contractor in a phased manner. Preparation of detailed fabrication drawing as required is in the scope of contractor.
- 1.2.2.13 The bidder should fully apprise himself of the prevailing conditions at the proposed site, climatic conditions including monsoon pattern, local conditions, soil strata and site-specific parameters and shall include for all such conditions and contingent measures in the bid, including those which may have not been specifically brought out in the specifications.
- 1.2.2.14 Bidder shall visit site for better clarification against present status of structural works in the area of works as mentioned under the scope and assessment of pending works. The work covered under scope shall be taken up on AS IS

TECHNICAL CONDITIONS OF CONTRACT (TCC)

WHERE IS basis, as applicable in site as per the instructions of BHEL Engineer in charge.

- 1.2.2.15 Structural Materials required to be supplied by the contractor are to be procured from customer TNPGL approved steel manufactures only. List of such approved manufactures to be obtained from BHEL before procurement. If the contractor is procuring from any other steel manufactures, necessary approval of the credentials is to be obtained from TNPGL through BHEL, before procuring the same.
- 1.2.2.16 Scope of work includes supply and erection of sheets as per the below specification
- Side cladding sheeting specification
 - Thickness : 0.6 mm BMT
 - AZ coating : 150 GSM
 - Painting
 - Outer : PVDF primer + finish = 20 microns
 - Inner : PVDF primer + finish = 12 microns
 - Roof sheeting specification including trans
 - Thickness : 0.8 mm BMT
 - AZ coating : 150 GSM
 - Painting
 - Outer : PVDF primer + finish = 20 microns
 - Inner : PVDF primer + finish = 12 microns
 - Colour shade shall be as per TANGEDCO approval.
- 1.2.2.17 The contractor at his cost shall carry out the grouting of all equipment including supply of grouting cement. Total cost quoted by the contractor is including this also and no separate shall be made for grouting.
- 1.2.2.18 Minor re-alignment of the already erected structures of Crusher house to P78 galleries, if required, has to be carried out by the contractor at no extra cost.
- 1.2.2.19 Minor stitch welding of the stools of galleries, if required, has to be carried out by the contractor at no extra cost.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.2.2.20 Any minor enabling works required for crane / hydra movement required for erection is to be done by the contractor at no extra cost.
- 1.2.2.21 Bidders to specifically note that, in case of any contradictions between Part I chapters and technical specifications attached in Part II chapter of this tender, then the specifications as per Part I chapters would prevail. For all other order of precedence, please refer NIT.
- 1.2.2.22 Scope of Electrical, C&I and Illumination works
 - 1.2.2.22.1 Preassembly, Erection, Testing, Commissioning, Trial operation and reliability operation of equipment included in the scope of work of this contract.
 - 1.2.2.22.2 Erection, Testing and commissioning of LT panels, Dry Type transformer, Lighting panels, control panels, VFD panels, etc.,
 - 1.2.2.22.3 Erection and commissioning of All Types of Field Instruments like switches, RTDs, etc.,
 - 1.2.2.22.4 Erection & Testing of all types of power/control/instrumentation cables etc.
 - 1.2.2.22.5 Fabrication and installation of steel supports wherever required.
 - 1.2.2.22.6 Supply of all consumables required for installation as detailed elsewhere in the contract.
 - 1.2.2.22.7 Supply of paints and application of final painting.
 - 1.2.2.22.8 Installation of any other items that have not been specifically indicated, but required for completing installation.
 - 1.2.2.22.9 Erection of LT drives and Commissioning of LT drives, Dry transformer erected by other agencies.
 - 1.2.2.22.10 Installation of Local Push Button Stations, Junction Boxes etc.
 - 1.2.2.22.11 Installation of above ground earthing grid, equipment earthing
 - 1.2.2.22.12 Installation of lightning protection system
 - 1.2.2.22.13 Fabrication and installation of steel supports wherever required.
 - 1.2.2.22.14 Erection and Commissioning of Illumination Package like installation of lighting panels, light fixtures, Receptacles, Wiring etc.
 - 1.2.2.22.15 Supply of paints and painting of items covered in the scope of work, as detailed elsewhere.
 - 1.2.2.22.16 Supply of all consumables required for installation as detailed elsewhere in the contract.
 - 1.2.2.22.17 Installation of any other items that have not been specifically indicated, but required for completing installation.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.2.2.22.18 The scope of specification covers the installation, testing and commissioning of the electrical equipment, hardware along with accessories as detailed in Bill of Materials (BOM).
- 1.2.2.22.19 Receipt of materials / component to be erected by the contractor, loading and transportation from the storage yard to the project site, stacking, storage and preservation.
- 1.2.2.22.20 Preassembly, Erection, Testing, Commissioning, Trial operation and reliability operation of equipment.
- 1.2.2.22.21 Supply of consumables, Final painting including supply of paints, wherever applicable.
- 1.2.2.22.22 If any item or equipment not covered but requires to be erected / commissioned, the same shall be carried out by the contractor. Equivalent unit rate for those item or equipment shall be considered wherever possible from the BOM.
- 1.2.2.22.23 Contractor shall possess valid electrical license to carry out the Electrical works indicated in the BOQ.
- 1.2.2.22.24 The scope of work covers identification of items at stores / yards, checking, reporting the damages if any, loading, transportation, unloading at Contractor's stores / working yard, keeping in safe custody in contractor's stores, pre-assembly, calibration, checking, erection, testing and commissioning, supply of consumables like electrodes, gas, cable dressing materials, tag plates, PVC sleeves for wire marking, lugs (specific sizes), specific type of fasteners, paints and its consumables. Deployment of skilled / unskilled manpower, engineers / supervisors, T & P, Material handling equipment, testing instruments (except proprietary type instruments), returning of un-used materials / items to BHEL stores.
- 1.2.2.22.25 The installation and commissioning of all the electrical equipment / items shall conform to the technical requirements specified elsewhere in the tender.
- 1.2.2.22.26 It is not the intent to specify herein all details of material. Any item related to this work not covered by this specification, but necessary to complete the system will be deemed to have been included in the scope of the work.

FOR FURTHER DETAILED SCOPE OF WORKS REFER RELEVANT CHAPTERS IN THIS BOOK

VOLUME IA PART – I CHAPTER – III

1.3.0 FACILITIES IN THE SCOPE OF CONTRACTOR /

BHEL

(SCOPE MATRIX)

Sl.No	Description	Scope to be taken care by		Remarks
		BHEL	Bidder	
1.3.1	PART I			
1.3.1.1	ESTABLISHMENT			
1.3.1.1.1	FOR CONSTRUCTION PURPOSE:			
1.3.1.1.1.1	Open space for office		Yes	* Free - Refer relevant clause below
1.3.1.1.1.2	Open space for storage	Yes		
1.3.1.1.1.3	Construction of bidder 's office, canteen and storage building including supply of materials and other services		Yes	
1.3.1.1.1.4	Bidder 's all office equipments, office / store / canteen consumables		Yes	
1.3.1.1.1.5	Canteen facilities for the bidder 's staff, supervisors and engineers etc		Yes	
1.3.1.1.1.6	Firefighting equipments like buckets, extinguishers		Yes	
1.3.1.1.1.7	Fencing of storage area, office, canteen etc of the bidder	Yes		* Free - Refer relevant clause below
1.3.1.1.2	FOR LIVING PURPOSES OF THE BIDDER			
1.3.1.1.2.1	Open space		Yes	
1.3.1.1.2.2	Living accommodation		Yes	
1.3.1.2	ELECTRICITY			
1.3.1.2.1	Electricity For construction purposes			Chargeable Basis.
1.3.1.2.1.1	Single point source	Yes		Refer relevant clause below

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Sl.No	Description	Scope to be taken care by		Remarks
		BHEL	Bidder	
1.3.1.2.1.2	Further distribution for the work to be done which include supply of materials and execution		Yes	
1.3.1.2.2	Electricity for the office, stores, canteen etc of the bidder which include:		Yes	
1.3.1.2.2.1	Distribution from single point including supply of materials and service		Yes	
1.3.1.2.2.2	Supply, installation and connection of material of energy meter including operation and maintenance		Yes	Calibration certificate to be provided
1.3.1.2.2.3	Duties and deposits including statutory clearances for the above		Yes	
1.3.1.2.2.4	Demobilization of the facilities after completion of works		Yes	Refer relevant clause below
1.3.1.2.3	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc on the above lines.(in case BHEL provides this facility, the scope should be given without ambiguity)		Yes	
1.3.1.3	WATER SUPPLY			
1.3.1.3.1	For construction purposes:		Yes	
1.3.1.3.1.1	Making the water available at single point		Yes	
1.3.1.3.1.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	
1.3.1.3.2	Water supply for bidder's office, stores, canteen etc			
1.3.1.3.2.1	Making the water available at single point		Yes	
1.3.1.3.2.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Sl.No	Description	Scope to be taken care by		Remarks
		BHEL	Bidder	
1.3.1.4	LIGHTING			
1.3.1.4.1	For construction work (supply of all the necessary materials) At office storage area At the preassembly area At the construction site /area		Yes	
1.3.1.4.2	For construction work (Execution of the lighting work / arrangements) At office storage area At the preassembly area At the construction site /area		Yes	
1.3.1.5	COMMUNICATION FACILITIES for site operations	-		
1.3.1.5.1	Telephone, internet (min 1 No of PC & Printer) – Data entry operator as required with computer knowledge		Yes	

Sl.No	Description	Scope to be taken		Remarks
		BHEL	Bidder	
1.3.2	PART II			
1.3.2.1	ERECTION FACILITIES			
1.3.2.1.0	Engineering works for construction			In consultation with BHEL/FLS
1.3.2.1.1	Providing the GA & erection drawings (as applicable) for all the equipment covered under this scope	Yes		
1.3.2.1.2	Drawings for construction methods		Yes	
1.3.2.1.3	As-built drawings – wherever deviations observed and executed and also based on the decisions taken at site – in consultation with OEM - FLSmidth		Yes	
1.3.2.1.4	Preparation of site erection schedules and other input requirements		Yes	In consultation with BHEL
1.3.2.1.5	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments		Yes	
1.3.2.1.6	Weekly erection schedules based on SI No 1.3.2.1.4		Yes	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Sl.No	Description	Scope to be taken		Remarks
		BHEL	Bidder	
1.3.2.1.7	Daily erection / work plan based on SI No 1.3.2.1.6		Yes	
1.3.2.1.8	Periodic visit of the senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months.		Yes	

1.3.3 LAND FOR SITE OFFICE AND LABOUR COLONY

- 1.3.3.1 Minimum Open space is already under use by FLSmidth and the same shall be handed over to the contractor. Temporary storage yards, storage sheds (semi closed and closed) and fabrication yard are already available with FLSmidth and the same will be handed over to the contractor at free of charges.
- 1.3.3.2 The contractor has to build a temporary office shed in the same premises.
- 1.3.3.3 The contractor has to maintain all the above infrastructures / facilities properly and hand over back to BHEL at the end of the contract. Minor modifications / repairs, if any are to be carried out by the contractor at his cost.
- 1.3.3.4 If the contractor requires to build any other stores shed / store yard / fabrication yard for execution of the work, then open space shall be provided by BHEL for the same. All other expenses to carry out the construction shall be at the cost of contractor.
- 1.3.3.5 BHEL shall not provide to the contractor any residential accommodation to any of his staff and the contractor has to make his own arrangements. Contractor has to make his own arrangements for labour colony.

1.3.4 ELECTRICITY

- 1.3.4.1 Construction power will be provided to the contractor at one point, by BHEL on chargeable basis at the applicable rate of TANGEDCO under LT tariff VI at the nearest substation. The present LT tariff VI rate of TANGEDCO is
- Consumption charges at Rs.12.00 per unit
 - Fixed MD (Maximum Demand) charges as applicable per month
 - Electricity Tax on total amount

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- The TANGEDCO tariff and tax may vary from time to time. The required Energy meter for measuring the consumption shall be provided and installed by the contractor. Any dispute regarding consumption, the BHEL engineer's decision is final. The contractor shall make his own arrangement for further distribution with necessary isolator/LCB etc.
- 1.3.4.2 Any other charges, duty, deposit involved in getting the Electricity shall be borne by the bidder. As regards to contractor's office shed also, all such expenditure shall be borne by the contractor.
- 1.3.4.3 Provision of distribution of electrical power from the given points to the required places with proper distribution boards, approved cables and cable laying including supply of all materials like cables, switch boards, pipes etc., observing the safety rules laid down by electrical authority of the State/ BHEL / their customer with appropriate statutory requirements shall be the responsibility of the tenderer / contractor.
- 1.3.4.4 The required energy meter for measuring power consumption shall be arranged by the contractor and taken care by the contractor.
- 1.3.4.5 Necessary "Capacitor Banks" to improve the Power factor to a minimum of 0.9 shall be provided by the contractor at his cost. Penalty if any levied by customer on this account will be recovered from contractor's bills.
- 1.3.4.6 Contractor has to make his own arrangements for his electricity requirement for his labour colony at his cost.
- 1.3.4.7 BHEL is not responsible for any loss or damage to the contractor's equipment as a result of variations in voltage / frequency or interruptions in power supply.
- 1.3.4.8 **POSSESSION OF GENERATORS**
As there are bound to be interruptions in regular power supply, power cut/ load shedding in any construction sites, suitable extension of time, if found necessary only be given and contractor is not entitled for any compensation. It shall be the responsibility of the tenderer / contractor to provide, and maintain the complete installation on the load side of the supply with due regard to safety requirements at site. It shall be responsibility of the contractor to have at least one diesel operated welding generator set to get urgent and important work to go on without interruptions. The consumables required to operate the generators are to be provided by tenderers. This may also be noted while quoting. No separate payment shall be made for this contingency.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Since the work involved spans over a wide area, there may be places wherein arranging power supply would be difficult. The contractor has to arrange Diesel Generator sets of required capacity at their cost for execution of works without any stoppage.

1.3.5

CONSTRUCTION WATER

1.3.5.1

The contractor shall make his own arrangements of water suitable for construction purpose to have uninterrupted work. No separate payment shall be made for any contingency arrangement made by contractor. Contractor has to make his own arrangements for his water requirement for his labour colony at his cost.

1.3.6

DRINKING WATER:

Bidder shall provide drinking water at the work spot at their cost.

1.3.7

ONLINE SITE CONSTRUCTION MANAGEMENT SYSTEM [SCMS]:

Contractor has to provide minimum 1 No Computer (along with operator / planning person) for data entry operations like online material management, reporting of daily progress, billing and other similar activities, within the quoted rate.

1.3.8

CONSUMABLES:

1.3.8.1

All the required electrodes (in his scope) as approved by BHEL shall be arranged by contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL, before procurement regarding, suppliers, type of electrodes etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number and date of expiry etc.

1.3.8.2

The contractor shall provide within finally accepted price / rates, all consumables like welding electrodes, all gases (inert, welding, and cutting), soldering material, dye penetrants, radiography films. Other erection consumables such as wrap cloth, tapes, jointing compound, grease, lubricants, M-seal, Araldite, petrol, CTC / other cleaning agents, grinding and cutting wheels are to be provided by the contractor. Steel, H&S, packers, shims, wooden planks, scaffolding and pre-assembly materials, hardware items etc required for temporary works such as supports, scaffoldings, bed are to be arranged by him. Sealing

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- compounds, gaskets, gland packing, wooden sleepers, for temporary work, required for completion of work except those which are specifically supplied by manufacturing unit are also to be arranged by him.
- 1.3.8.3 All the shims, gaskets and packing, which go finally as part of equipment, shall be supplied by BHEL free of cost.
- 1.3.8.4 In addition, the material such as lube oil, grease required for commissioning the erected equipment shall be arranged by the contractor at their cost. Necessary approval of the Make of the lube oil / grease have to be obtained from BHEL before procuring.
- 1.3.8.5 In the event of failure of contractor to bring necessary and sufficient consumables, BHEL shall take action in line with relevant Breach of contract clauses of the contract. The entire cost towards this along with standard BHEL overhead shall be deducted from the contractor's immediate due bills.
- 1.3.9 MATERIAL SUPPLY:**
BHEL will supply the materials/equipments indicated in the weight schedule (BOQ) which are to be executed/incorporated in the permanent system.
- 1.3.10 LIGHTING FACILITY:**
Adequate lighting facilities such as flood lamps, hand lamps and area lighting shall be arranged by the contractor at the site of construction, pre assembly yard and contractor's material storage area etc. at his cost.
- 1.3.11 GASES:**
- 1.3.11.1 All the required gases like Oxygen / Acetylene / argon /Nitrogen required for work shall be supplied by the Contractor at his cost. It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of these gases. Non availability of gases cannot be considered as reason for not attaining the required progress.
- 1.3.11.2 BHEL reserves the right to reject the use of any gas in case required purity is not maintained.
- 1.3.11.3 The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.
- 1.3.11.4 The contractor shall ensure safe keeping of the inflammable cylinder at a separate place away from normal habit with proper security etc.

1.3.12 OTHER FACILITIES

Adequate water less urinals shall be arranged by the contractor within quoted rates, at site of construction at different level and different areas with proper disposal arrangement. Also refer chapter regarding HSE Plan for Site Operations by Subcontractor in Volume IA Part II.

1.3.13 CONTRACTOR'S OBLIGATION ON COMPLETION

On completion of work, all the temporary buildings, structures, pipe lines, cables etc. shall be dismantled and leveled and debris shall be removed as per instructions of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.

1.3.14 Security

The contractor has to arrange at their cost, enough security for watch and ward of their office premises, stores, storage yards and their erection locations till the end of contract period including extended period, if any.

1.3.15 BID DRAWINGS

Bid drawings like plot plan/ Layout plan enclosed along with this tender is only for information is enclosed for information and may not be referred for scope of works and this may also get revised during execution.

1.3.16 DEWATERING

Contractor shall ensure at all times that his work area & approach/ access roads are free from accumulation of water, so that the materials are safe and the erection/ progress schedule are not affected. No separate claim in this regard shall be admitted by BHEL. No separate payments for dewatering of subsoil, surface water or catchments water, if required, at any time during execution of the work including monsoon period shall be considered by BHEL.

VOLUME-IA PART-I CHAPTER – IV

1.4.0 T&Ps and MMEs to be deployed by Contractor

- 1.4.1 All the tools & plants and Measuring Monitoring Equipment (MME) required for this scope of work, except the tools & plants provided by BHEL, are to be arranged by the contractor within the quoted rates.
- 1.4.2 For loading, transportation and erection, all necessary T&P such as Trailers, Cranes, Winches, welding generators, slings, jacks, sleepers, rails etc., are to be arranged by the contractor. All the tools & plants required for this scope of work, except the tools & plants provided by BHEL, are to be arranged by the contractor within the quoted rates /prices.
- 1.4.3 All the tools and plants including suitable Jacks / Hydraulic jacks required for satisfactory completion of the work has to be arranged by the contractor.
- 1.4.4 Crane operators deployed by the contractor shall be tested by BHEL before he is allowed to operate the cranes. The crane load test has to be conducted before deployment as per statutory guidelines.
- 1.4.5 The crane operator(s) deployed by the contractor shall meet the following qualification requirement
 - 1.4.5.1 Must be capable of independently operating Hydraulic / Mechanical Crawler / Tyre mounted Cranes of respective categories.
 - 1.4.5.2 Must have minimum 2 years of experience in operation of Hydraulic / Mechanical Crawler / Tyre mounted Cranes in respective categories & hold valid HMV / TRANS license.
 - 1.4.5.3 Should be able to read and interpret the operation and maintenance manual, boom load chart, boom angle and other indicating devices.
 - 1.4.5.4 Shall have the latest Physician's certification for their physical fitness in vision with / without lenses & adequate hearing with / without hearing aid.
- 1.4.6 Downtime of cranes, for reasons other than normal wear and tear or routine maintenance are liable for levy of penalty.
- 1.4.7 In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, BHEL will make alternative arrangement in line with relevant Breach of contract clauses of the contract.

Case 1: BHEL provides its own Capital T&P

TECHNICAL CONDITIONS OF CONTRACT (TCC)

In case the BHEL provides any T&P which is owned by BHEL, hire charges (as per BHEL norms) will be recovered from the contractor as per the prevailing BHEL Corporate hire charges. In case, the T&P is specifically listed in "T&Ps to be deployed by Contractor", "hire charges applicable to outside agencies other than contractors working for BHEL" will apply. If not listed, "hire charges applicable to contractors working for BHEL" will apply. The hire charges of Capital Tools & Plants are exclusive of operating expenses e.g., Operator, fuel & Consumables and the same shall be arranged by the contractor at his cost.

Case 2: In all cases other than that specified in Case 1 above, actual expenses incurred by BHEL along with applicable overheads will be back-charged to the contractor.

The present rates of BHEL's Corporate Crane hire charge, are enclosed in part II of Technical Conditions of Contract (Volume-I Book-I). This may get revised further as per the BHEL corporate guidelines. The prevailing rates as on date of execution shall be applicable.

- 1.4.8 The following minimum testing equipment / T&P shall be arranged by contractor in sufficient number to carry out the job simultaneously in more than one area.

Sl. No.	DESCRIPTION
1	Insulation tester : a) Motorized megger - 0 - 1000 - 2000 - 5000V, 0 - 25000 M ohms b) Hand operated megger - 0.5 KV/1.0 KV/2.5 KV, 0- 1000 M Ohms
2	Earth resistance tester 0 to 1, 10, 100 ohms
3	Torque wrench
4	Voltmeter ac 0 - 125 - 250 - 625 V ac
5	Ammeter ac 0 - 2A - 10A ac.
6	Wattmeter - ac/dc - 0 - 125 - 250 V 0-5-10A.
7	Multimeter - analogue : ac V 2.5V - 2500V, ac A - 100 mA - 10 A dc V 25.V - 2500V, dc A - 50mA - 10A Resistance - 0 - 200 M ohms digital: voltages ac & dc - 100mv - 1000 V current 10-mA - 10A Resistance - 0-20 M ohms

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Sl. No.	DESCRIPTION
8	Variac - 1 /3 phase - 5A, 15A 3 phase - 10A, 20A , To be brought when required
9	Primary injection kit - 0-10000 A. To be brought when required
10	Secondary injection kit - 0-5A. To be brought when required
11	Phase sequence meter - 110V - 450V - 25 to 65Hz.
12	Frequency meter - 0 - 115 - 230 - 4500 - 45 - 601/s.
13	Tong tester - 0 - 5A - 10A, 30A, 60A, 150A - 600A, 500A-1000A.
14	Tachometer etc.
14	mA Source
15	Standard pressure gauges – If required
16	Temperature oil bath– If required
17	3 phase relay testing kit (Of type omicron etc) To be brought when required
18	Contact resistance measurement kit
19	Micro Ohm meter
20	Dead Weight tester rated 400 Kg/Sq.cm with weights & test gauges facility
21	DC Power Supply , 24 V ; 5A
22	Three/Single Phase Variac
23	Glass Thermometers of ranges in Deg C as below : 0-120 ; 0-200; 0-600
24	Function Generator
25	Digital Multimeter 3 1/2 Digit
26	Digital Multimeter 4 1/2 Digit
27	Wire wrapping tool
28	Soldering irons, soldering pump, Vacuum cleaner, Air blower etc.
29	High voltage test kits
30	Secondary injection kits

1.4.0 ACCURACY REQUIREMENT OF TESTING INSTRUMENTS

SINo	INSTRUMENT / TOOL	RANGE	ACCURACY
1	Power Pack	0 to 50V DC, 3A	$\pm 2\%$
2	Analog Multimeter	Voltage 2.5 to 2500V AC	$\pm 1.0\%$
		Current 100 mA to 10A AC	$\pm 2.0\%$
		Current 250 micro A to 1A DC	$\pm 1.5\%$
		Resistance upto 100 ohms	$\pm 3.0\%$
		Voltage 2.5V to 2500V DC	$\pm 1\%$
3	Digital Multimeter	Voltage 200mV to 1000 V DC	$\pm 1\% + 1 \text{ digit}$

TECHNICAL CONDITIONS OF CONTRACT (TCC)

SINo	INSTRUMENT / TOOL	RANGE	ACCURACY
		Philips Voltage 200mV to 1000 V AC	$\pm 1\% + 1 \text{ digit}$
		Hcl Current 200mA to 20 A AC	$\pm 0.8\% + 1 \text{ digit}$
		Philips Current 20 mA to 20 A AC	$\pm 0.8\% + 1 \text{ digit}$
		Resistance (Hcl) 2120 200* to 200M*	$\pm 0.5\% + 1 \text{ digit}$
		Resistance (Hcl) 2105 200* to 200M*	$\pm 0.25\% + 1 \text{ digit}$
		Hcl Voltage 200mA to 750 V	$\pm 0.8\% + 1 \text{ digit}$
		Philips Current 20 mA to 20 A DC	$\pm 0.5\% + 1 \text{ digit}$
		Hcl Current 200 mA to 010 A AC	$\pm 1\% + 1 \text{ digit}$
4	Vibration Measuring Equipments	Velocity upto 50 mm/sec.	$\pm 0.5\% \text{ mm/sec}$
		Displacement upto 300 microns	$\pm 2 \text{ microns}$
5	Secondary Injection Kit	Upto 5A	$\pm 0.5\text{mA}$
6	Motor operated Megger	Upto 200 Ohms	$\pm 5\% \text{ at Centre scale}$
7	Tong tester	0/300/600A AC	$\pm 5\%$
		0 to 300A DC	$\pm 5\%$
8	Tachometer (Hand held)	0 to 4000 rpm	$\pm 5\%$
9	Phase Sequence Meter		N/A
10	Three Phase Variac	15 A Capacity	N/A
11	Feeler gauges	300 mm long and 100 mm long	$\pm 2 \text{ microns}$
12	Dial gauges	0 to 10mm	$\pm 0.01 \text{ mm}$
13	Hand operated Megger 500V / 1000V/2.5 KV	Upto 1000 M Ohms	$\pm 5\% \text{ at Centre Scale}$ $\pm 10\% \text{ at end of Scale}$
14	Motorised Megger 2.5 KV	Upto 1000 M Ohms	$\pm 5\% \text{ at Centre Scale}$ $\pm 10\% \text{ at end of Scale}$
15	Earth Resistance tester (Tester)	0 to 1, 10 Ohms	$\pm 5\% \text{ at Centre Scale range}$
16	AC tong Tester	0 to 1000A AC	$\pm 3\%$

TECHNICAL CONDITIONS OF CONTRACT (TCC)

SINo	INSTRUMENT / TOOL	RANGE	ACCURACY
17	DC Tong Tester	0 to 300A DC	$\pm 5\%$
18	High Voltage test Kit	Upto 50 KV AC -50 ma capacity	$\pm 10\%$
		Upto 70 KV DC	$\pm 10\%$
19	DC Ammeter	0 to 300 A	$\pm 10\%$
20	DC Voltmeter	0 to 500 V	$\pm 10\%$
21	Micro ohm meter	10A and 100 A	
22	Primary Injection Kit	0-10000A	
23	Single Phase Variac	0-15 Amps	
24	Motor direction tester		
25	DC Tong Tester (mA)	0-500 mA	
26	Contact resistance tester for breaker contact resistance measurement		
27	Motorised Megger 5 KV	10000 M ohms	
28	MV/mV Source	0 to 200 mA/200mV	0.2%
29	Standard Pressure Gauges	0 to 1 kg/Cm ²	$\pm 0.25\%$ LC-0.02 kg/cm ² 10"
		0 to 10 kg/Cm ²	$\pm 0.25\%$ LC-0.02 kg/cm ² 10"
		0 to 25 kg/Cm ²	$\pm 0.25\%$ LC-0.25 kg/cm ² 10"
		0 to 60 kg/Cm ²	$\pm 0.25\%$ LC-0.1 kg/cm ² 10"
		0 to 6 kg/Cm ²	$\pm 0.25\%$ LC-0.1 kg/cm ² 10"
30	Dead Weight Tester	0 to 400	LC – 5 kg/cm ²
31	Standard Hg in glass Thermometer	0 to 100°C	LC - 1°C
		0 to 110°C	LC - 1°C
		0 to 250°C	LC - 1°C
		0 to 150°C	LC - 1°C
		0 to 360°C	LC - 1°C
		0 to 420°C	LC - 1°C

TECHNICAL CONDITIONS OF CONTRACT (TCC)

SINo	INSTRUMENT / TOOL	RANGE	ACCURACY
32	Power Pack	0 to 50V DC, 3A	$\pm 2\%$
33	Battery Anatomy Test Kit with Cell loader	Suitable for 125 V	
34	Tacho Meter (Hand held	0 to 4000 rpm	$\pm 5\%$
35	Earth Megger (Tester)	0 to 1, 10, 100 Ohms	$\pm 5\%$ at Centre Scale range
36	Non-contact Type Temperature indicator (Laser type)	0 to 250 Degree centigrade	$\pm 1\%$

NOTE:

1. For loading and transportation, all necessary T&P such as Trailers, Cranes, Winches, welding generators, slings, jacks, sleepers, rails etc., are to be arranged by the contractor. All the tools & plants required for this scope of work, except the tools & plants provided by BHEL are to be arranged by the contractor within the quoted rates.
2. **Note for Contractors' Instruments**
 - a. The contractor shall arrange all the above T&P, equipment and instruments as indicated except testing instruments which are proprietary in nature.
 - b. The contractor at his cost shall arrange all cranes and truck / tractor, trailers required for material handling purpose and also cranes required for erection. If contractor requires *any equipments other than what is mentioned as free issues from BHEL same can be hired from BHEL on chargeable basis subject to availability.*
 - c. Any other tools and plants instruments and equipment required in addition to the above for the successful completion of this job will have to be arranged by the contractor at his cost.
 - d. Necessary accessories for the above shall also be provided by the contractor.
 - e. The above instruments / equipment will be sent for testing and calibration wherever from time to time and maintained by contractor as required by BHEL.
 - f. All testing instruments shall have calibration certificate issued by recognized / accredited agencies.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- g. List of such agencies and periodicity of calibration required for different instruments will be furnished by BHEL at site.
- h. Contractor shall maintain calibration records as per the BHEL format and produce them *whenever called for by BHEL Engineers.*
- i. Contractors shall arrange experienced/qualified persons for using these calibration instruments at laboratory and also at work spot.
- j. Wherever frequent calibration is required, contractor shall arrange adequate number of instruments such that the work does not suffer for want of test instruments.
- k. Above deployment plan will be discussed with the site engineer and necessary changes *will have to be made by the contractor as per discussions. If required, an additional deployment during execution of work will have to be made by the contractor for meeting various schedules/targets set by BHEL without any additional compensation.*

VOLUME-IA PART-I CHAPTER - V

1.5.0 T&Ps TO BE DEPLOYED BY BHEL ON SHARING BASIS

- 1.5.1 The following T&Ps will be provided by BHEL to contractor free of hire charges on sharable basis.

S. No	T&P Description	Qty.
01	Suitable Higher capacity crane (150T Crane and above)	As required

- 1.5.2 All the above T&Ps shall be issued on free of hire charges on need basis for erection/pre-commissioning activities only and to be shared with other contractors.
- 1.5.3 Allotment of the above T & Ps will be made by BHEL Site Engineer depending on the requirement.
- 1.5.4 All the tools & plants required for this scope of work, except the tools & plants provided by BHEL as mentioned above, are to be arranged by the contractor within the quoted rates /prices.
- 1.5.5 BHEL may provide either BHEL owned cranes or hired cranes at the discretion of BHEL as below:
- 1.5.5.1 In the event of providing BHEL own cranes:
- 1.5.5.1.1 BHEL shall provide crane operator, free of charges. Fuel and lubricants are to be arranged by the contractor within the quoted rate.
- 1.5.5.1.2 Maintenance for the BHEL own cranes shall be carried out by BHEL. However, all the consumables for the maintenance of BHEL own cranes shall be provided by the contractor within the quoted rates. The Tentative List of consumables required to be provided by contractor from the BHEL/OEM recommended supplier is as below:
- 1.5.5.1.2.1 Engine Oil
- 1.5.5.1.2.2 Fuel Filters
- 1.5.5.1.2.3 Air Filters
- 1.5.5.1.2.4 Hydraulic Filters
- 1.5.5.1.2.5 Hydraulic Oil
- 1.5.5.1.2.6 Gear Oil
- 1.5.5.1.2.7 Engine Oil Filter
- 1.5.5.1.2.8 Oil Separator Filter
- 1.5.5.1.2.9 Rope

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.5.5.1.2.10 Grease

1.5.5.1.2.11 Maintenance for the BHEL cranes shall be carried out by BHEL. The bidder shall extend support if required for routine maintenance works without any additional cost.

1.5.5.2 In the event of providing hired cranes:

1.5.5.2.1 Crane Operators for hired cranes will be provided by BHEL, free of charges.

1.5.5.2.2 Fuel and lubricants are to be arranged by the contractor within the quoted rate.

1.5.6 Cranes provided by BHEL are only for erection purpose and shall not be available for material handling or transportation purpose. Contractor shall make their own arrangements for material transportation to erection site.

1.5.7 Besides the T & P mentioned above, which is being made available to the contractor on free of hire charges, any additional crane and other T & P which may be required for successful and timely execution of the work covered within the scope of this tender shall be arranged and provided at site by the contractor at his cost. In case if the contractor fails to provide such equipments, BHEL will arrange for the same and the cost will be recovered from the contractor's bill with BHEL overheads, as applicable from time to time which may vary even during contract period.

1.5.8 Any loss / damage to any or part of the BHEL T&Ps by the contractor shall have to be replaced or otherwise cost thereof shall be recovered from the contractor.

1.5.9 All the distribution boards, connecting cables, hoses etc., and temporary connection work including electrical connections shall have to be arranged by the contractor at his cost.

1.5.10 Necessary electrical / water / air connection required for operation of any of the tools & tackles shall be in the Contractor's scope.

1.5.11 Apart from the above mentioned tools, any other tools and plants including suitable Jacks / Hydraulics jacks required for satisfactory completion of the work has to be arranged by the contractor. However, bidders may note that the Hydraulic jacks that are supplied by manufacturing units for alignment of Generator Stator, if any shall be made available to TG contractor for the said purpose.

1.5.12 For the cranes, the required consolidation and preparation for placing crane for operation (civil work) is under bidder scope and also necessary

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- plates / sleepers required for marching operation shall be provided by the contractor within quoted rates.
- 1.5.13 For movement of cranes etc., it may become necessary to lay sleeper bed for obtaining leveled safe approach for usage of equipment. It shall be the responsibility of the contractor to lay necessary sleeper's. The sleepers shall be arranged by the contractor at his cost.
- 1.5.14 The contractor at his cost shall arrange for grouting of anchor points of T&Ps issued to him. Necessary grout materials are to be arranged by the contractor at his cost.
- 1.5.15 In case of non-availability of any of these equipment, due to any reason i.e., unavoidable breakdown, major overhaul or any other reason etc., the contractor should make arrangement at his cost to meet the erection targets. No extra claim will be admitted due to non-availability of any of the above equipment. No delay in execution of work shall be accepted on this account.

VOLUME-IA PART-I CHAPTER - VI

1.6.0 TIME SCHEDULE

1.6.1 TIME SCHEDULE

- 1.6.1.1 The entire work of erection testing, commissioning, O&M of the Pipe Conveyor and scope of works as detailed elsewhere in the Tender Specification shall be completed within Fifteen (15) months from the date of commencement of work at site.
- 1.6.1.2 The entire work of erection testing & commissioning of the Pipe Conveyor and scope of works as detailed elsewhere in the Tender Specification shall be completed within Ten (10) months from the date of commencement of work at site.
- 1.6.1.3 O&M services shall start from completion of load trial and continue till handing over of system to TNPGL. O&M services shall be for 300 shifts spread over 5 months. Number of shifts may be increased or decreased based on the requirement.
- 1.6.1.4 During the total period of contract, the contractor has to carry out the activities in a phased manner as required by BHEL to achieve the milestone events as programmed.
- 1.6.1.5 The erection work shall be commenced on the mutually agreed date between the bidder and BHEL engineer. The decision of BHEL in this regard shall be final and binding on the contractor. The scope of work under this contract is deemed to be completed only when so certified by the site Engineer.
- 1.6.1.6 The contractor is required to refer Form 15 – Monthly performance evaluation of contractors in Volume IA Part II of TCC for all the instructions to be taken immediately after receipt of LOI.

1.6.2 COMMENCEMENT OF CONTRACT PERIOD

The date of commencement of contract period shall be the mutually agreed date between the bidder and BHEL engineer to start the work. In case of discrepancy the decision of BHEL engineer is final.

1.6.3 MOBILISATION FOR ERECTION, TESTING, ASSISTANCE FOR COMMISSIONING ETC.,

- 1.6.3.1 The activities for erection, testing etc shall be started as per directions of Construction Manager of BHEL.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.6.3.2 The above time allowed for completion of work including Sundays and Holidays is from the date of commencement of work. Detailed program to be prepared by the successful bidder taking in to consideration of the COMPLETION SCHEDULES /site decision on drawings flow (latest) and submitted for BHEL's approval.
- 1.6.3.3 In order to meet above schedule in general, and any other intermediate targets set, to meet customer / project schedule requirements, contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL.
- 1.6.3.4 In case the project is to be advanced, the works in the scope of the contractor is to be advanced to meet the project requirement. No extra payment whatsoever shall be paid on this account
- 1.6.3.4.1 The contractor has to augment his resources in such a manner that following major milestones of erection & commissioning are achieved on specified schedules mentioned below:

Tentative schedule

Sl. No.	Milestone Description	Scheduled Completion (from date of commencement)
1.	START OF WORK	1 st Month
2.	Completion of Erection of galleries from P 50 to P 78	4 th Month
3.	Completion of erection of galleries from P 50 to New TP 2	5 th Month
4.	Completion of erection of all mechanical equipment from Crusher House to New TP 2	6 th Month
5.	Completion of Belt Laying	8 th Month
6.	Commissioning of Pipe Conveyor	9 th Month
7.	Commencement of O&M services	10 th month
8.	Handing over and completion of contractual obligation	15 th Month

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.6.3.5 In case the project is to be advanced, the erection works in the scope of the contractor is to be advanced to meet the project requirement. No extra payment whatsoever shall be paid on this account.

1.6.4 MAJOR INTERMEDIATE MILESTONES

Sl. No.	Milestone Description	Scheduled Completion (from date of commencement)	Intermediate Milestone for each Unit
1.	Completion of Erection of galleries from P 50 to P 78	4 th Month	M1
2.	Completion of Belt Laying	8 th Month	M2

Penalty for Intermediate Milestones

- M1 and M2 shall be intermediate Milestones for each unit of this work.
- In case of slippage of these identified Intermediate Milestones, Delay Analysis shall be carried out on achievement of each of these Intermediate Milestones in reference to Form 14.
- In case delay in achieving each M1 milestone is solely attributable to the contractor, 0.5% per week of executable contract value* limited to maximum 1% of executable contract value will be withheld.
- In case delay in achieving each M2 milestone is solely attributable to the contractor, 0.5% per week of executable contract value* limited to maximum 1.5% of executable contract value will be withheld.
- Amount already withheld, if any, against slippage of M1 milestone, shall be released only if there is no delay attributable to contractor in achievement of M2 milestone.
- Amount required to be withheld on account of slippage of identified intermediate milestone(s) shall be withheld out of respective milestone payment and balance amount (if any) shall be withheld @10% of RA Bill amount from subsequent RA bills.
- Final deduction towards LD (if applicable), on account of delay attributable to contractor shall be based on final delay analysis on completion / closure of contract. Withheld amount, if any due

TECHNICAL CONDITIONS OF CONTRACT (TCC)

to slippage of intermediate milestones shall be adjusted against LD or released as the case may be.

- In case of termination of contract due to any reason attributable to contractor before completion of work, the amount already withheld against slippage of intermediate milestones shall not be released and be converted in to recovery.
- Note: *Executable contract value-value of work for which inputs/fronts were made available to contractor and were scheduled for execution till the date of achievement of that milestone.

1.6.5 CONTRACT PERIOD

The contract period for completion of entire work under scope for each package shall be **Fifteen (15) months** from the “COMMENCEMENT OF CONTRACT PERIOD” as specified earlier for completion of the entire work under this package.

1.6.6 GUARANTEE PERIOD

The guarantee period of Twenty-Four (24) months for workmanship shall commence from:

- a) the date of PG test of the Pipe conveyor system to Customer or
- b) Six months from the date of first load commissioning of the Pipe conveyor system, whichever is earlier (provided all erection, testing, and commissioning works are completed in all respects).

VOLUME-IA PART-I CHAPTER - VII

1.7.0 TERMS OF PAYMENT

1.7.1 Secured Advance: Not applicable

1.7.2 The break-up of pro-rata payment (85%) and milestone payment (15%) detailed below are applicable. Further rate split as per site condition can be worked out at site based on the applicability of the relevant activities line with GCC clause no. 2.23.1 (v).

1.7.3 Break up of Activity wise terms of payment for 85% pro rate payment is as below:

S No	Activity	%
1.7.2.1	Supply	40
	Fabrication (incl assembly if any)	25
	Erection (incl alignment)	15
	Painting	5
1.7.2.2	Fabrication (incl assembly if any)	50
	Erection (incl alignment)	30
	Painting	5
1.7.2.3	Erection (applicable for all structures and mechanical equipment)	85
1.7.2.4	For all other misc items where supply and erection is involved	
	Supply	50
	Erection	35
1.7.2.5	For all other misc items where only erection is involved	85

Sl. No.	Activity / Work Description	% of unit rate
	PRO RATA PAYMENTS (85%)	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Sl. No.	Activity / Work Description	% of unit rate
	Cable tray and accessories	
	Fabrication and fixing / welding / bolting in position	60%
	Earthing of cable trays	10%
	Tagging of cable trays (including touch up painting & cable tray numbering on sides)	8%
	Covering of trays where ever envisaged	7%
	Total =	85%
	Cable laying including earthing wires	
	Laying of cables / Wires	45%
	Glanding, termination and tagging of cables	15%
	Testing and charging	10%
	Dressing and clamping	15%
	Total =	85%
	Junction box/Push button station (local)	
	Erection including fixing of terminal blocks where ever applicable	75%
	Name plate fixing where ever applicable and labelling (inside and outside)	10%
	Total =	85%
	Misc. Structural steel including cable tray supports, Canopies , Conduits, pipes etc.	
	Fabrication / Pre assembly	45%
	Erection, Alignment, welding/bolting and if applicable chipping/grouting/painting	40%
	Total =	85%

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Sl. No.	Activity / Work Description	% of unit rate
	Switch Gears / LT MCC / ACC / Starter panel / Dry type Transformers /GRP/ DAVR / Control Panels Miscellaneous Equipment/ etc.	
	Placement, Alignment and coupling / interconnection where ever applicable, erection of associated accessories etc.	50%
	Pre-commissioning checks and tests	10%
	Charging, Loop testing and commissioning	15%
	System commissioning	10%
	Total =	85%
	Earthing Materials	
	Fabrication, erection, alignment, welding / bolting of earthing / lightning protection strips; earth pits Completion	60%
	Testing / commissioning	25%
	Total =	85%
	Miscellaneous items (items not covered under above heads)	
	Erection	50%
	Alignment	10%
	Testing	15%
	Completion	10%
	Total	85%
	Total =	85%
	Instruments/Devices including Sensors/Cells/Probes etc	
	Calibration/Testing/Pre erection checks	30%
	Erection/Placement and fixing of loose items/accessories	30%

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Sl. No.	Activity / Work Description	% of unit rate
	Pre commissioning checks/loop testing/Simulation testing as required	10%
	Remote/local commissioning as required	15%
	Total =	85%
	Commissioning and Testing activities for Equipments erected by other agencies, like control valves, on/off valves, electrical/pneumatic valves, actuators, solenoid valves, valves, limit switches, ERV controllers, power cylinders, Pressure & Temperature gauges/Transmitters,etc	
	Removal & refixing/Fixing loose supplied components, including tubing/hose, regulators, etc	30%
	Calibration/Local testing - commissioning readiness	30%
	Local Commissioning & Loop Testing as required	10%
	System Commissioning or Remote Commissioning as required	15%
	Total =	85%
	Testing / Commissioning of Equipment (like LT motors, actuators, control valves, solenoid valves, limit switches, misc. equipment, etc.) erected by other agencies	
	Local testing (Including oil filtration for ESP transformers)	40%
	Remote testing, Loop testing, and commissioning	40%
	System commissioning	5%
	Total =	85%
	Testing Commissioning of Equipment	
	Local testing ,remote testing and dry out	80%

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Sl. No.	Activity / Work Description	% of unit rate
	System commissioning	5%
	Total =	85%

1.7.4 Break up of Activity wise terms of payment for 15% milestone pro rate payment is as below:

S No	Activity	%
	Commissioning of the Pipe conveyor system	5
	Trial operation of one unit	1
	PG test of the Pipe conveyor system as per approved procedure	4
	Area cleaning, temporary structures cutting / removal and return of scrap	1
	Material Reconciliation	2
	Punch List points / pending points liquidation	1
	Completion of Contractual Obligations	1

1.7.5 Terms of Payment For O&M shifts shall be 100% and no separate milestone deductions are envisaged.

1.7.6 **RETENTION AMOUNT SHALL BE AS PER GCC.**

1.7.7 **NO CLAIM WHAT SO EVER MAY BE, WILL BE ENTERTAINED UNDER THIS CONTRACT, AFTER DULY SIGNING THE FINAL BILL ALONG WITH MEASUREMENT BOOKS AND ACCEPTED BY BHEL.**

VOLUME-IA PART-I CHAPTER VIII

1.8.0 TAXES AND DUTIES

1.8.1 All taxes and duty other than GST & Cess and BOCW Cess

1.0 The contractor shall pay all (**except the specific exclusion viz GST & Cess and BOCW Cess, both of which are dealt separately**) taxes, fees, license charges, deposits, duties, tools, royalty/ seigniorage, commissions, Stamp Duties, or other charges / levies, which may be levied on the input goods (including construction material viz. sand, coarse aggregates, moorum, borrowed earth, etc.) & services consumed and output goods & services delivered in course of his operations in executing the contract **and the same shall not be reimbursed by BHEL**. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.

1.8.2 Goods and service Tax (GST) - For

GST Registered bidder:

- 2.1. The successful bidder shall furnish proof of GST registration under GST Law, covering the supply and services under this contract. Registration should also bear endorsement for the premises from where the billing shall be done by the successful bidder on BHEL for this project/ work. The bidder to specify in their offer the category of registration under GST i.e. Regular dealer or composite dealer.
- 2.2. Bidder's price/rates shall be exclusive of GST & GST Compensation Cess (herein after termed as GST).
- 2.3. Vendor / Contractor require to ensure that all Input Tax benefits as per existing laws have been considered. -
- 2.4. Price quoted by the **composite dealer** shall be considered as inclusive of GST. In the event of any change in the status of vendor / Contractor from composite to regular dealer after the submission of the bid but before completion of supply of services or goods, Contract value shall be amended to remove the embedded GST and any ITC benefit arising due to change of status, which shall be passed on to BHEL. GST paid on the amended contract value shall be reimbursed at actuals against the Tax invoice if BHEL is able to take input tax credit. However, no reimbursement of GST shall be made if BHEL is not able to take input tax credit. The decision of BHEL in this regard will be final and binding on the vendor/contractor.
- 2.5. It is the responsibility of the vendor / contractor to adhere to all the provisions of E- Invoicing under GST Act (if applicable). As per the E-Invoicing provisions vendor / Contractor has to generate IRN and QR Code from the E-Invoicing system and the same need to be printed in the invoice submitted to their customer. Invoices that do not comply to the above requirements, will not be accepted by BHEL. If the

TECHNICAL CONDITIONS OF CONTRACT(TCC)

successful Bidder is not falling under the preview of E-Invoicing, then he has to submit a declaration in that respect along with relevant financial statements. However, applicability of E-invoicing, shall be verified from the E-Invoicing portal on submission of vendor / Contractor GSTN. BHEL shall reimburse GST only if all the provisions of E-invoicing are complied with.

2.6. It is the responsibility of the vendor/ Contractor to issue the Tax Invoice strictly as per the format prescribed under the GST Act within the prescribed time period in order to enable BHEL to avail input tax credit within the due date. Invoices shall be submitted on time to the concerned BHEL Engineer In Charge. Tax invoice should also contain below details

- a. Contractor Name and Contact details.
- b. GST No of Contractor
- c. PAN No of Contractor
- d. Document Type: Tax Invoice/ Debit Note/ Credit Note
- e. Category: B2B / B2C (B2B is only applicable w.r.t BHEL)
- f. Customer Name and Contact details / Bill To Details (as mentioned below)
- g. Unique Tax Invoice Number
- h. Invoice Date
- i. IRN No, QR Code, Acknowledgment No and Acknowledgment Date generated from E-Invoice Portal as per E-invoicing provisions under GST Act (If applicable)
- j. Place of Supply (as mentioned below)
- k. Description of service provided
- l. 8 Digit SAC code
- m. GST Rate
- n. Gross value of Invoice
- o. Taxable Value
- p. Tax / GST Amount
- q. Total Invoice value including GST.

Above are inclusive and not exhaustive list of requirements.

2.7. Bidder should mention the “Bill To” and “Place of supply” as below in the Tax Invoice

Bill To: Location of BHEL Site office

.....'

State:

TENDER SPECIFICATION NO: BHEL PSSR SCT 2233

TECHNICAL CONDITIONS OF CONTRACT(TCC)

GSTN of BHEL: -----

Place of Supply: Location of BHEL Site office

-----,

GSTN of BHEL: -----

(Above details will be given later, contractors may contact BHEL, PSSR before billing)

- 2.8. In case of supply of goods contract, the successful bidder must promptly provide details of the dispatched items on the same day they are removed for shipment to the BHEL site. This intimation must include all relevant information and documents about the goods and a scanned copy of the tax invoice. If any financial liabilities arise for BHEL due to non-compliance with GST laws resulting from the bidder's delay in providing this information, the bidder will be held liable, unless the delay is directly attributable to BHEL.
- 2.9. BHEL will reimburse the GST amount claimed by the Vendor/Contractor, along with the payment due to the contractor in the RAB, upon receipt of a valid tax invoice. However, if the Vendor/Contractor fails to comply with the GST compliance requirements specified below for any prior invoice, BHEL reserves the right to recover an amount equivalent to the reimbursed GST from subsequent invoices as a corrective measure for statutory non-compliance. Furthermore, the GST amount claimed in any subsequent invoices will be withheld until the statutory compliance for the preceding invoice is ensured.

However, In the case of the Vendor/Contractor's final bill, or in case where single invoice is submitted for the entire contract, BHEL will withhold an amount equivalent to the GST claimed from the invoice value towards pending statutory compliance. This withheld amount will only be released once Vendor/Contractor satisfies the below specified GST compliance requirements.

GST Compliance Requirements:

- a. Vendor / Contractor must provide the original copy of Tax invoice /debit note as per the prescribed format under the GST act within the prescribed time period in order to enable BHEL to avail input tax credit within the due date.
- b. The details of the invoice or debit note referred to in clause (a) must be furnished/filed by the Vendor/ Contractor in the statement of outward supplies (presently in GSTR1 or IFF) and such details should get reflected in the BHEL GST login (both in GSTR 2A and GSTR 2B) in the manner specified under GST Act.

TENDER SPECIFICATION NO: BHEL PSSR SCT 2233

TECHNICAL CONDITIONS OF CONTRACT(TCC)

- c. Details of vendor/contractor invoice reflected in BHEL GST login should match with the details in the tax invoice submitted by the vendor/contractor, including the invoice number, invoice date, GSTIN, and place of supply. Additionally, the status of GSTR-1 and GSTR-3B filings must be "Yes."
 - d. The tax charged in the invoice /debit note referred to in clause (a) must be paid to the Government by the Vendor/Contractor, either in cash or through the utilization of input tax credit.
- 2.10 In case, any GST credit is delayed/denied to BHEL or BHEL has to incur any liability (like interest / penalty) due to non/delayed receipt of goods or submission of tax invoice after the expiry of timeline prescribed in the relevant GST Act for availing ITC, or any other reasons not attributable to BHEL, Then the same shall be recovered from the vendor/contractor along with interest levied/leviable on BHEL.
- 2.11 GST shall be levied on recoveries, wherever applicable and same shall be recovered from payments. BHEL shall issue / raise Tax invoice on contractor/vendors for such recoveries.
- 2.12 E-way bills / Transit passes / Road Permits, if required for materials / T&P etc., bought into the project site is to be arranged by the Vendor / Contractor themselves. BHEL shall not issue or raise any Road Permit/ E- Way Bill for this purpose. Any claim or demand raised by the GST department for non- generation / non-submission of E-way bill shall be to the contractor/ vendor account
- 2.13 BHEL shall not reimburse any expenditure incurred by the contractor towards demand, additional liability or interest / penalty etc., raised by the GST department due to issues such as wrong rates / wrong classification of services or goods.
- 2.14 Where GST is payable by BHEL under reverse charge basis, any demand raised or any interest or penalty levied / leviable by the GST department due to non-submission or delayed submission of invoice by the contractor or for any other reason not attributable to BHEL, the same shall be recovered from the vendor/contractor.
- 2.15 Tax Deduction at Source (TDS) as per Sec 51 of the CGST Act shall be deducted (if applicable). GST TDS certificate in Form GSTR -7A shall be issued to be contractor. However, GST TDS certificate can be generated only if the contractor accepts the TDS details uploaded by BHEL and files his return. If any specific exemption from GST TDS is applicable to any contractor/vendor, then a declaration to that effect along with relevant documents as may be required by BHEL, substantiating such exemption in line with GST law provisions or notification, shall be submitted by the vendor/contractor.

TECHNICAL CONDITIONS OF CONTRACT(TCC)

For GST Unregistered bidder:

- 2.16 In case, bidder is not required to register under Goods and service Tax (GST) & Cess, the same is to be specified in the offer.
- 2.17 Successful bidder to furnish a Self-declaration that registration under GST is not required or not applicable as per the provisions of GST Law along with relevant document and provisions in the GST law.
- 2.18 In case BHEL has to incur any liability (like interest / penalty etc.) due to non- compliance of GST law in respect of the invoice submitted by the contractor, for the reasons attributable to the contractor, the same shall be recovered from the contractor.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 2.19 TDS under GST (as & when applicable) shall be deducted at prevailing rates on gross invoice value.
- 2.20 If RCM is made applicable at a later date, GST will be paid by BHEL to the department at applicable rate treating the quoted price as inclusive of GST if BHEL is not able to take Input tax credit.
- 2.21 In the event of any change in the status of bidder from unregistered to registered under the GST law after the submission of bid but before the completion of supply of services or goods, the same need to be intimated and all the clauses applicable for Registered bidder need to be followed. The vendor/ contractor is required to pass on the ITC benefit arising due to change of status, to BHEL. Contract value shall be amended accordingly. GST paid on the amended contract value shall be reimbursed at actuals against the Tax invoice only if BHEL is able to take input tax credit.

1.8.3 Statutory Variations

- 3.1 BHEL shall pay statutory variation only for GST, and no other variations shall be payable
- 3.2 In general, Statutory variation for GST is payable to the Vendor/Contractor during the contract period including extension thereof. Beyond the contract period, BHEL will reimburse the actual applicable tax only if BHEL is able to take the input tax credit. However, the decision of BHEL in this regard will be final and binding on the vendor/contractor

1.8.4 New Taxes/Levies –

- 4.1 In case Government imposes any new levy / tax after submission of bid during the tenure of the contract, BHEL shall reimburse the same at actual on submission of documentary proof of payment subject to the satisfaction of BHEL that such new levy/ tax is applicable to this contract. However, Contractor/ Vendor shall obtain prior consent from BHEL before depositing new taxes and duties.
- 4.2 Any benefits arise out of new tax levies and/or abolition of existing taxes must be passed on to BHEL. The decision of BHEL in this regard will be final and binding on the vendor/contractor.

1.8.5 Direct Tax

- 5.1 Vendor/ Contractor is required to update himself on its own and comply with provisions of Indian Income Tax Act as notified from time to time. Purchaser shall not be liable towards liability of income tax accruing to the vendor/contractor of whatever nature including variations thereof, arising out of this Order/ Contract, as well as tax liability of the vendor/ Contractor and his personnel
- 5.2 Deductions of Tax at source as per Income Tax Act, at the prevailing rates shall be effected by the Purchaser before release of payment, as a statutory obligation, if applicable. TDS certificate will be issued by the Purchaser as per the statutory

TECHNICAL CONDITIONS OF CONTRACT (TCC)

provisions. The Vendor/Contractor has to mention their Permanent Account Number (PAN) and GSTIN in all invoices.

1.8.6 BOCW Act & BOCW Welfare Cess Act

6.1 Contractor's price/rates shall be exclusive of BOCW Cess .

6.2 The Contractor should Register their Establishment under BOCW Act 1996 read with rules 1998 by submitting Form I (Application for Registration of Establishment) and Form IV (Notice Of Commencement / Completion of Building other Construction Work) to the respective Labour Authorities i.e.,

- a. Assistant Labour Commissioner (Central) in respect of the project premises which is under the purview of Central Govt.–NTPC, NTPL etc.
- b. Appropriate State authorities in respect of the project premises which is under the purview of State Govt.

6.3 The Contractor should comply with the provisions of BOCW Welfare Cess Act 1996 in respect of the work awarded to them by BHEL.

6.4 The contractor should ensure compliance regarding Registration of Building Workers as Beneficiaries, Hours of work, welfare measures and other conditions of service with particular reference to Safety and Health measures like Safety Officers, safety committee, issue of Personal protective equipments, canteen, rest room, drinking water, Toilets, ambulance, first aid centre etc.

6.5 The contractor irrespective of their nature of work and manpower (Civil, Mechanical, Electrical works etc) should register their establishment under BOCW Act 1996 and comply with BOCW Welfare Cess Act 1996.

6.6 Contractor shall make remittance of the BOCW Cess as per the Act in consultation with BHEL as per the rates in force (presently 1%). BOCW remittance should be made only after obtaining prior consent from BHEL. BHEL shall reimburse the same upon production of documentary evidence. However, BHEL shall not reimburse the fee paid towards the registration of establishment, fees paid towards registration of Beneficiaries and Contribution of Beneficiaries remitted.

6.7 Non-compliance to Provisions of the BOCW Act & BOCW Welfare Cess Act is not acceptable. In case of any non-compliance, BHEL reserves the right to withhold any sum as it deems fit. Only upon total compliance with the BOCW Act and the discharge of total payment of Cess (in consultation with BHEL) under the BOCW Cess Act by the Contractor, BHEL shall consider refund of the amounts.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

VOLUME-IA PART-I CHAPTER IX

1.9.0 BILL OF QUANTITY

Sl.No.	Description of Work	Unit	Qty	Remarks
1	Supply of structures related to Galleries & tail end trolley station as per the drawing provided by BHEL/FLS	MT	301	
2	Assembly of structures related to Galleries & tail end trolley station as per the drawing provided by BHEL/FLS	MT	303	
3	Erection of structures related to Galleries & tail end trolley station as per the drawing provided by BHEL/FLS	MT	688	
4	Assembly, Erection of Other Structure :(Take-up seal plate, Ladder, Platform, Cross Over, Hoist Maintenance Platforms, Chute Supports & Brake Support Frame)	MT	28	
5	Erection of technological structures for conveyors.: (Base frames, take-up weight alone in tower, Chutes, Skirt boards,Pulley Frames, Deck Plates,Tail & head stringers Handrails, Skirt board access ladder, Sheave & brackets etc)	MT	160	Handrails here refer to the the rails which are mounted on the standard module assembly.
6	Erection of technological structures for conveyors. (Std module)	MT	545	Complete Idler assemblies (on carrying side as well as return side) with brackets and all the fixing accessories as per the approved GA drawing.
7	Erection of Chequer Plate	MT	40	
8	Erection of Hand Rail	MT	27	
9	Erection of conveyor equipments. (Gearbox Motor, Pulleys, Coupling,Bearing,	MT	140	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Sl.No.	Description of Work	Unit	Qty	Remarks
	Plummer block, Scrapers, Winch assembly. Electric hoist, Brakes, Trolley etc)			
10	Belt laying for Pipe conveyor including arrangement of wire rope for belt pulling, winch machine, sheave pulleys etc. and other tools & tackles required for laying.	MT	485	- 24 nos of belt drums
11	Erection of counter weight	MT	30	
12	Dismantling and Re-erection of dismantled items under bidder's scope of work due to any manufacturing defect or contingency requirement (as per BHEL engineer instruction) including lifting to required position, aligning in position, tack welding (if applicable), final welding (if applicable), scaffolding, staging, tools & tackles, gas cutting, welding, consumables etc to meet the system requirement. Note: No payment shall be made for re-erection due to defects in workmanship, wrong erection and mishandling of items by bidder.	MT	50	
13	Supply and Erection of roof sheeting as per the drawing & specification	Sq MTR	2222	
14	Supply and Erection of cladding sheeting as per the drawing & specification	Sq MTR	1321	
15	Supply and Erection of transparent sheeting as per the drawing & specification	Sq MTR	100	
16	Operation & Maintenance (O&M) of equipment till handing over to customer.	Shifts	300	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Sl.No.	Description of Work	Unit	Qty	Remarks
17	Miscellaneous supplies & erection			
A	Foundation Bolts			
	M16X320 Lg	Nos	26	
	M20X470 Lg	Nos	16	
	M24X820 Lg	Nos	84	
B	Consumables			
	MINERAL OIL ISO VG 320	Litres	1080	
	MINERAL OIL EP-90	Litres	30	
	MINERAL OIL ISO VG 68	Litres	40	
	INDIAN OIL (EP-90) ISO VG 320	Litres	44	
	Grease	Kgs	313	
	Supply and Application of Touchup Paint Neromastic Primer	Litres	4500	
	Supply and Application of Touchup Paint MIO (Mid coat)	Litres	3250	
	Supply and Application of Touchup Paint Finish Paint	Litres	2750	
	Supply and Application of Thinner	Litres	2100	
C	Supply & Erection of Coupling Guards,Pulley Guards Take-Up guards	MT	11.5	
D	Skirt sealing Rubber			
	Rubber curtain (DCH8) Drg. No. 10469191 (Sh 7 of 24),PN 9048730	Set	1	
	Rubber (DC10) Drg. No. 10469191 (Sh 17 of 24),PN 9048795	Set	1	
	Seal rubber (SR1) Drg. No. 10469191 (Sh 22 of 24),PN 9048819	Set	2	
	Seal rubber (SR2) Drg. No. 10469191 (Sh 23 of 24) PN 9048816	Set	4	
	Seal rubber (SR3) Drg. No. 10469191 (Sh 24 of 24)PN 9048821	Set	2	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Sl.No.	Description of Work	Unit	Qty	Remarks
E	Bolt, nuts, washers, fasteners, U bolts	Lot	1	Indicative list as per list below.
F	Belt Supporting Rollers with frame (as per attached drg)			
	Belt Supporting Rollers	Nos	28	
	Frame for 3- roll Belt Supporting Rollers	MT	8	
	Frame for single roll Belt Supporting Rollers	MT	4	
G	Finger Rollers with brackets:as per attached drgs.	Sets	12	
H	Bearings with sleeves for Pulleys as below (shall be from approved make, refer drg) :			
	Bearing type 23164 BEA-XL-K-MB1 + H3164 HG	Nos	2	
	Bearing type 23152 BE-XL-K + H3152-XHG	Nos	2	
	Bearing type 22222 E1-XL-K / H322	Nos	2	
I	Supply of Belt Vulcanising Kits for PC Belt ST 800, 2200mm Wide, 8/6 FR, LRR as per OEM Forech recommendation and Belt splicing, joining & Hot vulcanizing including arrangement of jointing agency, vulcanizing machine, DG set and all tools and tackles, for belt	Nos	30	
Electrical, C&I works				
J	Power Cables			
J.1	3C x 16 Sq.mm	Mtrs	560	
J.2	3C x 240 Sq.mm	Mtrs	1680	
J.3	3C x 300 Sq.mm	Mtrs	1540	
J.4	3C x 185 Sq.mm	Mtrs	280	
J.5	1C x 120 Sq.mm	Mtrs	1680	
J.6	1C x 150 Sq.mm	Mtrs	1120	
J.7	3C x 2.5 Sq.mm	Mtrs	2240	
K	Control & Signal cables			
K.1	2P X 1.5 Sq.mm	Mtrs	3475	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Sl.No.	Description of Work	Unit	Qty	Remarks
L	FO Cables - Pipe conveyor VFD-main PLC at Feed end to RIO panel at discharge end	Mtrs	9000	
M	Cable Trays			
M.1	FRP Perforated Tray - 50mm WIDTH	Mtrs	2170	
M.2	FRP Ladder Tray - 150mm WIDTH	Mtrs	6510	
N	Earthing Accessories			
N.1	50x6mm HOT DIP GI FLAT	Mtrs	2464	
N.2	25x3mm HOT DIP GI FLAT	Mtrs	70	
N.3	8 SWG GS WIRE	Mtrs	2800	
N.4	M8 Ring type Al Lug for 8 SWG wire	Nos	2800	
O	Welding Sockets			
O.1	415V Welding Sockets	Nos	1	
O.2	240V Welding Sockets	Nos	1	
P	Lighting Cables			
P.1	5C X 10 Sq.mm Al cable	Mtrs	8750	
P.2	3C X 2.5 Sq.mm flexible Cu cable	Mtrs	1050	
Q	Local push button station - DOL Type for all conveyors & cooling motors of pipe conveyors	Nos	6	
R	Control Junction boxes	Nos	12	
S	Lighting JB	Nos	400	
T	35W LED Fixtures	Nos	400	
U	Instruments			
U.1	Pull cord switch	Nos	140	
U.2	Belt sway switch	Nos	16	
U.3	Zero speed switch	Nos	2	
U.4	Chute block switch	Nos	4	
U.5	Overfill detection switch	Nos	4	
U.7	Hooters	Nos	2	
U.9	Motor RTD	Nos	48	
V	VFD Transformer			
V.1	1500KVA Distribution transformer - 2700mm L x	Nos	2	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Sl.No.	Description of Work	Unit	Qty	Remarks
	2750mm D x 2900mm H – 2 NO'S			
V.2	750KVA Distribution transformer - 2450mm L x 2600mm D x 2450mm H –2 NO'S	Nos	2	
W	VFD Panel with PLC for Pipe Conveyor			
W.1	Pipe conveyor VFD panel at head end START/DELTA PANEL (Dimension -1200 (L) x 2250 (H) x 800 (D)) – 2 NO'S	Nos	2	
W.2	Pipe conveyor VFD panel at head end MASTER (Dimension - 2600 (L) x 2250 (H) x 800 (D)) – 2 NO'S		2	
W.3	Pipe conveyor VFD panel at head end SLAVE-1 (Dimension - 3000 (L) x 2250 (H) x 800 (D)) – 2 NO'S		2	
W.4	Pipe conveyor VFD panel at tail end SLAVE-2 (Dimension - 2600 (L) x 2250 (H) x 800 (D)) - 2 NO'S		2	
W.5	Pipe conveyor VFD LCS (Dimension - 300 (L) x 350 (H) x 150 (D)) – 2 NO'S		2	

1.9.1 Supply and application of Paint shall be in the scope of contractor. Rate included for item S No 1 shall include supply & application of paint also.

1.9.2 Separate line item is given for Touch up paint (primer, Mid coat and final). The same shall be required for structures, technological structures and equipment. Please refer to painting specification for further details.

1.9.3 Indicative list of Bolt, nuts, washers, fasteners, U bolts are as below. However, total required Bolt, nuts, washers, fasteners and U bolts required for completion of the job is in bidder's scope.

Square taper washer, hot dip galvanized 1710. M12	Nos.	240
Square taper washer, hot dip galvanized 1710. M16	Nos.	1482
Square taper washer, hot dip galvanized 1710. M20	Nos.	432
Nyloc nut, galvanized M12 G.8	Nos.	2628

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Nyloc nut, galvanized M16 G.8	Nos.	37314
U-Bolt (UB1) Drg. no. 20164835 Sheet 9 of 10- Ver-3.0 with 2Nut & 2Washers	Set.	4600
Hexagon head bolt, electroplated Gr.10.9 1246. M30×160	Nos.	24
Hexagon head bolt, hot dip galvanized Gr.8.8 1535. M24×140	Nos.	48
Hexagon head screw, hot dip galvanized 8.8 1541. M12×50	Nos.	2628
Hexagon head screw, hot dip galvanized Gr.8,8 1541. M16×60	Nos.	3788
Hexagon head screw, hot dip galvanized Gr.8.8 1541. M20×60	Nos.	243
Hexagon head screw, hot dip galvanized Gr.8.81541. M16×100	Nos.	32
Hexagon head screw, hot dip galvanized Gr.8.81541. M16×120	Nos.	26842
Hexagon head screw, hot dip galvanized Gr.8.8 1541. M20×90	Nos.	201
Hexagon head screw, hot dip galvanized8.8 1541. M30×110	Nos.	48
Hexagon nut, hot dip galvanized Gr.8 1422. M20	Nos.	180
Hexagon nut, hot dip galvanized Gr.8 1422. M30	Nos.	24
Spring washer 0720. M36 HDG	Nos.	48
Spring washer, electroplated1720. M16	Nos.	26442
Washer, electroplated1700. M16	Nos.	36042
Hexagon head screw, hot dip galvanized Gr.8.8 1541. M16×60	Nos.	236
Hexagon nut, hot dip galvanized Gr.10 1124. M30	Nos.	12
Shield Anchor Gr. 4.6 0612. M12×140	Nos.	8
Fasteners (balance qty)		
BOLT & Nut M20X60,Gr.4.6-Black	Nos	188
BOLT & Nut M20X50,Gr.4.6-Black	Nos	672
BOLT & Nut M16X65,Gr.4.6-Black	Nos	56
BOLT & Nut M16X60,Gr.4.6-Black	Nos	204
BOLT & Nut M16X55,Gr.4.6-Black	Nos	270
BOLT & Nut M16X50,Gr.4.6-Black	Nos	242
BOLT & Nut M16X45,Gr.4.6-Black	Nos	1402
BOLT & Nut M16X40,Gr.4.6-Black	Nos	6348
BOLT & Nut M16X35,Gr.4.6-Black	Nos	610
Hot Dip . Galv. BOLT, Nut,P.Washer, Check nut M20x100 with Sq. plate washer ID 22 x 60 x 60 x 5mm Gr.10.9 Full Thread	Nos	336

1.9.4 Instruction to Bidders:

1. The quantity indicated in the BOQ in Part C of Price Bid is approximate only and is liable for variation. Payment will be as per actual quantity executed and as certified by BHEL Engineer.
2. Tenderers are requested to affix their company seal and authorized signature in all pages.
3. Bidders shall quote 'Total Amount' in the format enclosed as a separate Excel File in BHEL NIC e-Procurement portal for the subject tender and upload the same under 'Packet details - > Tender covers -> Finance '(Cover Type Description – Price Bid)' and same shall be taken into account for evaluation and awarding and hence, shall be complete in all respect for the full scope of work defined in specification and in accordance with terms & conditions of the tender. Any other entry elsewhere

TECHNICAL CONDITIONS OF CONTRACT (TCC)

in the price bid shall be treated as Null and Void. Quoting of rates in any other form/formats will not be entertained.

4. The above mentioned 'Total amount' is for the entire Bill of Quantity (BOQ) given in Part -C of the Price Bid.

5. BHEL has pre-fixed the weightages for the amount of individual items of Bill of Quantity with respect to the 'Total Amount' in Part C of Price Bid.

6. Based on the pre-fixed weightages, the amount for the individual items of the Bill of Quantity shall be arrived at. This amount shall be rounded off to the nearest rupee.

7. Based on the quantities of individual item and the amount arrived in Sl. No: 6 above, unit rate of individual items shall be derived. This unit rate shall be rounded off to four decimal places.

8. Bidders to note that this is an item rate contract. Payment shall be made for the actual quantities of work executed as certified by BHEL Engineer.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

VOLUME-IA PART-I CHAPTER -X

1.10.0 GENERAL

The scope of the work will comprise of but not limited to the following:

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

- 1.10.1 Successful Bidder is requested to furnish the following at PSSR-HQ Chennai immediately after release of Letter of Intent (LOI)
- i) Security Deposit
 - ii) Unqualified Acceptance for Detailed LOI / Work Order.
 - iii) Rs.100/- Stamp Paper for preparation of Contract Agreement.
- 1.10.2 Successful Bidder are requested to furnish the proof of documents for the following at the respective PSSR- Site
- i) PF Regn No.
 - ii) Labour License No.
 - iii) Workmen Insurance Policy No.
- 1.10.3 **In addition to the clause 2.8 of General Conditions of Contract (Volume-1C of Book-II) the contractor shall comply with the following.**

1.10.3.1 PROVIDENT FUND

- 1.10.3.1.1 The contractor is required to extend the benefit of Provident Fund to the labour employed by you in connection with this contract as per the Employees Provident Fund and Miscellaneous Provisions Act 1952. For due implementation of the same, you are hereby required to get yourself registered with the Provident Fund authorities for the purpose of reconciliation of PF dues and furnish to us the code number allotted to you by the Provident Fund authorities within one month from the date of issue of the letter of intent. In case you are exempted from such remittance an attested copy of authority for such exemption is to be furnished. Please note that in the event of your failure to comply with the provisions of said Act, if recoveries therefore are enforced from payments due to us by the customer or paid to statutory authorities by us, such amount will be recovered from payments due to you.
- 1.10.3.1.2 The final bill amount would be released only on production of clearance certificate from PF / ESI and labour authorities as applicable.

1.10.3.2 OTHER STATUTORY REQUIREMENTS

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.10.3.2.1 The Contractor shall submit a copy of Labour License obtained from the Licensing Officer (Form VI) u/r25 read with u/s 12 of Contract Labour (R&A) Act 1970 & rules and Valid WC Insurance copy or ESI Code (if applicable) and PF code no. along with the first running bill.
- 1.10.3.2.2 The contractor shall submit monthly running bills along with the copies of monthly wages (of the preceding month) u/r78(1)(a)(1) of Contract Labour Rules, copies of monthly return of PF contribution with remittance Challans under Employees Provident Fund Act 1952 and copy of renewed WC Insurance policy or copies of monthly return of ESI contribution with Challans under ESI Act 1948 (if applicable) in respect of the workmen engaged by them.
- 1.10.3.2.3 The Contractor should ensure compliance of Sec 21 of Contract Labour (R&A) Act 1970 regarding responsibility for payment of Wages. In case of “Non-compliance of Sec 21 or non-payment of wages” to the workmen before the expiry of wage period by the contractor, BHEL will reserve its right to pay the workmen under the orders of Appropriate authority in line with relevant Breach of contract clauses of the contract.
- 1.10.3.2.4 The Contractor shall submit copies of Final Settlement statement of disbursal of retrenchment benefits on retrenchment of each workmen under I D Act 1948, copies of Form 6-A (Annual Return of PF Contribution) along with copies of PF Contribution Card of each member under PF Act and copies of monthly return on ESI Contribution – Form 6 under ESI Act 1948 (if applicable) to BHEL along with the Final Bill.
- 1.10.3.2.5 In case of any dispute pending before the appropriate authority under ID Act 1948, WC Act 1923 or ESI Act 1948 and PF Act 1952, BHEL reserve the right to hold such amounts from the final bills of the Contractor which will be released on submission of proof of settlement of issues from the appropriate authority under the act.
- 1.10.3.2.6 In case of any dispute prolonged / pending before the authority for the reasons not attributable to the contractor, BHEL reserves the right to release the final bill of the contractor on submission of Indemnity bond by the contractor indemnifying BHEL against any claims that may arise at a later date without prejudice to the rights of BHEL.

1.10.3.2.7 DEPLOYMENT OF SKILLED / SEMI-SKILLED TRADESMEN

The following clause is applicable in case the contract value / contract price is Rs.Five crores and above.

The contractor shall, at all stages of work deploy skilled / semi-skilled tradesmen who are qualified and possess certificate in particular trade from CPWD Training Institute / Industrial Training Institute / National Institute of Construction

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Management and Research (NICMAR), National Academy of Construction, CIDC or any similar reputed and recognized Institute managed / certified by State / Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled / semi-skilled workers required in each trade at any stage of work. The contractor shall submit number of man days required in respect of each trade, its scheduling and the list of qualified tradesmen along with requisite certificate from recognized Institute to Engineer-in-Charge for approval. Notwithstanding such approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Engineer-in-Charge. Failure on the part of contractor to obtain approval of Engineer-in-Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate of Rs. 100 per such tradesman per day. Decision of Engineer-in-Charge as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding.

1.10.3.3 Site Visit by the Bidder

- 1.10.3.3.1 The bidder shall, prior to submitting his tender for the work, visit, examine and acquire full knowledge & information and necessary conditions prevailing at the site and its surroundings of the plant premises together with all statutory, obligatory, mandatory requirements of various authorities about the site of works at his own expense, and obtain and ascertain for himself on his own responsibility that may be for preparing his tender and entering into a contract, and take the same into account in the quoted contract price for the work.
- 1.10.3.3.2 The bidder shall satisfy themselves about the following factors:
- i) Site conditions including access to the site, existing and required roads and other means of transport/communication for use by him in connection with the work including diverting and re-routing of services.
 - ii) Requirement and availability of land and other facilities of his enabling works, establishment of his nursery, office, stores etc.
 - iii) Ground conditions including those bearing upon transportation, disposal, handling and storage of materials required for the work or obtained there-from.
 - iv) Source and extent of availability of suitable materials, including water etc., and labour (skilled and unskilled) required for work, and laws and regulations governing their use and employment.
 - v) Geological, meteorological, topographical and other general features of the site and its surroundings as are pertaining to and needed for the performance of the work.
 - vi) The limit and extent of surface and subsurface water to be encountered during the performance of the work, and the requirement of drainage and pumping.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- vii) The type of equipment and facilities needed, for and in the performance of the work;
 - viii) The extent of lead and lift required for the work in complete form over the entire duration of the contract, and
 - ix) All other information pertaining to and needed for the work including information as to the risks, contingencies and other circumstances which may influence or affect the work or the cost thereof under this contract.
- 1.10.3.3.3 The bidder should note that information, if any, in regard to the local conditions, as contained in these tender documents, has been given to tenderer merely for guidance and is not warranted to be complete.
- 1.10.3.3.4 A bidder shall be deemed to have full knowledge of the site, whether he inspects it or not, and no extra charges consequent on any misunderstanding or otherwise shall be allowed.
- 1.10.3.3.5 The bidder and any of his personnel or agents will be granted permission by the Site-In-Charge or his authorized nominee, on receipt of formal application in respect thereof a week in advance of the proposed date of inspection of site, to enter upon his premises and lands for purpose of such inspection, but only on the express condition that the tenderer (and his personnel and agents) will relieve and indemnify the Employer (and his personnel and agents) from and against all liability in respect thereof and will be responsible for personal injury (whether fatal or otherwise), loss of or damage to property and any other loss, damage, costs and expenses however caused which, but for the exercise of such permission, would not have arisen.
- 1.10.3.4 Scope of work covered under this specification requires quality workmanship, engineering and green belt management along with the supply of all consumables, tools and tackles and testing instruments. The contractor shall ensure timely completion of work. The contractor shall have adequate tools, measuring instruments etc. in his possession. He shall also have adequate trained, qualified and experienced engineers, supervisory staff and skilled personnel. The manpower deployment identified by contractor shall match with above scope of works.
- 1.10.3.5 It is not the intent to specify herein all details of all material. Any item related this work not covered by this but necessary to complete the system will be deemed to have been included in the scope of the work.
- 1.10.3.6 All the necessary certificates and licenses required to carry out this scope of work are to be arranged by the contractor then and there at no extra cost.
- 1.10.3.7 Site testing wherever required shall be carried out for all items / materials installed by the contractor to ensure proper installation and functioning in accordance with drawings, specifications and manufacturer's recommendations.
- 1.10.3.8 The contractor shall carryout additional tests if any, which the Engineer feels necessary because of site conditions and also to meet system specification.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.10.3.9 All the work shall be carried out as per instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the contractor.
- 1.10.3.10 Wherever work sequences are furnished by BHEL, the contractor shall follow the same sequence.
- 1.10.3.11 Contractor shall execute the supply and works as per sequence prescribed by BHEL at site engineer. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the methods of execution of similar job in any other site or for any reasons whatsoever.
- 1.10.3.12 If required by BHEL, the contractor shall change the sequence of his operation so that work on priority sectors can be completed within the projects schedule. The contractor shall afford maximum assistance to BHEL in this connection without causing delay to agreed completion date.
- 1.10.3.13 Contractor shall, transport all materials to site and unload at site / working area for inspection and checking. All material handling equipment required shall be arranged by the contractor.
- 1.10.3.14 Contractor shall retain all T&P / Testing instrument / Material handling equipments etc at site as per advice of BHEL engineer and same shall be taken out from site only after getting the clearances from engineer in charge.
- 1.10.3.15 The contractor at his cost shall arrange necessary security measures for adequate protection of his machinery, equipment, tools, materials etc. BHEL shall not be responsible for any loss or damage to the contractor's construction equipment and materials. The contractor may consult the Engineer-in-Charge on the arrangements made for general site security for protection of his machinery equipment tools etc.
- 1.10.3.16 The Contractor may have to execute work in such a place and condition where other agencies also will be under such circumstances. However completion time for work agreed will be subject to the condition that contractor's work is not hampered by the agencies.
- 1.10.3.17 Contractor has to work in close co-ordination with other work agency at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less / more at a particular given time. Activities and work program have to be planned in such a way that the milestones are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.
- 1.10.3.18 The contractor must obtain the signature and permission of the security personnel of the customer for bringing any of their materials inside the site premises. Without the Entry Gate Pass these materials will not be allowed to be taken outside.
- 1.10.3.19 Contractor shall remove all scrap materials periodically generated from his working area and collect the same at one place earmarked for the same. Load of scraps is to be shifted

TECHNICAL CONDITIONS OF CONTRACT (TCC)

to a place earmarked by BHEL. Failure to collect the scrap is likely to lead to accidents and as such BHEL reserves the right to collect and remove the scrap in line with relevant Breach of contract clauses of the contract.

- 1.10.3.20 The contractor shall ensure that his premises are always kept clean and tidy to the extent possible. Any untidiness noted on the part of the contractor shall be brought to the attention of the contractor's site representative who shall take immediate action to clean the surroundings to the satisfaction of the Engineer-in-Charge.
- 1.10.3.21 The contractor is strictly prohibited from using BHEL's regular components like angles, channels, beams, plates, pipe / tubes, and handrails etc for any temporary supporting or scaffolding works. Contractor shall arrange himself all such materials. In case of such misuse of BHEL materials, a sum as determined by BHEL engineer will be recovered from the contractor's bill. The decision of BHEL engineer is final and binding on the contractor.
- 1.10.3.22 No member of the already erected structure / buildings, other component and auxiliaries should be removed / modified without specific approval of BHEL engineer.
- 1.10.3.23 Contractors shall ensure that all their Staff / Employees are exposed to periodical training programme conducted by qualified agencies/ personnel on ISO 9001 – 2008 Standards.
- 1.10.3.24 The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.
- 1.10.3.25 Crane operators deployed by the contractor shall be tested by BHEL before he is allowed to operate the cranes.
- 1.10.3.26 On Completion of work, all the temporary buildings, structures, pipe lines, cable etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.
- 1.10.3.27 It is the responsibility of the contractor to do the checking, testing etc. if necessary, repeatedly to satisfy BHEL Engineer with all the necessary tools and tackles, manpower etc. without any extra cost. The testing will be completed only when jointly certified so, by the BHEL Engineer.
- 1.10.3.28 If any item or equipment not covered but requires being executed, same shall be carried out by the contractor. Equivalent or proportional unit rate shall be considered wherever possible from the BOQ. The rates quoted by the contractor shall be uniform as far as possible for similar items appearing in rate schedule.
- 1.10.3.29 The contractor's work shall not hinder other work, either underground or over ground, such as electrical, phone lines, water or sewage lines, etc. In areas of overlap, the contractor shall work in coordination with other related contractors. Any damage by

TECHNICAL CONDITIONS OF CONTRACT (TCC)

the landscape contractor's team to such utilities will be penalized and contractor shall be responsible for cost for such damages.

1.10.3.30 SITE INSPECTION

BHEL or his authorized agents may inspect various stages of work during the currency of the contract awarded to him. The contractor shall make necessary arrangements for such inspection and carry out the rectification pointed out by the owner / employer without any extra cost to the owner / employer. No cost whatsoever such duplication of inspection of work be entertained.

BHEL will have full power and authority to inspect the works at any time, either on the site or at the contractor's premises. The contractor shall arrange every facility and assistance to carry out such inspection. On no account will the contractor be allowed to proceed with work of any type unless such work has been inspected and entries are made in the site inspection register by BHEL.

Wherever the performance of work by the contractor is not satisfactory in respect of workmanship, deployment of sufficient labour or equipment, leading to delay in execution of work or any other matter, BHEL shall have the right to engage labour at normal ruling rates and get the work executed through other agency and debit the cost to the contractor and the contractor shall have no right to claim compensation thereof. In such a case, BHEL shall have the right to utilize the materials and tools brought by the contractors for the same work.

1.10.3.31 DOCUMENTATION

1.10.3.31.1 The following information shall be furnished by the bidder within two weeks of award of contract for purchaser's approval:

- a) Bar chart covering planned activities at site
- b) Detailed organization chart
- c) Details of T&P available with contractors with documents proofs.

1.10.3.31.2 The following information shall be furnished by the bidder after testing and inspection: Test certificates of various tests conducted at site. All inspection and test certificates shall be signed by BHEL representative also.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.10.3.32 RECORDS TO BE MAINTAINED AT SITE:

- 1.10.3.32.1 Record of Quantity of FREE/Chargeable items issued by BHEL must be maintained during contract execution. Also reconciliation statement to be prepared at regular intervals.
- 1.10.3.32.2 The under mentioned Records/ Log-books/ Registers applicable to be maintained.
 - a. Hindrance Register.
 - b. Site Order Book.
 - c. Test Check of measurements.
 - d. Supply and Consumption Daily Register of Cement and Steel
 - e. Records of Test reports of Field tests.
 - f. Records of manufacture's test certificates.
 - g. Records of disposal of scraps generated during and after the work completion.

Statutory clearance for Electrical work is included in bidders' scope

VOLUME-IA PART-I CHAPTER - XI

1.11 PROGRESS OF WORK

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

- 1.11.1 Refer forms F -14 to F-15 of volume I D of volume -I book-II (. Plan and review will be done as per the formats. These should be submitted on monthly basis with duly signed by BHEL and Contractor.
- 1.11.2 Contractor is required to draw mutually agreed monthly erection programs in consultation with BHEL well in advance. Contractor shall ensure achievement of agreed program and shall also timely arrange additional resources considered necessary at no extra cost to BHEL.
- 1.11.3 Progress review meetings will be held at site during which actual progress during the week vis-a-vis scheduled program shall be discussed for actions to be taken for achieving targets. Contractor shall also present the program for subsequent week. The contractor shall constantly update / revise his work program to meet the overall requirement. All quality problems shall also be discussed during above review meetings. Necessary preventive and corrective action shall be discussed and decided upon in such review meetings and shall be implemented by the contractor in time bound manner so as to eliminate the cause of nonconformities.
- 1.11.4 Tenderers have to furnish a list of Tools and Plants including cranes, Tractor / Trailers etc., which they propose to deploy for this work.
- 1.11.5 The contractor shall submit daily, weekly and monthly progress reports, manpower reports, materials reports, consumables (gases / electrodes) report, cranes availability report and other reports as per Performa considered necessary by the Engineer. The periodicity of the reports will be decided by BHEL Engineer at site.
- 1.11.6 The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.
- 1.11.7 The contractor shall submit a report of any damage, shortage, discrepancy etc., every week detailing in this regard.
- 1.11.8 The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.
- 1.11.9 The monthly report as a booklet shall be submitted at the end of every month and shall contain the following details: -
 - a. Progress photographs in colour.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- b. Erection progress in terms of tonnage, welding joints, radiography, stress relieving, etc., completed as relevant to the respective work areas against planned.
- c. Site Organization chart of engineers & supervisors as on the last day of the month with further mobilization plan.
- d. Category- wise man hours engaged during the previous month under the categories of fitters, welders, riggers, khalasis, grinder-men, gas-cutters, electricians, crane operators and helpers.
- e. Consumables report giving consumption of all types of gases and electrodes during the previous month.
- f. Availability report of cranes.
- g. Safety implementation report in the format.
- h. Pending material and any other inputs required from BHEL for activities planned during the subsequent month.

1.12 MATERIAL HANDLING, TRANSPORTATION AND SITE STORAGE

The scope of the work will comprise of but not limited to the following:

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

- 1.12.1 Open land as available shall be provided by BHEL on free of cost basis as provided by TANGEDCO. Also please refer scope matrix chapter for more information on open space. Contractor shall maintain store cum fabrication yard at his own cost. Hard surfacing of this yard and all-round drain as necessary shall be carried out by the contractor at his own cost within the quoted rate. The bidder shall make complete arrangement of necessary security personnel, to safeguard all such materials in his custody at his own cost. Materials issued will be used only for construction of permanent work. The contractor shall take care of material issued by BHEL and shall protect the same from theft, damage and weathering at his own cost.
- 1.12.2 The system for receipt, storage & issue of materials shall be available with vendors for easy traceability.
- 1.12.3 Periodic audit of system of purchasing, storing and issue, etc. will have to be carried out by the vendors. BHEL will also audit the same.
- 1.12.4 The contractor shall in no case be entitled for any compensation or damages on account of any delay in supply or non-supply thereof for all or any such material.
- 1.12.5 Excessive rusting of steel must be avoided. In case, due to any cause attributable to the contractor, rusting of steel for BHEL issued steel occur rendering the same unusable, then such quantity of steel shall be recovered from the interim payment at the penal rate specified in the tender.
- 1.12.6 The contractor shall maintain proper store account for all the BHEL issued materials and shall give three copies of computerized reconciliation statement of such account to the BHEL with each running bill.
- 1.12.7 All structural steel and bought out construction materials shall be stacked plate size wise, thickness wise and item wise. Materials issued by BHEL as free of supply shall be stacked separately on sleepers.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.12.8 Materials shall not under any circumstances taken out of the project site unless otherwise permitted by BHEL.
- 1.12.9 Loading at BHEL / Customer stores and storage yard, transport to site, unloading at site / working area of equipment placement on respective foundation / location, fabrication yard, pre-assembly bay or at working area are in the scope of work. The scope includes taking materials / Equipment from customer stores / storage yard also. Contractors Quoted / Accepted rate shall be inclusive of the same. Required cranes, tractors, trailer or trucks / slings / tools and tackles / labour including operators Fuel lubricants etc for loading & unloading of materials will be in the scope of contractor.
- 1.12.10 Contractor shall plan and transport equipments, components from storage yard to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to congestion at site of work.
- 1.12.11 The equipments / materials from the storage yard shall be moved in sequence to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage / loss of such equipment at site.
- 1.12.12 Materials shall be stacked neatly, preserved and stored in the contractor's shed / work area in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work area / site to enable other agencies to carry out their work, same shall be done by the contractor at no extra cost.
- 1.12.13 Open ends of piping valves, pipes and tubes shall be covered with plastic caps or will be closed with wooden plugs as the case may be., as provided by BHEL Manufacturing units
- 1.12.14 The contractor shall provide any fixtures, concrete blocks & wooden sleepers, which are required for temporary supporting of the components at site.
- 1.12.15 The contractor shall take all such measures as may be reasonably necessary to ensure that its arrangements and those of its sub-contractors with respect to the transport of Goods, Materials and Labour to the site do not interfere with local traffic in the vicinity of the site and where such interference is unavoidable shall make such special arrangements as may be reasonably required to minimize the effect of such interference.
- 1.12.16 **RECEIPT AND LOADING /UNLOADING:-** Materials to be handled under this contract are project material such as mechanical equipment & accessories used for pipe conveyor system. For storage of these materials, existing open & closed store yard of FLS shall be used.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- a) Receipt, Unloading, Stacking, Storage of the materials/ equipment receiving and loading on truck /trailer at site in line with BHEL storage manual and as per the instruction of BHEL site engineer.
- b) Organizing weighing of material and weighing slip, arranging gate pass/permission for the entry/exit inside the project premises.
- c) Loading /unloading of all types of consignment including heavy /Over Dimensional Consignments (ODC), electrical panels, box/ packages/ crates material from Trucks, Trailers, Carriers, Vans.
- d) Stacking and storing of material on RCC sleepers wherever required with proper marking and identification. RCC sleepers required shall be in bidder's scope of supply.
- e) Verifying the materials as per the packing list, preparing the Material Receipt Certificate (MRC) and submission of MRC to BHEL site engineer.
- f) The bidder shall maintain computerized records for receipt of materials, and the FLS supplied and reconciled materials. Track materials issued during erection and return of any unused items in BHEL standard format/ computerized system. Monthly report shall be produced by the bidder and suitable soft & hard copy be maintained as a backup.
- g) The bidder shall stack the materials as per grid plan of BHEL, maintain proper 'housekeeping', maintain and upkeep entire storage area and passage for smooth material handling as per BHEL instructions.
- h) Equipment while in storage shall be greased, capped, plugged or blank flanged.
- i) All structural fabricated members like Technological structures, frames, std modules, galleries, etc shall be stacked in the sequence in which they are required for erection. All members shall be stacked free from ground to prevent corrosion and shall be so stacked as not to cause deformation in any individual member.
- j) Welding rods shall be stored in a hot dry place. During storage, welding rods for different alloy materials and categories of work shall be stored separately and identified for proper use.

1.12.17 **STORE MANAGEMENT:** It covers and includes the following

- a) Maintenance of the store records like -Day Book Register, Stock Register, Issue Register, Issue pass, MRC as per the approved formats.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- b) Issuing the materials during erection based on front availability, retrieving & shifting/relocation of the stored materials to any other location inside or outside the plant.
- c) Monthly reconciliation and final Reconciliation of all the received materials and handing over of balance material to the BHEL at the end of the contract.
- d) Office with necessary equipment like computers, printers, accessories, data entry operator for maintaining the records.
- e) Organizing necessary tools and tackles, machinery and man power to carry out the loading /unloading, security and storage work.
- f) The materials/components at stores shall be handled with care and diligence. Any loss or damage to BHEL due to the bidder's lapses will have to be made good by the bidder. Otherwise BHEL will arrange for repair/replacement and recover the expenses incurred therein from the bidder's bills.
- g) The bidder to ensure proper cleaning and house maintenance of stores (both covered and open yard) and BHEL office regularly.

VOLUME-IA PART-I CHAPTER-XVIII

1.13 PAINTING

The scope of the work will comprise of but not limited to the following:

All painting should be carried out as per the painting specification provided in Volume IA Part II of this tender. Broad guidelines are as below:

1.13.1 PAINTING

- 1.13.1.1 The scope of work shall also include supply and application of touch up painting of all the supplied and erected equipments as required and specified in the BHEL / Customer / Customer Consultant's painting specification which forms the part of this tender
- 1.13.1.2 In the case of steel fabricated items, raw steel after fabrication has to be cleaned by Sand / Grit / shot blasting by and subsequent painting to be carried out. Sand / Grit / shot blasting equipment with all accessories and consumables as required has to be arranged by the contractor within the Quoted rates.
- 1.13.1.3 All the exposed metal parts of the equipments including piping, structures, hangers etc., wherever applicable after installation unless otherwise specified the surface protected, are to be first painted with at least one coat of suitable primer and required number of finish coats as indicated in the Painting Specification which matches the shop primer paint used, after thoroughly cleaning the dust, rust, scales, grease oil, and other foreign materials by wire brushing scrapping and chemical cleaning and the same being inspected and approved by BHEL engineers for painting. Afterwards the above parts shall be finished with as per the instructions of BHEL / Customer official.
- 1.13.1.4 Normally Paint shall be applied by brushing as per the instruction of BHEL Engineer. It shall be ensured that brush marks are minimum. If needed and insisted either by BHEL / Customer in certain cases, spray painting has to be carried out within the Quoted rates. Spray painting gun and compressed air arrangement has to be made by the contractor himself within the Quoted rates.
- 1.13.1.5 Paint used shall be stirred frequently to keep the pigment in suspension. Paint shall be of the ready mix type in original sealed containers as packed by the paint manufacturer. Paint manufacturer's instructions shall be followed in method of application, handling, drying time etc.,

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.13.1.6 The scope of painting includes application of colour bands, lettering the names of the systems, equipments, tag Nos of valves, marking the directions of flow and other data required by BHEL within the quoted rate.
- 1.13.1.7 All surfaces shall be thoroughly cleaned, free from scales, dirt and other foreign matter. Each coat shall be applied in an even & uniform film free from lumps, streaks, runs, sags and uncoated spots. Each coat (Primer, intermediate, finish) shall have a minimum thickness of dry film thickness (DFT) in microns and the DFT of finish paint shall not be less than the specified value. Necessary instrument for measuring the thickness of paint applied is to be arranged by the contractor.
- 1.13.1.8 Finish coat paint, no of coats and DFT shall be as indicated in the painting specification enclosed in this tender / relevant BHEL document / customer's specifications. The painting specification forming part of this tender shall be used as guidelines to be followed. Painting to be done as per the procedure / approved painting schedule given by BHEL Engineer / Manufacturing unit.
- 1.13.1.9 The actual colour to be applied shall be approved by BHEL / customer before starting of actual painting work.
- 1.13.1.10 Primer, Intermediate & finish paint shall be of reputed paint supplier approved by BHEL / Customer. Contractor has to procure paints from the BHEL / Customer approved agencies only, and the paints should be as per the customer painting specification. The quality of the finish paint shall be as per the standards of IS or equivalent as approved by BHEL / Customer. Before procurement of paint the contractor has to obtain the clearance from BHEL authorities. The batch certificates of paints to be submitted to BHEL Engineer before using the same.
- 1.13.1.11 No paint shall be applied when the surface temp is above 55 deg. Centigrade or below 10 deg. Centigrade, and when the humidity is greater than 90% to cause condensation on the surface or frost / foggy weather.
- 1.13.1.12 Before commencement of final painting, contractor has to obtain written clearance from BHEL / Customer for effective completion of surface preparation.
- 1.13.1.13 Before applying the subsequent coats, the thickness of each coat shall be measured and recorded with BHEL / Customer.
- 1.13.2 PRESERVATION / TOUCH UP PAINTING

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.13.2.1 Contractor shall carryout cleaning and preservation / touch up painting for the materials / equipments under this tender specification right from pre- assembly stage to till the equipment is cleared for final painting.
- 1.13.2.2 The contractor shall clean, wherever necessary and paint inside surfaces of the equipments like coolers, oil tanks and other components as per instruction of BHEL Engineer during erection at the quoted rate. The Contractor has to arrange necessary paints within the quoted price.
- 1.13.2.3 Any equipment which has been given the shop coat of primer shall be carefully examined after its erection in the field and shall be treated with touch up coat of same primer wherever the shop coat has been abraded, removed or damaged during transit / erection, or defaced during welding.
- 1.13.2.4 Mostly the equipment / items / components will be supplied with one coat of primer paint and one coat of finish paint. However, during storage and handling, the same may get peeled off / deteriorate. All such surfaces are to be thoroughly cleaned and to be touch up painted with suitable approved primer and finish paint matching with shop paint / approved final colour.
- 1.13.2.5 All welded joints should be painted with anti-corrosive paint, once radiography and stress relieving works are over.
- 1.13.2.6 Due to atmospheric conditions erected materials are likely to get rusted more frequently. It is the responsibility of the contractor to preserve the erection materials drawn from stores for erection till these are commissioned and handed over to customer. The required consumables for this purpose like paint, thinner, rust converter compound (Ruskill or Ferropro) or any other equivalent shall be arranged by contractor. However, the contractor should also arrange other consumables like wire brushes, emery paper, cotton waste, cloth etc. at their cost. The contractor should ensure that the materials are not rusted on any account till they are handed over to customer. The decision of the BHEL Engineer is final with regard to frequency of application of paint and rust converter compound.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

VOLUME 1A PART-1 CHAPTER XIII

1.14 ACCOUNTING OF MATERIALS ISSUE

1.14.1 The material issued to the contractor by BHEL will be accounted as follows:

1.14.1.1 ISSUE OF STEEL, CONSUMPTION, WASTAGE & RETURN OF MATERIALS - Please refer SPECIAL CONDITIONS OF CONTRACT (SCC)- Civil & Structural Chapter – VI: Material Handling, Storage & Preservation

1.14.1.2 SCRAP & SERVICEABLE MATERIALS Please refer SPECIAL CONDITIONS OF CONTRACT (SCC)- Civil & Structural Chapter – VI: Material Handling, Storage & Preservation

1.14.1.3 RECONCILIATION OF MATERIALS Please refer SPECIAL CONDITIONS OF CONTRACT (SCC)- Civil & Structural Chapter – VI: Material Handling, Storage & Preservation

1.14.1.4 RECOVERY OF MATERIAL Recovery of wastages shall be made from the bills of contractor at the penal rate mentioned in the table below for the following cases: a) If wastage exceeds the specified limit b) If the wastage not exceeded specified limit, but not returned to BHEL store except invisible wastage c) For not returning the surplus serviceable materials.

1.14.1.5 PENAL RATE OF MATERIALS

A	STRUCTURAL STEEL MS plates, MS flats, rolled steel beams, channels, and angles, MS pipes, Chequered Plates, etc. in sizes and lengths as available	BHEL's latest purchase Price per MT + 5% overhead + GST and/or other taxes & duties
B	Bought Out Construction Material Gratings, SS liner, GI pipe for handrail etc.	BHEL's latest purchase Price per MT + 5% overhead + GST and/or other taxes & duties

1.14.2 All other materials sourced by the contractor should also be properly accounted. Contractor has to build in their own cost for any wastages on the raw materials sourced by them. Final payment shall be made only for erected weight as per drawing. Separate register duly signed by BHEL and contractor has to be maintained for this.

1.14.3 Materials given by BHEL for erection:

TECHNICAL CONDITIONS OF CONTRACT (TCC)

All the materials in the custody of FLSmith shall be handed over to the contractor with proper protocols for further storage.

- 1.14.4 The contractor shall be responsible for the materials once it is handed over to them except for any malfunctioning of materials.
- 1.14.5 Contractor has to exercise due caution for proper preservation, storage of these materials and are responsible till it is handed over to customer / BHEL.

VOLUME 1A PART-1 CHAPTER XV

1.15 Foundations and Grouting

1.15.1 The scope of the work will comprise of but not limited to the following:

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

- 1.15.1.1 Foundation for the equipment to be erected shall be provided by BHEL / clients of BHEL. The dimensions of the foundations and anchor bolt pits shall be checked by the contractor for their correctness as per drawings. Further, top elevation of foundations shall be checked with respect to bench mark etc. All adjustments of foundations surfaces, enlarging the pockets in foundations etc. as may be required for the erection of equipment / plants shall be carried out by the contractor.
- 1.15.1.2 Cleaning of foundation surfaces, pocket holes and anchor bolt pits etc., dewatering, making them free of oil, grease, sand and other foreign materials by soda wash, water wash, compressed air or any other approved methods etc., form / shuttering work are within the scope this work.
- 1.15.1.3 It shall be contractor's responsibility to check the various equipment foundations for their correctness with respect to level, orientation, dimensions etc., and ascertained dimensions shall be measured and submitted to BHEL for approval before erection. Also minor chipping, dressing of foundations up to 30 mm for obtaining proper face for packer plates / shims, as may be required for the erection of the equipment / plants will have to be carried out by the contractor without extra cost
- 1.15.1.4 The surface of foundations shall be dressed to bring the surface of the foundations to the required level and smoothness prior to placement of equipment / equipment based on the foundations including shear lug provisions/openings.
- 1.15.1.5 Foundation pockets are to be cleaned thoroughly before placing the supports / columns / equipment. Verticality of foundation bolts to be checked along with correctness of the threads and freeness of the nuts movement. If required cleaning of the threads to be done with proper dies.
- 1.15.1.6 The concrete foundation, surfaces shall be properly prepared by chipping, as required to bring the top of such foundation to the required level to provide the necessary roughness for bondage and to ensure enough bearing strength. All laitance and surface film shall be removed and cleaned and the packers placed with suitable mortar prior to erection of the equipment. Packer plates, if any should not only be blue matched with foundation but also

TECHNICAL CONDITIONS OF CONTRACT (TCC)

inter-packer contact surfaces between the packers and foundation frame etc., shall also be blue matched by Prussian Blue match checks and required percentage contact shall be achieved by chipping and scrapping as per BHEL Engineer's instructions.

- 1.15.1.7 Total grouting of the columns / equipment including pocket grouting, grouting at the gap between foundation and base plates top surface of column / equipment is in the scope of the contractor. All the grouting should be carried out by non-shrink cement like Conbextra GPI / Conbextra GP II / Shrinkkomp or its equivalent etc. This special non-shrink cement shall be arranged by the contractor at his cost. The quoted rate shall be inclusive of the same.
- 1.15.1.8 The contractor shall arrange for grouting of foundation bolt holes of equipment and final grouting of equipment as per the drawings / specification as advised by the Engineer or BHEL after preparing the foundation surface for grouting. The contractor has to arrange, a representative from the supplier of special cement for witnessing the grouting and other works at their cost including any miscellaneous expenditure for this activity. BHEL will not pay any service and incidental charges for arranging the supplier representative. The contractor to take note of this aspect and quote accordingly.
- 1.15.1.9 All equipment bases and structural steel bases and foundations pockets shall be grouted and finished as per these specifications after surface preparation unless otherwise recommended by the equipment manufacturers. The surface preparation includes soda washing of the foundations to remove oil, grease etc. to ensure proper grouting.
- 1.15.1.10 The certificates of the grout are to be submitted BHEL. If necessary, test cubes are to be made and tested at site to ensure the quality of the grout as per relevant IS standards. In case grouting with Portland cement is approved, necessary cement, sand etc. to be arranged by the contractor including the fine aggregates.
- 1.15.1.11 All the materials required for grouting including special cements as approved by BHEL and other materials like Portland cement, sand, chips, gravel, etc., are to be arranged by the contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, type of grouting cements before procurement of grouting cements.

1.15.2 **PROCEDURE FOR GROUTING:**

Contractor has to carry out the grouting as per the work instructions for grouting available at site or the grouting is to be carried out as per the supplier's recommendation / IS standard. Copy of those recommendations is to be submitted to BHEL for records.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

VOLUME 1A PART-1 CHAPTER XVI

1.16 Electrical, C&I and Illumination – Detailed scope of work and technical specifications

1.16.1 Detailed scope of Electrical, C&I and Illumination works:

1.16.1.1 SCOPE OF WORK FOR CABLES:

1.16.1.1.1 BHEL will supply LT Power cables, LT Control Cables and Instrumentation cables of different sizes. The special cables supplied shall be compensating cable, Ethernet cables and Fibre-optic cable of different sizes and type and also Termination Kits.

1.16.1.1.2 The scope of work includes laying & termination of cables, fixing of glands, ferrules, tag plates with necessary numbering and dressing of cable, as per BHEL specification and BHEL engineer's instructions. All the cables shall be identified at both ends, adjacent to the cable glands. In addition, cable shall be identified at all draw / pull pits, manholes, pull boxes, and at major changes of direction in cables tray/trenches and multilayer racking cable routes.

1.16.1.1.3 Cable Termination

- For all LT, instrumentation and FO cables, a composite rate covering laying and termination shall be applicable.

1.16.1.1.4 Unit rate for cable shall cover laying, termination, drilling of holes on the gland plates of the panels/JB or Enlargement of cable entry holes by tapping or any modification required, fixing of cable glands, fixing of glands, ferrules termination and providing tag plates and dressing.

1.16.1.1.5 Unit rates for cabling shall also include supply of clamping/ dressing materials such as Aluminium/GI strips or PVC ties, ferrules, tag plates, lugs upto 2.5 sq. mm. apart from the work mentioned above. Supply of above material shall conform to the specification detailed general Guide lines.

1.16.1.1.6 Uniform unit rate shall be applicable for the cables whether laid on cable trays or routed through duct bank, conduits, cable shafts etc.

1.16.1.1.7 Ethernet cables and Fibre optic cables shall be isolated from other cables and laid in a separate cable tray as directed by site Engineer. Wherever required I/O Box shall be

TECHNICAL CONDITIONS OF CONTRACT (TCC)

installed for Ethernet cable termination and Punch Down crimping tools shall be used for Ethernet cable termination.

- 1.16.1.1.8 Wherever required, the Fibre optic cable shall be laid through HDPE Conduit. Unit rate for laying of Fibre Optic cable shall include laying of HDPE conduit wherever required.
- 1.16.1.1.9 The contractor shall provide Tools/ equipment required for the connections and termination of cable wherever necessary. No separate rate shall be paid for cable terminations, unless it is indicated otherwise in the Rate Schedule. For cable joining, if any, separate rate shall be considered on extra works basis.
- 1.16.1.1.10 The contractor shall carry out cable dressing and clamping for all the cables laid by the contractor. However, if any other agency laid cables of lesser quantity for which no separate trays have been allotted, the contractor shall do clamping along with the cables.
- 1.16.1.1.11 Wherever cable entry holes have not been provided for equipment installed by another agency, the contractor shall co-operate to get the same done.
- 1.16.1.1.12 During testing and commissioning, if the equipment on which the cables are terminated not functioning, it is the responsibility of the contractor to check and establish in coordination with the commissioning agencies that there is no defect in the cabling. The contractor shall promptly depute his supervisor or technicians to assist the commissioning agencies to check the interconnecting cables.
- 1.16.1.1.13 Contractor shall carefully plan the cutting schedule for each cable drum in consultation with Engineer such that wastage is minimized and any resultant short lengths can be used where appropriate route lengths are available.
- 1.16.1.1.14 If the cables are to be laid on the angles or routed in conduit pipe as per site condition, the unit rate for erection of angles and conduit pipes shall be as per the rate quoted elsewhere in the tender.
- 1.16.1.1.15 Any fabrication required at site for cable support shall be carried out at the rate quoted for fabrication.
- 1.16.1.1.16 Cable installation shall be properly coordinated at site with other services and wherever necessary suitable adjustment shall be made in the cable routings with a view to avoid interference with any part of the building, structures, equipment, utilities and services any such adjustment shall be done with the approval of Engineer.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.16.1.1.17 The approximate number of termination for the purpose of estimation to be assumed as follows: The average RUN length shall be considered as 150 Mtrs. However, for 10% of the 2 pair and below, the average length shall be considered as 30 Mtrs.

1.16.1.2 SCOPE OF CABLE TERMINATION

- 1.16.1.2.1 The scope of termination shall include termination of cables on various equipment installed by others.
- 1.16.1.2.2 Re-termination, if required during testing/ commissioning shall be carried out without additional cost.
- 1.16.1.2.3 Scope of termination shall include supply of insulating sleeves. The sleeves shall be fire resistant, long enough to over pass conductor insulation and properly sized.
- 1.16.1.2.4 Contractor shall arrange all type of termination and crimping Tools/ equipments required for the connections/terminations.
- 1.16.1.2.5 Only printed ferrules should be used and contractor shall arrange necessary ferrules printer.
- 1.16.1.2.6 After cable terminations, the debris shall be removed then & there.

1.16.1.3 SCOPE OF WORK FOR CABLE TRAYS/ CONDUITS/ FLEXIBLE CONDUITS/ HOSE:

1.16.1.3.1 CABLE TRAYS

- 1.16.1.3.1.1 Scope of cable tray works covers erection of various sizes of perforated trays with accessories mostly for branch trays in Power House building. All type of cable trays including, standard trays accessories shall be supplied by BHEL.
- 1.16.1.3.1.2 The scope of work for cable trays shall be as follows:
- 1.16.1.3.1.2.1 Unit rate for erection of trays, on per meter basis, shall also include erection of all tray accessories such as elbow, cross, Tees, bends such as vertical and Horizontal, reducers, coupler plates/fixing plates, anchor bolts, fasteners etc.
- 1.16.1.3.1.2.2 For routing of trays standard tray accessories supplied by BHEL shall be used. However, if above standard tray accessories are not supplied, the same shall be fabricated and installed at no extra cost.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.16.1.3.1.2.3 If standard tray accessories like Tees, Reducers, Bends, cross etc. require any modification to suit the tray routing, the same shall be carried out at no extra cost.
- 1.16.1.3.1.2.4 Unit rate for trays shall also cover making of offsets by means of cutting standard tray sections and inserting suitable trays to match with the existing arrangement.
- 1.16.1.3.1.2.5 No separate rate shall be paid for any such site fabrication/ modification on trays or on tray accessories.
- 1.16.1.3.1.2.6 Uniform rate on meter basis shall be applicable for erection of trays and Tray accessories like Tees, Reducers, Bends, cross etc.
- 1.16.1.3.1.2.7 Tray covers are to be erected after completion of cable laying and no separate payment will be made for fixing these covers. GI strip clamps are to be used for fixing the tray covers.
- 1.16.1.3.1.2.8 Welded Joints of trays shall be painted with red lead and aluminium paint in turn with bitumen as per IS 3043. The unit rate shall also include supply of paints, thinner, other consumables and brush etc.

1.16.1.4 SCOPE OF WORK FOR JUNCTION BOXES/CJCBs /PUSH BUTTON BOXES:

- 1.16.1.4.1 Different Junction Boxes/ Push Button boxes with gland plates shall be supplied by BHEL.
- 1.16.1.4.2 The rate for erection of junction boxes/push button boxes shall cover the following also.
- Providing necessary supports
 - Drilling of bottom gland plates for cable glands as required
 - Painting the tag Nos. or fixing a separate tag plate on junction boxes/push button boxes
 - Minor chipping, grouting as required for mounting the JB/PB
 - Supply of all bolts and nuts (Fasteners) including grouting bolts as required for mounting the junction box/push button.
 - Closing all unused holes on the gland plates using grommet or any other suitable materials.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- Any modification like replacement of terminals, enlarging gland holes etc. that may be required to accommodate power cables.

1.16.1.4.3 All bolts and nuts (Fasteners) required for mounting the junction box shall be arranged by the contractor.

1.16.1.4.4 For CJCBs/ RJCBs, the rate for Junction Boxes similar size, as per Rate Schedule, will be applicable.

1.16.1.4.5 For fabrication and fixing of supports/Frame, rate shall be paid on tonnage basis.

1.16.1.5 **SCOPE OF WORK FOR FABRICATION & ERECTION OF STEEL MATERIALS:**

1.16.1.5.1 Scope of steel fabrication and installation covers, fabrication and installation of various type of supports for cable tray, instruments, impulse pipes, GI pipes, support angles for copper tubing, mounting frames for JB, Control Box/Panel, local PB Stations, canopy for local instruments and local instrument rack etc. wherever required.

1.16.1.5.2 The fabrication steel materials such as angles, channels, plates, etc shall be supplied in standard lengths by BHEL. Fabrication shall be carried out by the contractor as per schemes in consultation with site engineers.

1.16.1.5.3 Immediately after fabrication, primer shall be applied to prevent corrosion. The installation shall be carried out only after applying the primer as detailed in painting clause.

1.16.1.5.4 All fabricated steel materials shall be painted as detailed in the scope of painting.

1.16.1.5.5 A composite rate shall be applicable for fabrication and installation of steel, on tonnage basis. The above rate shall include supply of paints and painting, grouting and grouting material as required.

1.16.1.6 **SCOPE OF EARTHING**

1.16.1.6.1 The scope of earthing covered in this contract is above ground earthing i.e equipment earthing. Scope of earthing covers earthing of field Instruments, JBs, Branch trays, LIR/LIE, JB, Push Button boxes, LT panels, etc. All PLC/Instrumentation panels/systems etc, shall be earthed to a separate Electronic earth grid.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.16.1.6.2 Different type of earthing materials shall be supplied by BHEL and same shall be erected as per site requirement.

1.16.1.6.3 All connections from the equipment to the main earthing conductors shall be made as illustrated in earthing drawings. A copy of earthing drawing shall be provided to the contractor at site.

1.16.1.6.4 Unit rate for earthing shall include supply of required fasteners, lugs, minor civil works, painting the welded joint etc.

1.16.1.7 SCOPE OF CIVIL WORKS W.R.T ELECTRICAL, C&I AND ILLUMINATION

Minor civil works like drilling, chipping for transformer and punching & opening in concrete floors, slabs, brick walls, grouting of bus duct columns, base frame of panels, Transformer etc., punching holes on slabs and brick- walls and grouting related to installation of LIR/LIE/Local Gauge Board, control panels, Junction boxes etc., shall be included in the erection cost of such items. No separate payment is applicable. The scope also includes supply of cement, sand, grouting material and cleaning of all debris from above works. More details regarding scope of civil are given in the respective equipment erection.

1.16.1.8 SCOPE OF CALIBRATION:

1.16.1.8.1 Contractor shall calibrate all the instruments (Gauges, Transmitters, Switches, Indicators, Transducers, Recorders, Relays etc.), panel mounted instruments including that will be supplied along with equipments mounted in or as loose.

1.16.1.8.2 Contractor shall maintain calibration records as per the format prescribed by BHEL-Engineer-in charge.

1.16.1.8.3 All testing Instruments/ Equipment deployed for calibration shall be calibrated before taking it into service. A copy of calibration certificate issued by recognized/accredited agencies shall be submitted to BHEL Engineer for his verification and approval.

1.16.1.8.4 BHEL will provide vendor support for calibration of proprietary instruments such as analyzers etc. If BHEL is unable provide or arrange vendor support for above mentioned proprietary instruments, contractor shall carry out the calibration through authorized agency, at extra cost. The actual cost of such calibration carried out by outside agency shall be reimbursed by BHEL. However, if above such calibrator is available with BHEL at site the calibration shall be carried out by the contractor within the quoted rate. However overall responsibility lies with contractor and Contractor

TECHNICAL CONDITIONS OF CONTRACT (TCC)

shall provide all supports like manpower, standard T&P, Instruments etc for calibration and testing of above proprietary type instruments.

1.16.1.8.5 The contractor shall carry out calibration with their own calibration and testing equipments and shall be done under the supervision of BHEL/Customer Engineers.

1.16.1.9 **SCOPE OF COMMISSIONING OF EQUIPMENT ERECTED BY THE MECHANICAL CONTRACTOR.**

All types of Drives

- a- Cable identification, checking and meggering.
- b- IR value of motor, measurement of winding resistance etc.
- c- Dry out all the motors if required to improve IR value.
- d- Checking direction of rotation of motors and testing and commissioning from local as well as remote.
- e- Attending to any defects till the handing over of the unit to customer

SWITCHES

- a) Checking the calibration and servicing if required.
- b) Setting the alarm value
- c) Replacement of defective components if any

LIMIT SWITCHES & LEVEL SWITCHES

- a) Checking the operation
- b) Replacing defective components if required

TEMPERATURE ELEMENTS (MOTORS AND GENERATORS WINDING AND BEARING)

- a) Checking the healthiness
- b) Replacement of defective element (only for bearing)

INSTRUMENTS MOUNTED ON THE EQUIPMENTS/ SKIDS/ PANELS

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Scope of work covers removal, re-calibration, re-fixing, and re-termination of cables, checking the continuity, replacing any defective parts or replacing the total instrument, if required.

NOTE:

The scope of work covered also includes collecting the replacement instruments/parts from BHEL/customer stores, stockyard etc. Separate group shall be identified for commissioning. The above group shall be available right from Trial run to full load operation including shift operation.

1.16.1.10 MATERIALS/CONSUMABLES TO BE ARRANGED BY THE CONTRACTOR FOR ERECTION AND COMMISSIONING OF RESPECTIVE EQUIPMENT/ ITEMS.

The following materials/ consumables shall be arranged by the contractor at his cost for erection and commissioning of items covered in the scope of this tender,

- a. Welding electrodes and gas
- b. Provision for Temporary Scaffoldings.
- c. "U" Clamps with nuts and washers for impulse pipes and GI pipe clamping.
- d. Tag Plates- Al/ Fiberglass/ Stainless Steel
- e. Insulation tape.
- f. Teflon tape for GI pipe coupling.
- g. Paints required for primer coating and final coating of synthetic enamel paint of approved colour, Consumables like thinner, brushes, emery paper etc.
- h. Solder wire (Lead) -(60/40)
- i. Protocol/Calibration report sheets as per BHEL Format.
- j. Fastener for mounting JB, Earthing and local PB Boxes.
- k. Panel/ JB Sealing compound material (for cable entry from bottom/Top of Panel).
- l. PVC cable tie, Aluminium or GI strips and fasteners for clamping of cables and other dressing materials required for cable dressing, grommet
- m. PVC wire marker sleeves and tag plates
- n. Anchor fasteners for wall mounted cable trays & JBs
- o. Ferrules, sleeves for cables
- p. Lugs upto 2.5 sqmm, Solderless crimping type

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.16.1.11 TECHNICAL REQUIREMENTS FOR SUPPLY ITEMS

- 1 CABLE LUGS: (upto 2.5 sq mm size)
 - a) Type: Solderless crimping type
 - b) Material Copper / Aluminium
 - c) Whether tinning required (For copper cable lugs) Yes.
 - d) Thickness of tinning: 10 microns
 - e) Applicable Standard for LT Cables IS:8309
- 2 FERRULES:
 - a) Colour of ferrules: Yellow/White
 - b) Colour of engraving Black
3. TAGS:
 - a) Material: Al/Fiberglass/ Stainless Steel
 - b) Markings: Engraving/Embossing/Printing

1.16.1.12 DOCUMENTATION

1.16.1.12.1 The following information shall be furnished after commencement of works.

- a. Calibration certificates for the Instruments calibrated at site.
- b. Test certificates of various tests conducted at site.
- c. Erection and commissioning protocols signed by customer & BHEL

1.16.1.12.2 As built drawings:

After successful completion, testing and commissioning of installation work, the above listed Purchaser's drawings/documents shall be updated in line with the actual work carried out and as built drawings/documents shall be submitted by the contractor as agreed for the project.

1.16.1.13 ELECTRICAL INSPECTORATE'S APPROVAL:

1.16.1.13.1 Contractor is responsible for getting Electrical Inspector/statutory authority's approval for all electrical installation covered in his scope. This also includes the Electrical equipments that are erected by mechanical contractor for which commissioning assistance is to be provided by the Electrical contractor.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.16.1.13.2 All electrical installation covered in contractor's scope as well as equipments covered in commissioning assistance are to be inspected/approved by the electrical inspector/statutory authority. For getting electrical inspector approval, contractor shall arrange the following:

- a) Work Completion certificate for all the equipment covered in the contract
- b) Details of Equipments (specification)
- c) Test results conducted at site for all the equipments including electrical equipment erected by Mechanical contractor.
- d) Any other documents as required by statutory authority. Any expenditure related to documentation shall be borne by contractor.

1.16.1.13.3 Contractor shall carry out the modifications/rectifications if any as suggested by the authority at his cost. However, it is not applicable for equipment erected by Mechanical contractor.

1.16.1.13.4 Contractor shall also have valid electrical installation license on his company as well as for individuals acceptable to respective state electrical inspectorate requirement.

1.16.1.13.5 The contractor shall arrange necessary statutory inspections and obtain certificate for installation work at his cost. Any Expenditure related to documentation shall be borne by the contractor. Contractor shall pay all fees relates to electrical inspectorate approval. However, BHEL shall reimburse all statutory fees on production of receipts (FEES FOR VISITS, INSPECTION FEES, REGISTRATION FEES and any other statutory fees).

1.16.1.13.6 Any modification work required by inspector shall be attended by the contractor. Modifications which are arising due to execution deficiencies shall be attended at the cost of contractor. Modifications that arise due to design changes shall be treated as extra work.

1.16.1.14 MEASUREMENTS & WASTAGE & CUTTING ALLOWANCES:

1.16.1.14.1 For all payment purposes, measurement shall be made on the basis of the execution of drawings/physical measurements. Physical measurements shall be made by the contractor in the presence of the Engineer.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.16.1.14.2 The measurement for cable, impulse pipes/tubes, GI pipe, conduits, flexible conduits, trays etc. shall be made on the basis of length actually laid.
- 1.16.1.14.3 All the surplus, scrap and serviceable materials, out of the quantity issued to the contractor shall be returned to BHEL in good condition and as directed by the engineer.
- 1.16.1.14.4 All materials returned to stores should carry an aluminium tag indicating the size and type. More than 5 metres length termed as serviceable material and shall be returned size wise and category wise to the owner's stores/yard. Cable of serviceable length being returned to the stores in drums shall have their free ends sealed and the balance lengths on the drum(s) shall be noted and certified by the Engineer-in charge. This shall be applicable only for the purpose of accounting the cables issued for installation.
- 1.16.1.14.5 While carrying out material reconciliation with contractor, all the above points will be taken into account. All serviceable material returned by the contractor shall be deducted from the quantities issued for the respective sizes and categories and the balance quantity(ies) will be taken as the net quantity(ies) issued to the contractor. Material appropriation shall be done and allowable scrap quantity calculated as per wastage allowance specified in General Guide lines. Any scrap/wastage generated by the contractor in excess of the allowable percentage shall be charged at the rates decided by the Engineer whose decision shall be final and binding on the contractor.
- 1.16.1.14.6 For all site-fabricated steel items such as supports, racks, frames, Canopy etc. physical measurement shall be made and then converted to tonnage. For steel material supplied to the contractor, all scrap shall be returned to BHEL stores with due accounting.
- 1.16.1.14.7 Every month the contractor shall submit an account for all the materials issued to him by BHEL in the standard proforma prescribed for this purpose by the site in charge.
- 1.16.1.14.8 The erection contractor shall make every effort to minimize wastage during erection work. In any case, the wastage shall not exceed the following limits;

S NO	Description	Item % Wastage on issued Qty
1	Fabrication steel	2
2	Each size of power cables	1

TECHNICAL CONDITIONS OF CONTRACT (TCC)

3	Each size of control/Inst cables	2
4	Impulse pipe/tubes/ GI pipes/ copper tube	1

1.16.1.14.9 If, however, the bidder quotes for more wastage than specified above, the excess portion will be considered for adjustment during the tender evaluation at the supply rate of material.

1.16.1.14.10 The cable take-off from drums shall be planned strategically such that jointing in the run of cables and wastage are avoided. For this purpose, the exact route length between various equipment/panels as per the cable schedule shall be measured and the route length recorded before laying of the cables. Depending upon the route length the type of cable required for various destinations, the cable drums shall be suitably selected for cable laying. Any jointing which may be approved by the engineer all the cut pieces/bits of cables which are not used/unused shall be returned to the purchaser for accounting towards wastage. The cables damaged by the contractor shall have to be replaced by the contractor at his own cost.

1.16.1.14.11 NOTE:

Salvageable scrap shall mean lengths of pipes, multi-cables, other cables etc., that can be used one time or other at a later date and normally they are recovered from the cut-pieces of tubes, pipes, multicore cables, cables etc.

Non - Salvageable scrap means the lengths of tubes, pipes, multicore cables, cables etc., and they are from cut-pieces of tubes, pipes, multicore cables, cables etc., that cannot be used at all one time or other.

1.16.2 Technical Specification

1.16.2.1 SWITCHGEAR / CONTROL PANELS:

1.16.2.1.1 Erection

The base frames will be supplied normally along with the boards. These will have to be aligned, levelled and grouted in position as per approved drawings. Wherever the base channels are not available, the same will have to be fabricated and painted at site. Base frames shall be grouted on the openings which shall be made on the floor during the time of casting. All necessary concrete chipping and finishing works are to be completed.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.16.2.1.2 All the panels/board shall be placed on its foundation or supporting structures and **shall** be assembled as required. All panels should be installed with parallel, horizontal and vertical alignment by skilled craftsmen.

1.16.2.1.3 All the **boards** will be delivered in sections. Necessary interconnection of busbar, bolting of panels, left out panel / interpanel wiring, etc. will have to be done after assembling the panel.

1.16.2.1.4 THE FOLLOWING POINTS SHALL BE CHECKED UP DURING ERECTION

1. Layout of foundation channels.
2. Floor level covered by the panel with respect to main floor level.
3. Location and serial no. of panels.
4. Positioning of panels.
5. Verticality of switchgear panels within the limit specified.
6. Freeness of Breaker Truck and modules in housing and its manual operation.
7. Earthing of panels and breaker truck to station earth.
8. Lugs for termination of HT and LT cables.
9. Mounting and fixing arrangements of Bus bars.
10. Tightening of Busbar jointing bolts as specified.
11. Clearance between :
 - i. Phase to Phase
 - ii. Phase to earth
12. Minimum clearance for:
 - i. Breaker, Truck and moduls withdrawal
 - ii. Distance required for maintenance work
13. Check the operation of:
 - i. Remote control
 - ii. Various required - closing / tripping / alarm / indications / interlocks
14. Installation position of insts and relays
Operation of relays and meters by secondary injection.
15. AC/DC supplies for panel
Final relay settings as per customer requirements.
16. Tightness of terminal connections for HT & LT connections.
17. Opening operation of breaker, manually and electrically.
18. Working of ammeters and voltmeters for their entire range and other panel mounted instruments like recorder, indicator etc.

1.16.2.1.5 HT SWITCHGEAR TESTS

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1. IR test
2. HV one minute P.F. test checking of oil level
3. Measurement of contact resistance for HT breakers
4. Test to prove inter changeability of similar parts (including breaker module)
5. Testing of relays as per supplier's commissioning manual
6. Testing and calibration of all meters.
7. Operation of all relays by secondary injection method
8. Testing of CT polarities and CT ratio by primary injection test.
9. Measurement of knee point voltage and secondary resistance for CTs used for differential protection.
10. IR and voltage ratio test for PTs
11. Functional test of all circuit components for each panel / feeder.
12. Test to prove closing/tripping operation at minimum and maximum specified voltage in test and service position.
13. Check for drawout test and service position of breakers for all feeders.
14. Check for covering of all openings in the panel - check for continuity and operation of aux. contacts of breaker.
15. HV test on vacuum interrupters (for VCBs)
16. Check for pressure of SF6 gas and air (for SF6).

1.16.2.2 LT SWITCHGEAR PANELS

1.16.2.2.1 Erection

- 1.1 The base frames will be supplied normally along with the boards. These will have to be aligned, levelled and grouted in position as per approved drawings. Wherever the base channels are not available, the same will have to be fabricated and painted at site. Base frames shall be grouted on the openings which shall be made on the floor during the time of casting. All necessary concrete chipping and finishing works are to be completed.
- 1.2 All the panels/board shall be placed on its foundation or supporting structures and shall be assembled as required. All panels should be installed with parallel, horizontal and vertical alignment by skilled craftsmen
- 1.3 All the boards will be delivered in sections. Necessary interconnection of busbar, bolting of panels, left out panel / inter panel wiring, etc. will have to be done after assembling the panel.

1.16.2.2.2 Checks during erection

1. Layout of foundation channels.
2. Floor level covered by the panel with respect to main floor level.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

3. Location and serial no. of panels.
4. Positioning of panels.
5. Verticality of switchgear panels within the limit specified.
6. Freeness of Breaker Truck and modules in housing and its manual operation.
7. Earthing of panels and breaker truck to station earth.
8. Lugs for termination of LT cables.
9. Mounting and fixing arrangements of Bus bars.
10. Tightening of Busbar jointing bolts as specified.
11. Clearance between :
 - i. Phase to Phase
 - ii. Phase to earth
12. Minimum clearance for :
 - i. Breaker, Truck and moduls withdrawal
 - ii. Distance required for maintenance work
13. Check the operation of:
 - i. Remote control
 - ii. Various required - closing / tripping / alarm / indications

/ interlocks
14. Installation position of instruments and relays
Operation of relays and meters by secondary injection.
15. AC/DC supplies for panel
Final relay settings as per customer requirements.
16. Tightness of terminal connections for HT & LT connections.
17. Opening operation of breaker, manually and electrically.
18. Working of ammeters and voltmeters for their entire range and other panel
mounted instruments like recorder, indicator etc.

1.16.2.2.3 LT Switchgear tests

1. IR test
2. Measurement of contact resistance for LT breakers
3. Test to prove inter changeability of similar parts (including breaker module
4. Testing of relays as per supplier's commissioning manual.
5. Testing and calibration of all meters.
6. Operation of all relays by secondary injection method.
7. Testing of CT polarities and CT ratio by primary injection test.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

8. Measurement of kneepoint voltage and secondary resistance for CTs used for differential protection
9. IR and voltage ratio test for PTs
10. Functional test of all circuit components for each panel / feeder
11. Test to prove closing / tripping operation at minimum and maximum specified voltage in test and service position
12. Check for drawout test and service position of breakers for all feeders

Check for covering of all openings in the panel - check for continuity and operation of aux. contacts of breaker.

1.16.2.3 TEST FOR GENERATOR RELAY AND CONTROL PANELS :

A. For generator relay panel :

- (i) Functional checks on all the relays in the panel like pickup and drop of voltage and by doing secondary injection.
- (ii) Loop checking of the relays.
- (iii) Checking of interlock and protection as per schemes by Primary injection.
- (iv) Checking of synchronising circuits.
- (v) Calibration of energy meter

B. For generator and transformer control panel :

- (i) Checking of the control circuits.
- (ii) Calibration of the panel meters.
- (iii) Checking of the total annunciator / indication system.
- (iv) Calibration of energy meters.

1.16.2.4 BATTERY AND BATTERY CHARGER TESTS

1.16.2.4.1 Battery

1. Checking for completion of civil/ventilation requirement of battery room.
 2. Checking of adequacy of charger output/ requirement wrt current required battery charging as per the manual.
 3. Check availability of safety devices, water and first aid kit.
 4. Check polarity of connections between battery and charger
-

TECHNICAL CONDITIONS OF CONTRACT (TCC)

5. Visual inspection test for level and leakage.
6. Checking of layout as per approved drawing.
7. Checking of IR value from positive to earth and negative to earth.
8. Checking of voltage per cell and total voltage between positive negative and earth to positive/negative and also tap cell voltage (as applicable).
9. Checking of tightness of connectors on each cell.
10. Checking of capacity test and hourly measurement of specific gravity and voltage for each cell.

1.16.2.4.2 Battery Charger

1. IR test
2. HV test
3. Checking voltage ratio of boost and float mode transformers
4. Checking for charging mode of batteries, constant current and constant voltage mode.
5. Load test on chargers by running of DC drives and by liquid resistance system.
6. Checking of tightness of earthing connections.
7. Check for all alarm conditions.
8. Checking and calibration of all indicating meters.
9. Check functional operation of charger, auto/ manual changeover from float to boost and boost to float.
10. Checking and setting of all relays.
11. Check AC ripple in boost and float mode after charging.
12. Check polarity of cables connected to battery.

Apart from above following tests also to be carried out.

1. Insulation resistance and earth resistance checks.
2. Primary and secondary injection test.
3. Calibration of all instruments
4. Tests at normal voltage and when required at reduced voltage to prove satisfactory closing and tripping from local and remote points, checking of tripping from relay and protective gear, intertripping, interlocks etc. Reduced voltage test at 70% rated voltage to prove tripping of each circuit breaker.
5. Battery capacity test.

1.16.2.5 Dry type transformers:

- 1.16.2.5.1 These transformers are unloaded and stored at site. Distance of erection point of these transformers from their storage location would be more than 2 Kms. Bidder scope includes arranging adequate capacity of trailer and other arrangements for

TECHNICAL CONDITIONS OF CONTRACT (TCC)

transporting from the storing location and shifting/dragging to the respective transformer foundations.

1.16.2.5.2 Other parts and accessories of the all Transformers are stored in the storage yard. Bidder scope also includes transportation of these items from the storage yard up to the foundation within the quoted rates.

1.16.2.5.3 Bidders to visit site to assess site conditions and locations of Storage yard before quoting. No extra cost shall be paid for shifting of transformer accessories from storage yard irrespective of distance of storage yard.

1.16.2.5.4 Completion of Structural works if any required.

1.16.2.5.5 **INSTALLATION:**

1.16.2.5.5.1 To ensure that a Transformer will function satisfactorily, it is important that handling, lifting, storing and assembling are carried out with great care and cleanliness by experienced personnel who know the various working operations very well.

1.16.2.5.6 **INSPECTION:**

1.16.2.5.6.1 In connection with receiving and unloading at site, and at the final storing place before assembling, the transformers shall be inspected carefully. External visible damages as dents, paint damage etc. may imply that the transformer has been subjected to careless handling during transport and/or re-loading, and a careful investigation is therefore justified.

1.16.2.5.6.2 After the arrival of the material at receiving points, before unloading, the condition of packing and of the visible parts should be checked and possible traces of leaks verified (condenser bushing). If necessary, appropriate statements and claims should be made.

1.16.2.5.6.3 Drums containing oil which have separately dispatched should be examined carefully for leaks or any sign of tampering. All dispatched drums are filled up to their capacity and any shortage should be reported.

1.16.2.5.6.4 Check immediately the gas pressure at the arrival. A positive indicates that the tank and the transformer components respectively are tight, and that the active part including the insulation materials is dry

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.16.2.5.6.5 If there is no positive gas-pressure, transformer should be immediately filled with dry Nitrogen gas at a pressure of 0.17 kg/cm² (2.5 psi) without loss of time.

1.16.2.5.6.6 Otherwise, it should be checked if the core isolation is satisfactory and that accessories packed separately have not been damaged during transportation

1.16.2.5.7 UNLOADING:

1.16.2.5.7.1 Whenever rollers/trolleys are supplied with transformer, movement of transformer at site is carried out by mounting these rollers / trolleys.

1.16.2.5.7.2 Alternatively for movement of transformer from loading bay to actual site of the equipment, skidding on greased rails etc can also be resorted to.

1.16.2.5.8 STORING:

1.16.2.5.8.1 Dismantled equipment and components are packed to be protected against normal handling and transport stresses. The instructions for lifting given on the packages, must be complied with to avoid damages.

1.16.2.5.8.2 Goods stored outdoors must not be placed directly on the ground, and should be covered carefully with tarpaulin or similar materials.

1.16.2.5.8.3 Oil drum should be stored in horizontal (lying) position with both the bungs also in horizontal position.

1.16.2.5.9 LIFTING:

1.16.2.5.9.1 Lifting devices on the transformer tank are dimensioned for lifting of the complete transformer filled with oil. The positioning of the lifting devices, permissible lifting angles, minimum height to crane hook and transformer weight, appear from the OGA drawings. Check at lifting of complete transformer that the lifting wires/ropes are not in contact with bushing or other components on the cover.

1.16.2.5.9.2 For lifting with hydraulic jacks, the transformer is provided with jacking pads dimensioned for lifting of complete transformer filled with oil. The position of the pads appear on the OGA drawings.

1.16.2.5.10 CHECK POINTS BEFORE STARTING AND DURING ERECTION:

1.16.2.5.10.1 Check points before starting erection.

1.16.2.5.10.2 Conditions of leads

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.16.2.5.10.3 Bracing, clamping of leads
- 1.16.2.5.10.4 Connections
- 1.16.2.5.10.5 Tap changer checks
- 1.16.2.5.10.6 General conditions of insulation
- 1.16.2.5.10.7 Core check that it has not moved in transit.
- 1.16.2.5.10.8 Core-ground; this is checked with the megger after removing earth connection
- 1.16.2.5.10.9 CTs, including the secondary leads and their passage through metal parts
- 1.16.2.5.10.10 Check that shipping frame for bushings have been removed.
- 1.16.2.5.10.11 Check that coil position has not moved in transit
- 1.16.2.5.10.12 Check for dirt, metal swarf, moisture
- 1.16.2.5.10.13 Check that the bushing leads set without being too close to ground or other points of different potential.
- 1.16.2.5.11 b. Check-points during erection:
 - 1.16.2.5.11.1 By means of the part list and the transformer / reactor OGA, the assembling of a fully completed transformer is carried out according to the following instructions.
 - 1.16.2.5.11.2 The following precautions are to be taken:
 - 1.16.2.5.11.3 Fire-fighting equipment shall be available at the oil-treatment equipment as well as at work on and adjacent to the transformer.
 - 1.16.2.5.11.4 Welding work on or adjacent to the transformer shall be avoided, but if this is not possible, the work shall be supervised by fireprotection personnel.
 - 1.16.2.5.11.5 Smoking on or near the transformer shall not be allowed.
 - 1.16.2.5.11.6 Transformer tank, control cabinet etc, as well as assembling and oil-treatment equipment shall be connected with the permanent earthing system of the station
 - 1.16.2.5.11.7 Check that there is no overpressure in the transformer when blanking plates or connection lids are to be opened.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.16.2.5.11.8 All loose objects, tools, screws, nuts etc. shall be removed from the transformer cover before opening the connection and blanking lids.
- 1.16.2.5.11.9 All loose objects (tools, pencils, spectacles etc.) shall be removed from the boiler- suit pockets etc. before starting the work through man-holes.
- 1.16.2.5.11.10 Tools to be used inside the transformer e.g. for tightening of screws-joint-shall be fastened to the wrist or another fixed point by means of cotton tape or string.
- 1.16.2.5.11.11 Tools with loose sleeves and tools with catches must not be used at work inside the transformer.
- 1.16.2.5.11.12 Greatest possible cleanliness shall be observed at work inside the transformer, and at handling of part to be mounted inside the transformer.
- 1.16.2.5.11.13 Fibrous cleaning materials should not be used as it can deteriorate oil when mixed with it.
- 1.16.2.5.11.14 All components dispatched separately should be cleaned inside and outside before being fitted.
- 1.16.2.5.11.15 A Transformer is best protected for damp hazard by circulating warm, dry, de-aerated oil through it until its temperature is 5° C to 10° C above ambient. This should be done before allowing external excess to the interior of the tank. The warm oil should be circulated all the time transformer is open to atmosphere.
- 1.16.2.5.11.16 Oil pump & all joints in the oil pipe work should be air tight to avoid entrance of air through leakage joints.
- 1.16.2.5.11.17 The active part (core and winding) should be exposed to the surrounding air as short time as possible. Open therefore only one blanking plate or connection lid at a time for remounting of bushing, valves etc.
- 1.16.2.5.11.18 Objects which-despite all precaution are dropped inside transformer / reator, must absolutely be brought up from the equipment.
- 1.16.2.5.11.19 Check that the oxygen content inside the transformer tank is minimum 20% if a person is to enter the tank.
- 1.16.2.5.12 ASSEMBLY: Assembly of wheels Bushing Valves, cooling device, Oil conservator, Pilol Flanges, Blanking plates and accessories like cooling fans, pumps, OLTC and components for supervision and control oil level indicator, flow indicators,

TECHNICAL CONDITIONS OF CONTRACT (TCC)

gauges, Buchholz relay, PRV, thermometers etc. are assembled according to leaflet / description valid for the components.

1.16.2.5.13 COMMISSIONING: Testing after Assembly of the Transformer After the transformer has been assembled at site, it shall be tested in order to check that it has not been damaged during transport and assembly to such an extent that its future operation will be at risk. Regarding the performance of the test, refer to the testing method as per standards. The results of the test shall be documented.

1.16.2.6 TESTS FOR EQUIPMENT ERECTED BY MECHANICAL CONTRACTOR

The tests to be carried out on the equipment at which are normally being erected by Mechanical contractor.

a) **Generator :**

Generator set with all auxiliaries and controls shall be assembled and tested to verify compliance with the guaranteed technical particulars and for satisfactory performance. Relevant standards shall be followed as guideline for testing. All the tests shall be witnessed by customer or its representative. The commissioning tests shall be carried out at site under normal service conditions.

Following tests shall be carried out on the generators:

1. Insulation resistance test and determination of polarization index value of:
 - Generator
 - Exciter
 - Resistance temperature detectors
2. Dielectric test
3. No load characteristics
4. Short circuit characteristics
5. Temperature rise at rated voltage, current, power factor and frequency.
6. Over-speed test
7. Vibration tests*
8. Calculation of efficiency
9. Phase sequence / voltage balance / current balance checks.
10. Insulation of bearing pedestal/ housing.
11. Determination of reactance and time constants.
12. Waveform test and harmonic analysis (Type test results are acceptable).
13. Determination of moment of inertia (Type test results are acceptable).

Note :

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- a) Vibration tests in the factory to be taken at 100% of synchronous speed and at 120% during over-speed test.
 - b) Vibration test at site to be taken at 100% of synchronous speed of the complete generator with its driver.
- 14. Instantaneous short circuit test (Optional).
 - 15. Noise measurement test.
 - 16. Response of voltage and frequency with sudden shedding of 25%, 50%, 75% and 100% of rated load respectively.
 - 17. Temperature detector test.
 - 18. Measurement of DC resistance of winding.
 - 19. Inter turn insulation test of stator winding with induced voltage 130% of rated value for 5 minutes (if applicable).
 - 20. Measurement of shaft voltage.
 - 21. Tan Delta test for generator bushing (If required).

b) AC Motors

- 1. IR test of stator and rotor windings.
- 2. Heating of both windings up to the permissible temp.
- 3. Checking/testing of associated switchboard, cables, relays / meter interlocking as mentioned in relevant chapters are completed.
- 4. Tightness of cable connection.
- 5. Winding resistance measurement of stator and rotor.
- 6. Checking continuity of winding.
- 7. Checking tightness of earth connections.
- 8. Checking space heaters and carryout heating of winding (if required).
- 9. Checking direction of rotation in decoupled condition during kick start.
- 10. Measure no load current for all phases.
- 11. Measurement of temperature of body during no load and load conditions.
- 12. Check for tripping of motor from local/remote switches and from.
- 13. Checking of vibration (if required).
- 14. Checking of noise level (if required).
- 15. Measurement of stator and bearing temperatures during load running (if applicable) for every half an hour interval till saturation comes.
- 16. Checking tightness of foundation bolts.
- 17. Checking operation of speed switch (if there).
- 18. Check continuity of temperature detectors.
- 19. Check alignment, paralleling of shafts, level of lubricating oil etc. as per manufacturer's manual.
- 20. Check contact of slip ring brush and measure brush pressure (150-200 gm/sq. cm).

TECHNICAL CONDITIONS OF CONTRACT (TCC)

21. For CACW drive check cooling water and system/piping, availability of pressure, cleaning and pressure testing of pipelines etc.
22. Checking of polarisation index of stator winding, R10/R1 by motorised megger (The value should not be less than 2.0) R60/10 absorption coefficient shall not be less than 1.5.
23. Dielectric test (only for HT Motors).
24. Measurement of open circuit rotor winding voltage for slip ring motor.
25. For actuator drives, following shall be checked/ tested:
 - Visual and dimensional
 - Hydraulic pressure for valves
 - IR and operation of limit switches
 - Winding resistance

c) DC Motors

1. IR measurement and heating the winding as per heating curve.
2. Check for earth connection
3. Winding resistance for field and armature.
4. Check running of drive at minimum and maximum specified.
5. Check auto start of drive on failure of AC supply (if applicable)
6. Check operation of overload relay.
7. Measure vibration.
8. Check temperature rise on body of drive after required period of continuous running.
9. Measure load currents and no load currents (if possible)
10. Check direction of rotation.
11. Check continuity of winding.
12. Measurement of RPM.

1.16.2.7 GENERAL TECHNICAL REQUIREMENTS AND GUIDE LINES FOR INSTALLATION, TESTING & COMMISSIONING OF C&I SYSTEMS

1.16.2.7.1 Guidelines for Installation of C & I Equipments

- Instruments location shall be decided to the convenience of operation and maintenance. The location shall have least mechanical vibration and placed where corrosive, toxic and explosive gases and dust particles will not deposit and the place is not subject to high-temperature atmosphere or radiation. However, actual location shall be decided in consultation with customer/consultant.
- Maintenance platforms & approach facilities shall be provided for all sensing & primary devices wherever possible. Instruments shall be located in weatherproof

TECHNICAL CONDITIONS OF CONTRACT (TCC)

enclosures and wherever required suitable canopy shall be provided.

- High & Low pressure impulse lines shall not be grouped and run together. Also impulse lines for explosive & inert gases shall not run together.
- Impulse lines of high pressure steam, harmful gases, etc. shall not be brought into the control room, as far as possible.
- Intrinsically safe circuits shall be used for explosion hazardous areas.
- Separate cable routing shall be followed for high and low voltage lines.
- All electrical equipments shall meet the requirements of Indian Electricity Rules.
- Wherever severe vibrations are expected, shock absorbers shall be provided.
- Installation of instruments with radioactive isotopes, mercury and other toxic substances shall be as per statutory regulations provided by authorities.
- Compensating cables should be connected directly to instruments, i.e. no junction boxes shall be used if CJCBs are not provided.
- Orifice plates or flow nozzles must be provided with at least 10D upstream and 5D downstream straight length of pipe from bends tees, branch pipes & control valves.
- Pressure gauges shall be provided with snubbers, syphons (for more than 100°C), 3 way valve manifolds wherever applicable.
- For pneumatic instruments, air shall be dry & free from oil. Air must be supplied from oil-free compressors specially erected for this purpose. After drying, air must be stored in receiver. Pressure gauges must be provided on each supply line and after the pressure reducer.
- Correct level (height) between detecting element and tapping point and transmitter shall be maintained.
- The equipment shall maintain its normal posture (level, perpendicular, front and back).
- Connection between detecting element/tapping point and transmitter shall be maintained at short distances wherever practicable to avoid any time lag.
- Orifice plates and control valves shall be mounted on process piping, only after completion of cleaning of the process piping in order that these instruments may not suffer damage from metal waste, etc.
- For details of installing each measuring instruments, instruction manual issued by the

TECHNICAL CONDITIONS OF CONTRACT (TCC)

respective manufacturer of instruments may be referred to, wherever necessary.

- The drain pipes shall be terminated in a common closed header and finally the common header shall be connected to plant open drain.

1.16.2.7.2 GUIDELINES FOR CABLE LAYING

- In the plant building, substations, switchgear rooms, control rooms etc. Power and control cables shall generally be laid on cable trays installed in concrete trenches, tunnels, cable basements, cable vaults, cable shafts or along building and structures as the case may be.
- In case of multi-core cables of diameter up to 20 mm where not more than 3 cables are taken in one run, these can be taken directly along structures, walkways, platforms, galleries, walls, ceiling etc. by proper clamping at regular intervals of more than 300 mm.
- Power & control cables installed along buildings and structures, ceilings, walls, etc. which are required to be protected against mechanical damage shall be taken in G.I. conduits.
- GI conduits shall also be used for flameproof installations, wherever required, with sealing at both ends
- In corrosive atmosphere, where 1100 V grade cables are required to be taken in pipes, rigid heavy duty PVC pipes shall be provided.
- Entry of cables through trenches/tunnels into buildings shall be by means of one of the methods indicated in drawing as applicable for different buildings.
- Cables laid exposed in racks/trays and routed through trenches/tunnels/basements etc. to individual drive/control devices etc. shall be taken in embedded surface exposed rigid GI conduits and or flexible conduits unless directly terminated to the equipment in the panels located, above trenches, tunnels or basement.
- All cables routed along walls or in equipment rooms shall be protected by means of laying them through GI pipes or by providing sheet metal covers up to a height of 2000 mm from the working floor levels and platforms, for protection against mechanical damage. All vertical risers shall be of enclosed type.
- Tray covers shall not be provided for the cable trays within trenches, tunnels and basements. Non-perforated type sheet steel covers shall be provided for the trays in the areas susceptible to accumulation of coal dust/atmospheric abuses etc.
- Cable trays shall be supported on ISA 50x50x6mm MS/GI brackets. Brackets shall

TECHNICAL CONDITIONS OF CONTRACT (TCC)

be welded to steel plate inserts in the trenches / tunnels or supporting channel angle / inserts in other areas.

- Wherever direct heat radiation exists, heat isolating barriers (subject to customers approval), for cabling system shall be adopted.
- For 415V power wiring in ancillary buildings, offices and laboratories, cables shall be taken through embedded/exposed GI conduits or rigid PVC pipes as applicable.
- If required, a few numbers of cables in exceptional areas may be directly buried into the earth.
- Wherever cables are to be laid below roads and railway tracks, the same shall be taken through ducts buried at a suitable depth as decided by Engineers.
- At certain places where hazardous fumes / gases may cause fire to the cables, cable trenches after installation of cables may be sand-filled.
- In corrosive atmosphere, PVC conduits shall be used for cables.
- Single core cables, when pulled individually shall be taken through PVC pipes only.
- Laying and installation of power, control and special cables shall generally conform to IS : 1255
- The cables shall be laid-out in proper direction from the cable drums (opposite to the normal direction of rotation for transportation).
- In case of higher size cables, the laid out cables shall run over rollers placed at close intervals and finally transferred carefully on the racks/trays. Care shall be taken so that kinks and twists or any mechanical damage does not occur to cables. Only approved cable pulling grips or other devices shall be used. Under no circumstances cables shall be dragged on ground or along structure while paying out from cable drums, carrying to site and straightening for laying purpose.
- Suitable extra length of cables shall be provided for all feeders for any future contingency, in consultation with Engineer.
- Cable runs shall be uniformly spaced, properly supported and protected in an approved manner. All bends in runs shall be well defined and made with due consideration to avoid sharp bending and kinking of cable. The bending radius of various types of cables shall not be less than those specified by cable manufacturers and that specified in IS 1255.
- All cables shall be provided with identification tags indicating the cable numbers in accordance with the cable circuit schedule. Tags shall be fixed at both ends of cables (both inside & outside of panel) both sides of floor/wall crossings, every 25m

TECHNICAL CONDITIONS OF CONTRACT (TCC)

spacing for straight runs or as specified by Engineer for easy identification of cable.

- When a cable passes through a wall, cable number tags shall be fixed on both sides of the wall.
- Single core cables for AC Circuits shall form a complete circuit in trefoil formation supported by means of trefoil clamps of non-magnetic material.
- Multi-core cables above 1100 V grade shall be generally laid in ladder type trays in one layer with spacing not less than one cable diameter of bigger diameter cable.
- All 1100 V grade multicore power cables and single core DC cables shall be placed in single layer, touching each other and clamped by means of single or multiple galvanised MS saddles / aluminium strips / nylon cable ties. Cables above 35mm diameter shall be clamped individually.
- Control cables shall be laid touching each other and wherever required may be taken in two layers. All control cables shall be clamped with a common clamp/tie.
- Segregation of the cables on the basis of their types and their functions shall be as under for horizontal formation:
 - HT cables shall be laid in the top tier(s)
 - LT power cables to be laid in the tray(s) below the HT cable trays.
 - LT control cables to be laid in the Tray(s) next below to the LT power cable (trays)
 - Special control cables including screened control cables to be laid in the bottom most tray(s).
- For vertical formations, the trays closest to the wall shall be considered as bottom most tray and the order indicated in clause just above shall be followed. However, where there is no clear distinction of bottom / top trays, the order convenient for linking the horizontal and vertical formations shall be followed.
- When it may not be possible to accommodate the cables as per the criteria indicated in the two clauses 29 & 30 indicated above, the following rules shall override the criteria. However, prior approval of the Engineer will be required. In hierarchical order:
 - Control cables are mixed up with the special control cables with clear minimum gap of 100 mm between them.
 - LT power cables are mixed up with control cable with clear minimum gap of 150 mm between them.
 - LT power cables are mixed up with HT power cables with clear minimum gap of 200 mm between them.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- LT power cables are mixed up with special control cables with clear minimum gap of 200 mm between them.
- In case of duplicate feeders to essential loads, the respective cables shall be laid through separate raceways. Alternatively, such cables shall be laid on the opposite sides of a trench / tunnel / basement.
- For laying cables along building steel structures and technological structures, the cables shall be taken by clamping with MS saddles screwed to the MS flats welded to the structure. MS saddles and flats shall be galvanized.
- For laying cables along concrete walls, ceilings etc. The cables shall be taken by clamping with MS saddles screwed to the MS flats welded on the inserts. Where inserts are not available the saddles shall be directly fixed to the walls using raw plus and MS flat spacers of minimum 6 mm thickness.
- To facilitate pulling of cables in GI conduits, powdered soft stone, plastic scoop or other dry inert lubricant may be used but grease or other material harmful to the cable sheaths shall not be used.
- No single core cable shall pass through a GI conduit or duct except DC single core cables. AC single core cables shall pass through GT conduits/pipes in trefoil formation only.
- In case of a 3 phase, 4 wire system, more than one single phase circuit, unless originating from the same phase shall not be taken in the same GI conduit.
- Entry of cables from underground trenches to the buildings or tunnels shall be by some approved method. Necessary precautions shall be taken to make the entry point fully water tight by properly sealing the pipe sleeves wherever they enter directly into the building at trench level. The sealing shall be by cold setting compound. Any alternative sealing arrangement may be suggested with the offer for consideration by BHEL.
- Wherever specific cable routes are not shown in cable schedules cables shall be laid as directed by Engineer.

● **Support Spacing & Clamping**

Support spacing and clamping suitably provided and as required

● **Laying of cables directly buried in ground**

Laying and installation of directly buried cables in ground shall conform to the requirements of IS 1255.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Installation of cabling work shall comply with the following Indian Standards (Latest editions):

- IS 1255 Code of practice for installation and maintenance of power cables up to and including 33 KV rating.
- IS 732 Electrical wiring installation(system voltage not exceeding 650 V).
- IS 5216 Guide for safety procedures and practices in electrical works.
- IS 226 Structural steel (Standard quality)
- IS 800 Code of practice for use of structural steel.
- IS 316 Code of practice for use of metal arc welding for general construction in mild steel.
- IS 1363 Hexagonal bolts, nuts and screws.
- IS 1572 Electroplated coatings of cadmium on iron and steel.
- IS 2629 Code of practice for hot dip galvanising for iron and steel.
- IS 2633 Method of testing uniformity of coating on zinc coated articles.

In addition to the standards mentioned above, all works shall conform to the requirements of the following rules and regulations.

- a) Indian Electricity Act and Rules framed thereunder.
- b) Fire insurance regulations.
- c) Regulations laid down by the Chief Electrical Inspector of State and CEA.
- d) Regulations laid down by the Factory Inspector of State.
- e) Any other regulations laid down by the authorities.

In case any clause of contradictory nature arises between standards and this specification, the latter shall prevail.

1.16.4 GUIDELINES FOR ERECTION OF Cable Trays, GI PIPES, Supports & Accessories

- 1.16.4.1 Constructional details and supporting arrangement for the cable trays shall be as shown in the drawings which will be handed over to the successful bidder. All cable trays, vertical raceways and supporting steel work shall be installed along the routes as indicated in the drawings and as per the instructions of the Engineer-in-charge. The contractor has to fabricate and install complete tray supporting structures as per the drawing/site requirement.
- 1.16.4.2 Wherever specified or directed by Engineer, the contractor shall install galvanized MS sheets covers over cable trays. The width of the covers shall be same as that of cable trays. Bolting shall be done to fasten covers to the cable trays, elbows, reducers, tees, crosses etc.
- 1.16.4.3 The contractor shall install all angles, channels, beams, hangers, brackets, clamps etc. as may be necessary to suit the actual site conditions to support the cable trays.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.16.4.4 Straight pieces of standard MS angles/channels shall be used for fabrication of supports/racks. All welded joints shall be smooth enough to provide a good appearance and shall not cause injury to working personnel.
- 1.16.4.5 Cable trays within cable trenches, tunnels and basements shall be of ladder type. Bottom most tray within plant buildings for overhead runs of trays shall be of perforated type. Cable trays in the areas exposed to coal dust shall be installed in vertical formation. Wherever due to layout constraints, it is not possible to install the trays in vertical formation with Engineer's prior permission installing the trays in horizontal formation may be considered.
- 1.16.4.6 Cable trays/racks shall be so arranged that they do not obstruct or impair clearances of passage way or maintenance of adjacent equipment.
- 1.16.4.7 For installation of cables in GI conduits the conduits shall be installed first without cables but having suitable pull wires laid in conduits.
- 1.16.4.8 For equipment and devices having GI conduit entry arrangement other than standard GI conduit adopter, adopters shall be provided as required to enable the GI conduit to be properly terminated, between conduit end and motor T.B.
- 1.16.4.9 GI conduits shall run without moisture or water traps and shall be made drawing arrangement towards the end.
- 1.16.4.10 The entire GI conduit system shall be firmly fastened in position. All boxes and fittings shall generally be secured independently from the GI pipes entering them.
- 1.16.4.11 Bends of GI pipes/conduits shall be made without causing damage to the pipes/conduits.
- 1.16.4.12 Occupancy of conduits shall not be greater than 40%.
- 1.16.4.13 The adopter for coupling rigid GI pipe/conduits and flexible conduit shall be of aluminium or galvanized steel.
- 1.16.4.14 Transportation and storage of cable drums
- 1.16.4.15 Transportation and storage of cable drums shall generally conform to the requirements of IS : 1255
- 1.16.4.16 All the cables shall be supplied to the contractor free of cost from BHEL/Customer's store/storage area. Transportation of cables from storage area to the work site shall be the responsibility of the contractor.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.16.4.17 The cable drums shall be transported on wheels to the place of work.

1.16.5 GUIDELINES FOR Cable Termination and Jointing

1.16.5.1 Contractor shall carry out cable terminations at various electrical and electronic equipment terminals.

1.16.5.2 When the equipment are provided with undrilled gland plates for cable/conduit entry into the equipment, drilling and cutting on the gland plate and any minor modification work required to complete the job shall be carried out at site and drawings shall be prepared and take engineer's approval before drilling holes. cutting shall not be allowed.

1.16.5.3 Termination of cables shall be done as per termination drawings & interconnection diagrams furnished to the contractor. Looping of cores/wires at terminals as shown in interconnection diagrams is to be done by the column at no extra cost as part of the termination.

1.16.5.4 All cable entries in the equipment shall be sealed after glanding the cables..

1.16.5.5 Adequate length of cables shall be pulled inside the switch boards, control panels, terminal boxes etc. as per near termination of each core/conductor.

1.16.5.6 Power cable terminations shall be carried out in such a manner as to avoid strain on the terminals by providing suitable clamps near the terminals.

1.16.5.7 Control cable cores entering switchboard or control panels shall be neatly bunched and strapped with PVC perforated tapes/nylon ties and suitably supported to keep them in position at the terminal block. All spare cores shall be connected to spare terminals wherever possible. If spare terminals are not available, spare cores shall be neatly dressed and suitably taped at both ends.

1.16.5.8 Screened control cables of 0.5 sq. mm cross-sectional area shall be terminated by means of wire rapping system.

1.16.5.9 Individual cores of control cables shall have ferrules for identification. Ferrule numbers shall be provided as per the control schemes and other related documents supplied.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.16.5.10 End sealing/termination of cables shall be done by means specified on the specification for terminations. The system shall be suitable for types of cable specified and complete with stress relief system.
- 1.16.5.11 Termination and jointing of aluminium/copper conductor power cables shall be done by means of compression method using compression type aluminium / tinned copper lugs.
- 1.16.5.12 Copper conductor control cables shall be terminated directly into screwed type terminals provided in the equipment. Wherever control cables are to be terminated by means of terminal lugs, the same shall be of tinned copper compression type.
- 1.16.5.13 Cable joints shall normally be made at an intermediate point in the straight run of the cable only when the length of the run is more than the standard drum length supplied by the cable manufacturer. In such cases, when jointing is unavoidable, the same shall be made by means of specified cable-jointing kit, subject to BHEL's approval of Engineer shall be taken for deciding location of joint.
- 1.16.5.14 Junction boxes shall be used, wherever required, for jointing of control cables.
- 1.16.5.15 Termination and jointing shall generally conform to the requirements of IS : 1255 and shall strictly conform to the recommendations of termination and jointing kit supplier.

1.16.6 **Design Requirements of Items supplied for cabling installation work** (if supply is covered in contractor scope).

1.16.6.1 **Strip Cable Clamps**

- a) Strip Clamps shall be of aluminium alloy or cast steel or M.S. and shall be used to fasten the group of multicore cables on the tray.
- b) Clamps shall be of simple construction, made of 4 mm thick, 25 mm wide strip to cover the entire width up to 300 wide tray and part of the tray for more than 300 wide trays. Strip shall have two right angle bends for fixing on the rung with two bolts.
- c) Clamps shall be of different lengths for different sizes of tray width. The maximum size of clamp width shall be 300 mm and for cable trays of greater width, two clamps shall be used.

1.16.6.2 **Self-Locking Clamps**

- a) Clamps shall be of nylon material/fibre glass.
- b) Clamps shall have self-locking feature when the cord is looped.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- c) Clamps shall be provided with manual lock release.
- d) Clamp cord shall not move in the backward position once it has been locked, unless the lock release is applied.
- e) Type test certificates to ascertain the strength of clamps shall be submitted for purchaser's approval.
- f) Nylon self-locking clamps shall be of BHEL approved make only.

1.16.6.3 Ferrules

- a) Ferrules shall be required for individual core of cable hence they shall be suitable for the insulated conductor diameter.
- b) Ferrules shall be of plastic material.
- c) Numbering on the ferrules shall be engraved type with contrast colour to the base. Engrave colouring shall be of durable quality to match the entire life of the plant. Engraving shall be legible from a distance of 600 mm.
- d) Ferrules shall be interlocking type in such a way that the interlocked ferrules take the shape of tube with complete ferrule number appearing in a straight line.

1.16.6.4 Tags

- a) Cables shall be provided with cable number tags for identification.
- b) Cable tags shall be of durable fiber, aluminum, stainless steel sheets or lead of suitable thickness
- c) Cable number shall be engraved type in case of aluminium or stainless steel tags, and printed type in case of fibre sheet.
- d) Tags shall be durable quality of size 60mm x 12mm with holes at both ends.
- e) Samples of tags shall be approved by BHEL Engineer before delivery.
- f) Tags shall be provided with non-corrosive wire of sufficient strength for taggings.

1.16.7 GUIDELINES FOR EARTHING Installation

- 1.16.7.1 All equipments shall be earthed by two separate and distinct connections. Earthing terminals will be available in all the equipment supplied by BHEL.
- 1.16.7.2 The earthing conductors shall be mild steel/G.I. strips/wires. All connections from the equipments to the main earthing conductors shall be made as illustrated in earthing drawings. A copy of earthing drawing shall be provided to the successful tenderer.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.16.7.3 A continuous earthing conductor shall be installed in all cables trays and securely clamped to each tray section by suitable connectors to form a continuous earthing system. When two or more trays supporting power cables run on parallel a continuous earthing conductors shall be provided on one tray only with tap offs to the control cable trays. All valve and damper motor and rapping motors will be earthed to this conductor.
- 1.16.7.4 All joints in the earthing system shall be welded type. Earthing connections to all equipment including motors shall be bolted type.
- 1.16.7.5 Earthing connections shall be free from tinning scale, paint, grease, rust or dirt at the time of making joint.
- 1.16.7.6 Metallic sheaths, screens/shields and armour of all multicore cables shall be bonded and earthed.
- 1.16.7.7 Earthing conductors along with their run on columns, beams, walls etc., shall be supported by suitable cleats at intervals of 750 mm.
- 1.16.7.8 Conduits shall be bonded together and grounded at all switchgear and control centres.
- 1.16.7.9 M.S. Earthing conductors shall be coated with one coat of bituminous paint, wrapped with a layer of bitumen tape and finally coated with bitumen paint. For site welded GI strips/wires required coat of aluminium paint should be given.
- 1.16.7.10 If the equipment is not available at the time of earthing conductor laying tap connections from the main earthing conductor shall be brought out up to slab equipment foundation level with at least 200 mm spare length left for further connections to equipment earthing terminals.

1.16.8 Guidelines for Erection of Control Panels and Distribution Boards Erection

- 1.16.8.1 The base frames will be supplied normally along with the boards. These will have to be aligned, levelled and grouted in position as per approved drawings. Wherever the base channels are not available, the same will have to be fabricated and painted at site. Base channels will have to be grouted. Suitable concrete drilling machine shall be used for making hole on the concrete floor.
- 1.16.8.2 For the panels which are to be mounted on the trenches, channel supports have to be provided across the cable trenches over which the base frames of the panels shall be

TECHNICAL CONDITIONS OF CONTRACT (TCC)

mounted. Fabrication and erection of these support structures shall be carried out as per drawings.

1.16.8.3 All the panels/board shall be placed on its foundation or supporting structures and shall be assembled equipment as required. All equipment should be installed with parallel, horizontal and vertical alignment by skilled craftsmen.

1.16.8.4 All the boards will be delivered in sections. Necessary interconnection of busbar, bolting of panels, left out panel/interpanel wiring, etc. will have to be done after assembling the panel.

1.16.8.5 **The following points shall be checked up during erection**

- a) Layout of foundation channels.
- b) Floor level covered by the panel with respect to main floor level.
- c) Location and serial no. panels.
- d) Positioning of panels.
- e) Verticality of panels and breaker truck to station earth.
- f) Earthing of panels and breaker truck to station earth.
- g) Lugs for termination of HT and LT cables.
- h) Mounting and fixing arrangements all modules.
- i) Check the operation of:
 - i. Remote control
 - ii. Various required - closing / tripping / alarm / indications / interlocks Installation position of instruments and relays Operation of relays and instruments.
- j) AC / DC supplies for panel.
- k) Tightness of terminal connections for HT & LT connections.
- l) Working of ammeters and voltmeters for their entire range and other panel mounted instruments like recorder, indicator etc.

1.16.8.6 **415 V switchgear and Electrical panels tests(as applicable)**

- a) IR Test on each pole of breaker
- b) IR test on control circuit
- c) Measurement of contact resistance for all three phases of breaker
- d) Measurement of resistance of the closing and tripping coil of breaker
- e) Checking the close trip operation at 70% and 100% of the rated auxiliary D.C. Voltage.
- f) Checking of interlocks provided and tripping of breaker through relays
- g) Space heater operation check
- h) Opening and closing time check
- i) Control and metering circuit checks.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- j) Primary and secondary injection tests.
- k) Thermal overload relay testing and checking
- l) Calibration of all instruments and meters
- m) Phase rotation checks
- n) High voltage test on 7C.1.3KV switchboard

1.16.8.7 Cutting & Wastage Allowance

The following scrap allowances are permissible:

	non- salvageable	unaccountable
1. Length below 0.5 M steel pipes, SS/Cu tubes, Single pair cables	2%	0.5%
2. Length below 20m multi cable, multitubes	2%	0.5%

1.16.9 Guidelines for landing and storage of Electronic Cubicles/sub- assemblies / loose items.

1.16.9.1 Immediately after unloading at site, the electronic equipment should be kept in the covered area. Handling and lifting of the package should be done without jerks or impacts. Packing case should not be dripped or slid along the floor under any circumstances. Suitable forklift should be used to move the case to its final position. All the above points are to be strictly followed as the electronic equipments cannot withstand any stress due to vibration and shock.

1.16.9.2 After unloading at site, the package of the equipment shall be inspected for external damage. In case the package is damaged, the package number and details of the damage should be noted. The details of the damage should be reported to the responsible site Engineer.

1.16.9.3 Cases should be opened/unpacked using correct nail pullers. While opening the planks, care should be taken to see that the equipment is not damaged. Cases should not be unpacked in areas where they are exposed to rain water/liquid splashing, dust or other harmful materials like chlorine gas, sulphur dioxide etc.

1.16.9.4 After opening the case, all supports provided for transport are to be removed with due care.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.16.9.5 Hinged frames should not be opened when equipment is not secured to the floor as this is likely to cause it to topple over. The hinged frame can be opened only if the equipment is still fixed on to the bottom wooden pallet.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

VOLUME-IA PART-II CHAPTER 1

CORRECTIONS / REVISIONS IN SPECIAL CONDITIONS OF CONTRACT, GENERAL CONDITIONS OF CONTRACT AND FORMS & PROCEDURES

A. Following Clauses from S. No.1 & S.No. 3 are modified in the General Conditions of Contract (GCC):

Sl. No.: 01

Following Clauses in General Conditions of Contract (GCC) are modified/ revised/ added:

S.No	GCC Clause Reference	Modification / Revision / Addition in GCC Clause
1.1	GCC Clause 1.9.1, Sl. No. (ii)	The following mode of deposit, Sl. No. (e) is added: e) Insurance Surety Bonds
1.2.	GCC Clause 1.10.3, Sl. No. (vi)	The following Clause, Sl. No. (vi) is deleted: Security deposit can also be recovered at the rate of 10% of the gross amount progressively from each of the running bills of the contractor till the total amount of the required security deposit is collected. However, in such cases at least 50% of the required Security Deposit, including the EMD, should be deposited in any form as prescribed before start of the work and the balance 50% may be recovered from the running bills as described above
1.3.	GCC Clause 1.10.3, Sl.No.(vii)	The following mode of deposit, Sl. No. (vii) is added: e) Insurance Surety Bonds
1.4.	Note mentioned under the GCC Clause 1.10.3	Note mentioned under GCC Clause 1.10.3 is revised as below: Note: (1) BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith. (2) In case of delay in submission of security deposit, enhanced security deposit which would include interest (Repo rate +4%) for the delayed period, shall be submitted by the bidder.
1.5.	GCC Clause 1.10.8	GCC Clause 1.10.8 is revised as below: Bidder agrees to submit security deposit required for execution of the contract within the time period mentioned. In case of delay in submission of security deposit, enhanced security deposit which would include interest (Repo rate +4%) for the delayed period, shall be submitted by the bidder. Further, if security deposit is not submitted till such time the first bill becomes due, the amount of security deposit due shall be recovered as per terms defined in NIT / contract, from the bills along with due interest

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.6.	GCC Clause 2.22.1	GCC Clause 2.22.1 is revised as: Retention Amount shall be 5% of the Contract Value and shall be furnished through BG in line with clause 1.12 of GCC before payment of first RA Bill. The validity of the said BG shall be initially for the contract period & shall be extended, if so required, up to
S.No	GCC Clause Reference	Modification / Revision / Addition in GCC Clause
		acceptance of final bill. In case of increase in contract value, additional BG for 5% of differential amount shall be submitted by Contractor before payment of next RA Bill due. Retention Amount can also be recovered at the rate of 10% of the gross amount progressively from each of the running bills of the contractor till the total amount of the required retention amount is collected. In case, contractor opts cash deduction from RA bills in the beginning & subsequently offers to submit BG later on, then refund of deducted retention amount may be permitted against submission of BG for 5% of the Contract Value.
1.7.	New Clause for "Breach of Contract, Remedies and Termination" is added in place of existing clause of Risk & Cost (i.e. 2.7.2.1 to 2.7.3)	1.Clause 2.7.2 and 2.7.3 are revised as: 2.7.2 Breach of Contract1 Remedies and Termination 2.7.2.1 BHEL shall terminate the contract after due notice of a period of 14 days in any of the following cases, which if not rectified/ improved within the time period mentioned in the notice, then, 'Breach of Contract' will be considered to have been established: - i). Contractor's poor progress of the work vis-a-vis execution timeline as stipulated in the Contract, backlog attributable to contractor including unexecuted portion of work does not appear to be executable within balance available period considering its performance of execution. - ii). Withdrawal from or abandonment of the work by contractor before completion of the work as per contract. - iii). Non-completion of work by the Contractor within scheduled completion period as per Contract or as extended from time to time, for the reasons attributable to the contractor. - iv). Repeated failure of contractor in deploying the required resources to comply the statutory requirements etc. even after given by BHEL is writing. - v). Strike or Lockout declared is not settled within a period of one month. - vi). Termination of Contract on account of any other reason (s) attributable to Contractor. - vii). Assignment, transfer, subletting of Contract without BHEL's written permission. - viii). Non-compliance to any contractual condition or any other default attributable to Contractor.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

		2.7.2.2 Remedies in case of Breach of Contract is established In case 'Breach of Contract' is established, Security Deposit and Retention Amount shall be encashed/ forfeited. This is without prejudice to BHEL's right to levy of liquidated damages, debarment
S.No	GCC Clause Reference	Modification / Revision / Addition in GCC Clause
		a) etc. which shall be applied as per the provisions of the contract. Sequence of recovery to be made in case of breach of contract is established, is as below: b) In case the value of Security Deposit & Retention Amount, available for the Contract, is less than 10% of the Contract Value, the balance amount shall be recovered from dues available in the form of Bills payable to contractor, BGs against the same contract etc. c) Demand notice for deposit of balance recovery amount shall be sent to contractor, if funds are insufficient to effect complete recovery against dues indicated in (a) above. d) If contractor fails to deposit the balance amount to be recovered within the period as prescribed in demand notice, following action shall be taken for balance recovery: e) Dues payable to contractor against other contracts in the same Region shall be considered for recovery. f) If recovery cannot be made out of dues payable to the contractor as above, balance amount to be recovered, shall be informed to other Regions/Units for making recovery from the Unpaid Bills/Running Bills/SD/BGs/Final Bills of contractor. g) In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor. h) Note: i) In addition to above, levy of liquidated damages, debarment, termination, short-closure etc. shall be applied as per provisions of the contract. j) If tendering is done for the balance work, the defaulted contractor (including all the members/partners in case of JV/ partnership firm) shall not be eligible for either executing the balance work or to participate in the tender(s) for executing the balance work. 2.7.3 In case Contractor fails to deploy the resources as per requirement informed by BHEL in writing to expedite the work, BHEL can deploy own/hired/otherwise arranged resources and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads or as defined in TCC.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.8.	GCC Clause 2.7.7	GCC Clause 2.7.7 is revised as: BHEL may permit or direct contractor to demobilize and remobilize at a future date as intimated by BHEL in case of following situations for reasons other than Force majeure conditions and not attributable to contractor: i) suspension of work(s) at a Project either by BHEL or Customer,
S.No	GCC Clause Reference	Modification / Revision / Addition in GCC Clause
		or ii) where work comes to a complete halt or reaches a stage wherein worthwhile works cannot be executed and there is no possibility of commencement of work for a period of not less than three months 4. In such cases, charges towards demobilization and remobilization shall be as decided by BHEL after successful remobilization by contractor at site, and decision of BHEL shall be final and binding on the contractor. After remobilization, all conditions as per contract shall become applicable. In case Contractor does not remobilize with adequate resources or does not start the work within the period as intimated, then BHEL reserves the right to terminate the contract and effect remedies under Clause 2.7.2.2. Duration of the contract/time extension shall be revised suitably. In case of any conflict, BHEL decision in this regard shall be final and binding on the contractor.
1.9.	GCC Clause 2.11.3	GCC Clause 2.11.3 is revised as: However, if any 'Time extension' is granted to the contractor to facilitate continuation of work and completion of contract, due to backlog attributable to the contractor alone, then it shall be without prejudice to the rights of BHEL to impose penalty/LO for the delays attributable to the contractor, in addition to any other actions BHEL may wish to take under clause 2.7.2 of GCC i.e. "Breach of Contract, Remedies and Termination".
1.10.	GCC Clause 2.19.1	GCC Clause 2.19.1 is revised as: The contractor will be fully responsible for all disputes and other issues connected with his labour. In the event of the contractor's labour resorting to strike or the Contractor resorting to lockout and if the strike or lockout declared is not settled within a period of one month, it may be considered as 'Breach of Contract' under Clause 2.7 and the remedies under Clause 2.7.2.2 may be executed, at the discretion of BHEL.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.11.	GCC Clause 2.24.1	GCC Clause 2.24.1 is revised as: Even though the work will be carried out under the supervision of BHEL Engineers the Contractor will be responsible for the quality of the workmanship and shall guarantee the work done for a period of Twelve months from the date of commencement of guarantee period as defined in Technical Conditions of Contract, for good workmanship and shall rectify free of cost all defects due to faulty erection detected during the guarantee period. In the event of the Contractor failing to repair the defective works within the time specified by the Engineer, BHEL may proceed to undertake the repairs of such defective works, by itself, without prejudice to any other rights and recover the cost incurred for the same along with 5% overheads from the Security Deposit.
-------	-------------------	---

Sl. No.: 02

In addition to The EARNEST MONEY DEPOSIT (EMO) clause 1.9 and The SECURITY DEPOSIT (SD) clause 1.10 published in General Conditions of Contract (Volume I Book II) following is added for FDR

1. FDR should be Lien marked in favour of M/s BHEL.
2. Bank issuing FDR should agree to the following conditions and submit duly signed letter addressed to BHEL, confirming the following points:
 - a) There is no Lock in Period for Encashment of the Said FDR
 - b) The amount under the Said FDR would be paid to BHEL-PSSR on Demand, at any point of Time before, or upon Maturity, without any reference to the (Contractor Name).
 - c) Encashment whether premature or otherwise would not require any clearance from any other authority /Person.
 - d) FDR will be auto renewed for such period/s initially mentioned in the FDR and the intimation of Such renewal shall be sent to BHEL, PSSR and (Contractor), immediately after the renewal.
 - e) FDR will not be closed, Encashed, Changed or Discharged without the Written permission/Confirmation from M/s BHEL PSSR.
3. Bank to acknowledge and agree that the Lien created on the FDR shall be in Force until M/s BHEL PSSR, gives a Discharge Letter in this regard.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Sl. No.: 03

Detailed Instruction for EMD / Security deposits through SBI e-collect:

Step 1: Vendors may visit SBI collect website, the URL of which is <https://www.onlinesbi.sbi/sbicollect> where they get the home page with various categories of institutions.

Step 2: Select PSU • Public Sector Undertakings -leading to a page with list of PSUs

Step 3: Type BHEL and search, they get to see all BHEL divisions wherein they shall select BHEL PSSR Chennai. The screen shot of the same is given below.

Step 4: Select EMD receipts. Having selected the Payee in the Payment Progress, it will lead to the payment details - a drop down list of values. From that list, vendors shall select EMO receipt.sUpon clicking the entry EMO receipts, a form will open asking for the remitters details and the details of the tender

Step 5: Confirm details and pay

Fill in all the details correctly, verify the details, and complete the payment as it is leading to the payment gateway.

Step 6: Take a printout on completing the payment and enclose the copy of the same along with the bid submission. Store the copy of receipt for future reference.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

The screenshot displays the SBI SB Collect web application interface. At the top, there's a navigation bar with the SBI logo and links for HOME, TRANSACTION HISTORY, FAQ'S, and CUSTOMER SUPPORT. Below this, a 'Payment Progress' section shows a five-step flow: Select Payee (active), Enter Payment Details, Verify Payment Details, Complete Payment, and Print Receipt. The main content area is titled 'Select Payee' and shows a search for 'PSSR' under the category 'GOVT / PSU/ COURTS'. A table lists the search results, with one entry: 'BHEL PSSR CHENNAI' under the 'Name of GOVT / PSU/ COURTS' column and 'Tamil Nadu' under the 'State' column. A 'Back' button is visible at the bottom.

S.No.4

Clause 2.14.1 of GCC under clause 2.14 - QUANTITY VARIATION is revised as under 2.14.1 Variation in Final Executed Contract Value

The quantities given in the contract are tentative and may change to any extent (both in plus side and minus side). No compensation becomes payable in case the variation of the final executed contract value is within the limits of Minus (-) 30% of awarded contract value. Also, no compensation becomes payable in case the contract gets partially executed/ short closed/ terminated/ work withdrawn under Rights of BHEL mentioned in Clause 2.7 of GCC. In case of work terminated / short closed under clause 2.7.4 of GCC, compensation may be considered only if BHEL receives compensation from customer.

Compensation due to variation of final executed contract value in excess of the limits defined in clause above, shall be as follows:

- In case the finally executed contract value reduces below the lower limit of awarded Contract Value due to quantity variation specified above, the Contractor will be eligible for compensation @ 15% of the difference between the lower limit of the awarded contract value and the actual executed contract value.
- In case the finally executed contract value increases above the awarded Contract Value due to quantity variation, the Contractor is not eligible for any compensation

TECHNICAL CONDITIONS OF CONTRACT (TCC)

B. Following Clauses from S. No.5 & S.No.14 are modified in the Special Conditions of Contract (CCC):

SI. NO 5

Clause No. 10.5 on RA Bill Payments, in Special Conditions of Contract (SCC), Volume- 18, Book• II, is revised as under:

"The payment for running bills will normally be released within 30 days of submission of running bill complete in all respects with all documents. It is the responsibility of the contractor to make his own arrangements for making timely payments towards labour wages, statutory payments, outstanding dues etc., and other dues in the meanwhile."

S.No. 6

Clause no. 6.3.4.1 is revised as under:

"6.3.4.1 The steel shall be issued to the contractor on the following basis:

- i. Structural Steel Weighment basis (Unit – MT)
- ii. Bought out construction material (i.e. Gratings, SS liner, GI pipe for handrail etc.) Weighment basis (Unit – MT)

S.No. 7

Clause no. 6.3.4.2 is revised as under:

"6.3.4.2 All the steel (structural and bought out construction materials) issued by BHEL shall be properly accounted for. The total quantity of steel required for the work will be calculated from the approved fabrication drawing. The measurement for payment as well as for accounting shall be based on the sectional weights as indicated in the following IS/BS/EN specifications."

S.No. 8

Clause no. 6.4.1 stands deleted.

S.No. 9

Heading of Clause no. 6.4.2 is revised as under:

"6.4.2. Return of Structural Steel and bought out construction materials including Scrap:"

S.No. 10

Clause no. 6.4.3.4 stands deleted.

S.No. 11

Heading of Clause no. 6.4.4 is revised as under:

"6.4.4 Steel Consumption and wastage

TECHNICAL CONDITIONS OF CONTRACT (TCC)

S.No. 12

Clause no. 6.4.4.1 to 6.4.4.2 stands deleted

S.No. 13

Clause no. 6.4.4.3 is revised as under:

Bought out construction material (i.e. Gratings, SS liner, GI pipe for handrail etc.) Consumption

The theoretical consumption of various sections of steel shall be based on approved construction drawing. Weight shall be calculated considering the sectional weights as per Indian standards. No extra cost shall be payable to the contractor for any deviation in weights for the different procedures adopted for issue and calculation of the theoretical consumption including rolling tolerances.

a) Actual consumption = Issue - Surplus.

b) Surplus = un-tampered, unused, uncut QTY of steel including serviceable material returned by the contractor to BHEL store along-with relevant documents.

c) Wastage = Actual consumption - Theoretical consumption.

S.No. 14

Heading of Clause no. 6.4.4.4 is revised as under:

“Bought out construction material wastage”

Table item description is revised as “Bought out construction material wastage”

Following Clause is added in the Special Conditions of Contract (SCC):

VOLUME-IA PART-II
CHAPTER - 2 to CHAPTER – 8

Chapter No.	Description	No. of pages
2	T&P Hire Charges	12
3	Drawings (For information & Tendering purpose only)	391
4	HSE Plan for Site Operations by Subcontractor	131
5	Painting Specification	8
6	Technical Specification	371
7	Erection conditions of contract	44
8	Technical Specification of BOIs	12