VOLUME - IA

Technical Conditions of Contract (TCC) for "Mechanical Equipment Erection and Piping Works"

FOR

IOCL Paradip-Standby SRU (525TPD) Train project

BHARAT HEAVY ELECTRICALS LIMITED

Maharatna Company	**Technical Conditions Of Contract (TCC)** **PROJECT ENGINEERING & SYSTEMS DIVISION** **HYDERABAD**	Ref No: HY/PE&SD/Projects/TCC/2020-21/Mech Erection/01 Rev. No. 01

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TECHNICAL CONDITIONS OF CONTRACT (TCC)

FOR

"MECHANICAL EQUIPMENT ERECTION AND PIPING WORKS"
FOR

IOCL PARADIP-STANDBY SRU (525TPD) TRAIN PROJECT

Revisions: Refer to record of revisions	Prepared By:	Checked By:	Approved By:	Date
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Volume IA
Part I
Contract specific details

Chapter I- Project Information

1. **Introduction:** Indian Oil Corporation Limited (IOCL), the owner/ customer is intending to install a Standby Sulphur Recovery Unit (SRU) train of 525 TPD along with Tail Gas Incinerator at Paradip Refinery, Odisha. IOCL has appointed Technip India Limited as Project Management Consultant (PMC) for the project. The work has been awarded to BHEL on LSTK basis.

2. Project Details

1	Customer	:	IOCL, Paradip, Odisha
2	Project Information	:	IOCL Paradip-Standby SRU (525TPD) Train project
3	Location	:	Paradip, Odisha
4	Address Detail	:	IOCL, Paradip, Jagatsinghpur District, Odisha, India
5	Nearest Railway Station	:	Paradip Railway Station
6	Road Approach	:	118KM from Bhubaneswar via Cuttack and NH 53
7	Nearest Air Port	:	Biju Patnaik Airport, Bhubaneswar, Odisha, 125KM
11	Ambient Air Temperature (Average)	:	a) Maximum : 39^0 C b) Minimum : 16^0 C
12	Average Relative Humidity	:	71 %
13	Climatic Condition	:	Tropical Climate

Bidder is advised to visit the project site and appraise himself about the local conditions and infrastructure available in the area for fulfilling their commitments under the contract. BHEL will not admit any claims whatsoever on account of Contractor's non-familiarization of local conditions.

Chapter II- Scope of Work

1. **Scope:** BHEL is executing Standby Sulphur Recovery Unit (SRU) train of 525 TPD along with Tail Gas Incinerator Project at IOCL Paradip Refinery, Odisha. Scope of work of this document shall be executed as per IOCL/ BHEL specifications. Scope under this document shall comprise but not limited to the following (All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified) :

1.1 Erection, Testing and Commissioning of Piping system:

1.1.1 Contractor's scope of work for Piping System shall be following:

i) Receipt of material from BHEL store, transportation to site,
ii) Inspection, obtaining statutory approvals/ certificates as applicable,
iii) Preparation of foundation, erection, leveling, centering, alignment, grouting, Pre-assembly, Erection, Alignment, Welding, NDT, fixing of hangers & supports,
iv) Chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing including temporary piping and pumps required for testing,
v) Surface finish, supply & application of primer & finish paints of all the pipes including pipe fittings and support structures as per requirement / as given in the drawings including labeling & flow direction on the piping / over insulation & hangers and supports,
vi) Pre-commissioning, commissioning, trial operation & handing over to customer and supply & application of final painting, etc. for all the piping systems.

1.1.2 Scope and philosophy of material supply shall be as follows:

i) All the pipes (IBR, Non-IBR, SS etc. all-inclusive), fittings, Flanges, Gaskets, Bolting material and valves shall be supplied by BHEL. Detailed piping BOQ/ Data shall be as per chapter-IX.
ii) IBR Piping is being supplied by BHEL Piping Centre, Chennai. Necessary approvals for IBR Pipe Spool fabrication shall be obtained by BHEL Piping Center, Chennai from CIB of Tamilnadu (where pre-fabrication shall take place). Contractor shall obtain the final IBR approval from CIB, State of Odisha, where Erection shall take place.
iii) All Piping of size NB50 and above, shall be supplied as per the following philosophy:

A. IBR (Supply By BHEL)

a) Pipes will be spooled (cut to length as per Isometric).
b) All pipe spools will be edge prepared as per requirement.
c) All Stubs (Pressure tap-offs, Temperature tap-offs, Vent & Drain tap-offs and all pipe-to-pipe tees & stubs) will be welded onto the Main Pipe.
d) All Fittings other than the Stubs, will be supplied loose duly edge prepared as per requirement.
e) All Flanges, Gaskets & Stud Nuts will be supplied loose.
f) All Valves will be supplied loose.
g) Pipe Spools & Fittings shall be delivered after Surface preparation and Application of Primer as per Customer Specification.

h) Welding Electrodes shall not be supplied by BHEL and the same shall be arranged by contractor without any extra cost.

B. Non IBR (By BHEL)

a) Pipes will be spooled (cut to length as per Isometric).
b) All pipe spools will be edge prepared as per requirement.
c) All Stubs (Pressure tap-offs, Temperature tap-offs, Vent & Drain tap-offs and all pipe-to-pipe tees & stubs) will be welded onto the Main Pipe.
d) All Fittings other than the Stubs, will be supplied loose duly edge prepared as per requirement. Wherever possible, at least one fitting will be welded to the adjoining Pipe spool to minimize site welding.
e) All Flanges, Gaskets & Stud Nuts will be supplied loose.
f) All Valves will be supplied loose.
g) Pipe Spools & Fittings shall be delivered after Surface preparation and Application of Primer as per Customer Specification.
h) Welding Electrodes shall not be supplied by BHEL and the same shall be arranged by contractor without any extra cost.
i) Jacketed Piping shall be supplied completely pre-fabricated with Flanged joints.

iv) All the Piping (both IBR and Non IBR Piping) of size below NB50, shall be supplied as per the following philosophy:

a) Pipes will be supplied loose in single random length of 3 to 7 meters.
b) All Stubs (Pressure tap-offs, Temperature tap-offs, Vent & Drain tap-offs and all pipe-to-pipe tees & stubs) will be supplied loose.
c) All Fittings, Flanges, Gaskets & Stud Nuts will be supplied loose.
d) All Valves will be supplied loose.
e) All Pipes, Fittings & Flanges shall be delivered after Surface preparation and Application of Primer as per Customer Specification.
f) Required Welding Electrodes shall be arranged by contractor without any extra cost.

v) Primer Repair (if any), Intermediate Paint and Final Paint (Supply & Application) as per Customer Specification for both IBR and Non IBR Piping is in the scope of the Contractor.

vi) Any modification to be carried out at site (to be duly approved by PE&SD) on the pre-fabricated piping spools shall be done by the contractor.

vii) Pipe shoe fabrication and welding of the pipe shoe to the Main Pipe including welding of shoe pad is in scope of Contractor. Necessary plates, pipes shall be supplied loose by BHEL.

viii) Spring Hangers and Rigid Hangers will be supplied in assemblies / part-assemblies. Cutting of hanger rods (if required) to adjust the Hanger length suit to site requirement, shall be contractor's scope.

ix) Fabrication and Installation of Auxiliary Structure for Pipe Supports is in the scope of Contractor. Necessary Structural Steel and Plates shall be supplied loose by BHEL.

x) Surface preparation of Structural Steel supplied for Pipe & Cable Tray Supports is in the scope of contractor. Supply & Application of Primer and Final painting for the structural steel is also in the scope of contractor.

xi) In general, Embedded steel plates / Concrete pedestals with a steel plate are provided on the Grade/ Floor/ Wall/ Slab / Ceiling for Pipe Supports. However, if such provision is not made because of any reason, where a pipe support is envisaged, then a steel plate shall be provided with the help of Anchor fasteners by contractor. The plate will be supplied by BHEL. Procurement of Anchor Fasteners and Installation of Steel Plate with the help of Anchor fasteners shall be in the scope of contractor.

xii) The material required for temporary supports are to be arranged by contractor.

xiii) Insulation Mattress, Aluminium Cladding & Insulation Ancillaries shall be supplied under separate packages. Application of Thermal Insulation for Piping is in the Scope of Contractor.

xiv) Access platforms wherever required as per piping Layout/ as per final site conditions, are in the scope of Contractor.

xv) Valves are supplied by BHEL.

xvi) The final piping hook-up at all the Terminal Points is in the Scope of BHEL.

xvii) Hot tapping, wherever envisaged shall be in the Scope of Contractor, including the Material required for Hot Tapping.

xviii) NB40 & below piping shall be site routed by Contractor. Indicative routing of these lines shall be provided by BHEL. Contractor to take prior approval from BHEL for routing of these lines.

xix) Erection and Commissioning of Piping Systems shall be carried out by the Contractor according to the relevant Construction Specifications provided by IOCL/ Technip as part of the Contract Specification.

1.2 Erection, Testing and Commissioning of ControTrace® system: Steam Tracing on Tail Gas lines in New SRU unit is to be erected with ControTrace®, a proprietary Bolt-on Heating System from Control Southeast Inc., USA.

1.2.1 ControTrace®

i) Is a fully engineered bolt-on heating system, for efficient Steam tracing of pipe lines

ii) Supplied as fully pre-fabricated bolt-on ControTrace® Panels complete with Steam supply connection and drain connection on either ends

iii) Bolt-on Panel is made up of individual ControTrace® elements (2" x 1" Rectangular sections) shaped to match the OD of the Pipe

iv) No welding is envisaged to the Parent pipe and also among the Panels

v) Maximum length of any ControTrace® segment is 12m. Steam Jump overs between panels, from panels to jacketed valves, shall be with flexible hoses, to be supplied along with the package.

vi) Special Jackets shall be designed and supplied to be installed on the existing Valves

1.2.2 Scope of Work

i) Installation of ControTrace®

ii) Steam supply connections from LP Steam Header to ControTrace® Panels

iii) Condensate drain connections from ControTrace® Panels to nearest condensate manifolds / Steam trap stations

iv) Installation of Steam Supply manifolds, Condensate manifolds and Steam Trap Stations, as applicable.

v) Installation of Thermal Insulation
vi) Scope of work shall be as per approved drawings and technical specifications.
vii) Contro trace® material supplier shall provide Erection & Commissioning supervision for this work.
viii) Contractor shall provide all the tools & tackles required for successful completion of this work.
ix) Contractor shall provide following manpower for successful completion of this work:
  a) Skilled manpower-Minimum 12 Nos
  b) Unskilled manpower- Minimum 6 Nos
x) Material supplier shall train the manpower to execute the work successfully. Contractor shall extend all the needed support to supplier's supervisory staff.
xi) In case contractor fails to supply required manpower/ tools & tackles required for this work, BHEL reserves the right to deploy the same at risk and cost of contractor. Administrative cost shall also be applicable, over and above the procurement cost.

1.3 Equipment Erection: Contractor's scope of work for Piping System shall comprise but not limited to the following:

1.3.1 Inspection, preparation of foundation, erection, leveling, centering, alignment, grouting, welding, NDT, Testing, commissioning, trial operation and handing over to customer including receipt, unloading, handling of materials at BHEL stores and transportation to site, supply and application of touch up painting, obtaining statutory approvals/ certificates as applicable of; Reaction furnace package, Incinerator package, Heat exchangers, Vessels, Drums and all other BOS (Balance of Supplies) equipment. Touch up, repair, field weld joints painting & colour coding at site shall also be in the scope of contractor. Detailed list of equipment shall be as per chapter-IX.

1.3.1.1 Reaction Furnace Package (Scope of supply and services): Reaction furnace package shall be supplied by a separate BHEL vendor.
i) Following are the major equipment/components in the package:

Sl No	Item No.	Item Description	Qty/ No.
1	088-F-001	Reaction Furnace Burner	01
2	088-F-002	Reaction Furnace Chamber	01
3	088-WHB-001	Waste Heat Exchanger 1st Pass	01
4	088-WHB-002	Waste Heat Exchanger 2nd Pass	01
5	088-V-004	Waste Heat Exchanger steam drum	01
6	088-A-002	TSP Dosing Package	01
7	NA	supports, piping, valves & fittings, electrical, instrumentation & controls (as per marked up P&ID attached), refractory, insulation engineering, equipment/ system specific structural, Platform &	1 Lot

		ladders, painting for all tagged items including associated auxiliaries & accessories	

ii) Supply of complete package including items listed in table as above along with necessary piping, valves, all platforms & stairs associated with equipment for approach /maintenance and directly mounted on equipment, refractory along with refractory anchors, complete shroud assembly, cleat / attachment for piping, foundation bolt, supports, gasket, fasteners, proper isolation system for each utilities at B/L.

iii) Supply and application of Refractory & dry-out at site shall be in the scope of package vendor. Contractor shall provide the following utilities to the package vendor (free of cost) for refractory application and dry out:

a) Compressed Air – 50 CFM @ 3 to 4 Kg/cm2
b) Construction Water with pH between 6-8 chlorine content < 50 ppm : Approx. 2,50,000 liters
c) Power :- 220/440 V – For Mixing Machines
d) Power :- 440 V 3 Phase – For Blowers

iv) Supply of spare, consumables, materials & chemicals for construction, assembly, erection & pre commissioning, commissioning including at the time of refractory dry out, alkali boil & chemical cleaning.

v) Preparation of statutory calculations & necessary drawings / documents for approval.

vi) Preservation procedures, erection, installation & hook up procedures/guidelines.

vii) Pre-commissioning & commissioning procedures.

viii) **E&C Supervision Services:** Supervision of site assembly, site construction, erection, site handling, testing, pre-commissioning & commissioning shall be done by package vendor.

ix) Surface finish, supply & application of primer, painting & final painting are in the scope of package vendor , however, touch-up, repair, field weld joints painting & colour coding application & supply of material at site shall be by contractor.

1.3.1.2 Incinerator Package (Scope of supply and services): Incinerator package shall be supplied by a separate BHEL vendor.

i) Following are the major equipment/components in the package:

Sl No	Item No.	Item Description	Qty/ No.
1	090-F-001	Incinerator Burner	01
2	090-F-002	Incinerator Chamber	01
3	090-WHB-001A/B	Incinerator Waste Heat Exchanger	01
4	090-V-006	Steam Drum	01
5	090-V-007	Mud Drum	01
6	090-SK-001	Vent Stack	01
7	090-K-001A/B	Incinerator Air Fans	02
8	090-A-002	TSP Dosing System	01

9	090-DS-002	HP Steam de-super heater	01
10	NA	Metallic Expansion Joint (Universal Type)	01
11	NA	Fabric Expansion Joint	01
12	NA	Ducting & supports, piping, valves & fittings, instrumentation & controls, electrical (as per marked up P&ID attached), refractory, equipment/system specific structural, Platform & ladders, painting for all tagged items including piping / ducting / auxiliaries & accessories	1 Lot

ii) Supply of complete package including items listed in table as above along with necessary piping, valves, all platforms & stairs associated with equipment for approach /maintenance and directly mounted on equipment, refractory along with refractory anchors, complete shroud assembly, cleat / attachment for piping, foundation bolt, supports, gasket, fasteners, proper isolation system for each utilities at B/L.

iii) Supply and application of Refractory & dry-out at site shall be in the scope of package vendor. Contractor shall provide the following utilities to the package vendor (free of cost) for refractory application and dry out:

e) Compressed Air – 50 CFM @ 3 to 4 Kg/cm2
f) Construction Water with pH between 6-8 chlorine content < 50 ppm : Approx. 2,50,000 liters
g) Power :- 220/440 V – For Mixing Machines
h) Power :- 440 V 3 Phase – For Blowers

iv) Supply of spare, consumables, materials & chemicals for construction, assembly, erection & pre commissioning, commissioning including at the time of refractory dry out, alkali boil & chemical cleaning.

v) Preparation of statutory calculations & necessary drawings / documents for approval.

vi) Preservation procedures, erection, installation & hook up procedures/guidelines.

vii) Pre-commissioning & commissioning procedures.

viii) **E&C Supervision Services:** Supervision of site assembly, site construction, erection, site handling, testing, pre-commissioning & commissioning shall be done by package vendor.

ix) Surface finish, supply & application of primer, painting & final painting are in the scope of package vendor , however, touch-up, repair, field weld joints painting & colour coding application & supply of material at site shall be by contractor.

x) **Incinerator Stack Fabrication and Erection:** Incinerator stack of minimum height 71 meter (Final height shall be known after design approval) shall be supplied by package vendor in pieces as per following details:

Sl No	Description	Length	Dia	Thickness	Remarks
1	Incinerator Stack - Bottom Piece	27500 mm	5700 mm	Avg. thickness 48 mm	Each Semicircular section of 3 meter Length shall be

					dispatched. Total 18 sections.
2	Incinerator Stack – Conical Transition Piece-1	3000 mm	5700 mm Bigger ID x 4275 mm Smaller ID	Avg. thickness 32 mm	1 section
3	Incinerator Stack - Middle Piece	11000 mm	4275 mm	Avg. thickness 30 mm	1 section
4	Incinerator Stack - Conical Transition Piece-2	3000 mm	4275 mm Bigger ID x 3450 mm Smaller ID	25 mm	1 section
5	Incinerator Stack - Middle Piece	11000 mm	3450 mm	22 mm	1 section
6	Incinerator Stack - Conical Transition Piece-3	3000 mm	3450 mm Bigger ID x 2900 mm Smaller ID	20 mm	1 section
7	Incinerator Stack - Top Pieces	10000 mm	2900 mm	14 mm	1 section
8	Incinerator Stack - Top Pieces	3000 m	2900 mm	8 mm	1 section
Note: Thickness and lengths are tentative. Final details shall be shared after drawing approval.					

a) These vendor supplied pieces shall be welded (Welding, PWHT, NDT, touch up paint etc. including all tools and tackles) into a single piece stack in horizontal position at site by contractor as per drawings and specifications of package vendor
b) E&C supervision of this work shall be in the scope of package vendor.
c) The single/ multiple piece stack shall be erected as per the approved lifting plan.

1.3.1.3 Erection, Testing and Commissioning of Balance of Supplies: Erection, Testing, commissioning, trial operation and handing over to customer including receipt, unloading, handling of materials at BHEL stores and transportation to site, supply and application of touch up painting of following BOS items:
Air Preheaters, Condensers, Reheaters, coolers, Sulphur pit ejectors, Degassing contactors, KO (Knockout) drums, condenser seal pots, converters, pumps (Vertical and horizontal both), Chain Pulley Block, Hand Trolley, Scissor Trolley,

FDA and FPS packages, control valves, on-off valves, PSVs etc. Detailed list of equipment shall be as per chapter-IX.

1.4 Providing Expert Supervisory Manpower for Commissioning: Contractor shall provide expert supervisory manpower services for commissioning of project as per following details:

i) Expert Mechanical Erection and piping Works: One (1) number, Minimum 19 to 26 Years of experience in the relevant field of work.

j) Expert Mechanical Electrical and C&I Works: One (1) number, Minimum 19 to 26 Years of experience in the relevant field of work.

k) Senior Expert Overall SRU Works: One (1) number, Minimum 27 to 30 Years of experience in the relevant field of work.

Contractor shall submit the Biodata of the above-mentioned experts to BHEL for approval. Following shall be the key responsibilities of the experts:

i) Ensuring commissioning of the all mechanical, electrical, C&I systems (Except Reaction Furnace and Incinerator Package) including preparation of all documentation and liasioning with IOCL/TechnipFMC.

1.5 The quantities indicated in the price bid format are approximate and are liable for variation and alteration at the discretion of BHEL The item details and its weights under this scope of work indicated in the Chapter-IX "ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK (BOQ)" are approximate and these are subject to change as per site conditions. The information furnished is only a description regarding the item to be erected by the contractor. BHEL reserves the right of adding or excluding any components/ items / systems according to the site requirements/ customer requirements to complete various systems in all respects. Any other systems / components, which are integral to equipment supplied by the manufacturing units, and package vendors shall also be erected and commissioned by the contractor within the quoted/accepted Lump sum rate. No additional payment shall be made towards any variation in weights and quantities for such systems.

1.6 Supervisors / Engineers, consumables etc., required for the scope of work shall be provided by the contractor. All the expenditure including taxes and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clause. The contractor's quoted rates should be inclusive of all such contingencies.

1.7 It shall be specially noted that, the contractor may have to work round the clock (24x7) to achieve the completion schedules / plans / targets during the entire course of erection, testing and commissioning works, which may involve payment of considerable overtime. Hence contractor's quoted rate shall take into consideration of all expenses that will be incurred for such arrangement of personnel including labors, engineers / supervisors, T&Ps etc.

1.8 The terminal points can be inferred from the relevant drawings and any further clarifications can be obtained / decided by BHEL and that is final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals. Carrying out work as per the specification between equipments constituting terminal points, whether the terminal equipments fall within the scope of work/specification, contractor shall carry out the terminal joints at either end. Also where the piping connection to the terminal points involve flanged joints, matching of flanges,

fixing gaskets, bolting and tightening as per BHEL Engineers instructions is in the scope of work. In case piping connected to equipment, matching of flanges for achieving the parallelism and alignment at the equipment end, by suitably resorting to heat correction or other method as instructed by BHEL Engineer, with in the quoted rate.

1.9 The work shall conform to dimensions and tolerances given in various drawings and quality manuals provided by BHEL. If any portion of work is found to be defective in workmanship not conforming to drawings or other stipulations, the contractor shall dismantle and redo the work duly replacing the defective materials at his cost, failing which the job will be carried out by BHEL by engaging other agencies / departmentally and recoveries will be effected from contractor's bill towards expenditure incurred including BHEL's overhead charges.

1.10 Contractor has to work in close co-ordination with other erection 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 erection program have to be planned in such a way that the milestone events are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.

1.11 During the course of erection, testing and commissioning, certain rework / modification / rectification / repairs / fabrication etc will be necessary on account of feedback/revision from various relevant sources, and also on account of design discrepancies/ alterations, manufacturing defects, site operations/ maintenance requirements. This will also include modifications / re-works suggested by BHEL / customer / other inspection group. Contractor shall carry out such rework / modification / rectification / fabrication / repairs etc promptly and expeditiously. Daily log sheets indicating the details of work carried out, man-hours etc shall be maintained by the contractor and got signed by BHEL engineer every day. Claim of Contractor if any, for such works will be governed by relevant clauses of 'General Conditions of Contract'.

1.12 The scope of work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, engineering and construction management and green belt management. The contractor should ensure successful and timely completion of the work. The contractor must have adequate quantity of tools, construction aids, equipments etc., in his possession. He must also have on his rolls adequate trained, qualified and experienced supervisory staff and skilled personnel. The manpower deployment identified by contractor shall match with above scope of works.

1.13 Contractor shall execute the work as per sequence and procedure prescribed by BHEL at site. The erection manuals, which are available with BHEL site office, are to be referred for compliance and guidance before taking up the work. Any failure to comply with the above might lead to rework and the cost for the same shall be borne by the contractor only. BHEL engineer, depending upon the availability of materials, fronts etc., will decide the sequence of erection and methodology. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the method of erection adopted in erection of similar jobs or for any reason whatsoever.

Chapter III- Facilities in the scope of BHEL/Contractor

S. No.	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.1	**ESTABLISHMENT**			
3.1.1	**FOR CONSTRUCTION PURPOSE**:			
a	Open space for office (as per availability)	Yes		Location shall be finalized after joint survey with customer.
b	Open space for storage (as per availability)	Yes		Location shall be finalized after joint survey with customer.
c	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
d	Bidder's all office equipment, office / store / canteen consumables		Yes	
e	Canteen facilities for the bidder's staff, supervisors and engineers etc.		Yes	
f	Firefighting equipment like buckets, extinguishers etc.		Yes	
g	Fencing of storage area, office, canteen etc. of the bidder		Yes	
3.1.2	**FOR LIVING PURPOSES OF THE BIDDER**			
a	Open space for labor colony (as per availability)		Yes	
b	Labor Colony with internal roads, sanitation, complying with statutory requirements		Yes	
3.2.0	**ELECTRICITY**			
3.2.1	Electricity For construction purposes		Yes	Electricity shall be provided by IOCL/ BHEL at one point on chargeable basis. Further distribution from IOCL/ BHEL feeder point shall be done by contractor. No separate payment for downstream power distribution shall be made. Contractor shall install a calibrated energy meter at feeder point for billing purpose.

S. No.	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.2.2	Electricity for the office, stores, canteen etc. of the bidder		Yes	
3.2.3	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc.		Yes	
3.3.0	**WATER SUPPLY**			
3.3.1	For construction purposes		Yes	Water shall be provided by IOCL at one point on chargeable basis. Further distribution shall be done by contractor.–Further distribution from IOCL supply point shall be done by contractor. No separate payment for downstream water distribution shall be made**.**
3.3.2	Water supply for bidder's office, stores, canteen etc.		Yes	
3.3.3	Water supply for Living Purpose		Yes	
3.4.0	**LIGHTING**			
a	For construction work (supply of all the necessary materials) 1. At office/storage area 2. At the preassembly area 3. At the construction site /area		Yes	
b	For construction work (execution of the lighting work/ arrangements) 1. At office/storage area 2. At the preassembly area At the construction site /area		Yes	
c	Providing the necessary consumables like bulbs, switches, etc. during the course of project work		Yes	
d	Lighting for the living purposes of the bidder at the colony / quarters		Yes	
3.5.0	**COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER**			

S. No.	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
a	Téléphone, fax, internet, intranet, e-mail etc.		Yes	
3.6.0	**COMPRESSED AIR wherever required for the work**		Yes	
a	Supply of Compressor and all other equipments required for compressor & compressed air system including pipes, valves, storage systems etc		Yes	
b	Installation of above system and operation & maintenance of the same		Yes	
c	Supply of the all the consumables for the above system during the contract period		Yes	
3.7.0	**Demobilization of all the above facilities**		Yes	
3.8.0	**TRANSPORTATION**			
a	For site personnel of the bidder		Yes	
b	For bidder's equipment and consumables (T&P, Consumables etc.)		Yes	

Sl. No	Description PART II	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.9.0	**Erection Facilities**			
3.9.1	**Engineering works for construction:**			
a	Providing the erection drawings for all the works covered under this scope	Yes		Drawing schedule shall be finalized at the time of kick off meeting
b	Drawings for erection methods	Yes	Yes	In consultation with BHEL
c	As-built drawings – where ever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		Yes	In consultation with BHEL
d	Shipping lists etc. for reference and planning the activities	Yes		

Sl. No	Description PART II	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
e	Preparation of site erection schedules and other input requirements		Yes	In consultation with BHEL
f	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments	Yes	Yes	In consultation with BHEL
g	Weekly erection schedules based on S. No. e. hard copy to Construction manager, by email to HO.		Yes	In consultation with BHEL
h	Daily erection / work plan based on S. No. g. hard copy to Construction manager, by email to HO.		Yes	In consultation with BHEL
i	Periodic visit of 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 Weeks.		Yes	
j	Arranging the materials required for Work		Yes	
k	Coordination for inspection & checking and getting clearance from customer		Yes	
l	Preparation of formats for completion of activities		Yes	
m	Preparation of preassembly bay		Yes	
3.10	**Work Permits, gate pass etc. from customer for manpower, machinery and material**		Yes	
3.11	Ambulance Services for contractor's site staff		Yes	

3.9 Open Space:

i) Minimum Open space as made available by customer will be provided at free of charges to the contractor, for construction of temporary office shed, fabrication yard and storage area at the job site, contractor's stores shed(s). This is subjected to availability of space from customer. Non-availability of space due to any reason whatsoever shall not entitle the vendor for any claim against BHEL because of cost and time implications.

ii) BHEL shall not provide to the contractor any residential accommodation to any of his staff and the contractor has to make his own arrangements.

iii) Contractor has to make his own arrangements for labour colony.

iv) Location and area requirement for office / storage sheds / fabrication yard shall be discussed and mutually agreed to.

3.10 Construction power will be provided to the contractor at one points within plant area by BHEL on chargeable basis at the applicable rate of IOCL. Feeder Rates are as follows:

Cat No	Load Demand	Feeder Rating	Cost/ Month (Rs.)
1	Up to 32A	415V, 32A	25000
2	>32A to 63A	415V, 63A	50000
3	>63A to 125A	415V, 125A	100000
4	>125A to 250A	415V, 250A	200000

3.10.1 In the event of power requirement (and or availability of power) is for less than one month, pro- rata cost will be arrived on the basis of above rates. The required digital Energy meter for measuring the consumption and MD 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 (as required within plant boundary and outside plant boundary) with necessary isolator / LCB etc within the accepted contract price.

3.10.2 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.

3.10.3 The required energy meter for measuring power consumption shall be arranged by the contractor and taken care by the contractor. 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.

3.10.4 Contractor has to make their own arrangements for electricity requirement for labour colony at their cost. Any duty, deposit involved in getting the Electricity for contractors use i.e. Office shed, labour colony etc. shall be borne by the bidder.

3.10.5 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.

3.11 Construction Water: Subject to availability, Construction water shall be provided by IOCL on chargeable basis. The cost of water supply shall be recovered from CONTRACTOR'S running/ final account bill at 0.25%.

However, in case BHEL/ IOCL is not able to provide construction water due to any reason whatsoever, CONTRACTOR shall be responsible for making all arrangements for Construction water at his cost. Any statutory requirements/ documentation etc. to this effect shall be met by the CONTRACTOR.

Non-availability of water due to any reason shall not entitle the CONTRACTOR for any claim against BHEL because of cost and time implications.

3.12 ONLINE SITE CONSTRUCTION MANAGEMENT SYSTEM (SCMS):

3.12.1 Two Nos of computers and printers (MFP) of latest configuration (preferably i5 processor, 8GB Ram, 1 TB Hard disk, with internet provision on all the computers), along with one data entry operator per computer to be arranged by contractor for reporting of daily progress, billing, updating details in online SCMS package of BHEL, etc., within the quoted rate.

3.13 CONSUMABLES: All electrodes including stainless steel electrodes required shall be arranged by the contractor at his cost. The Contractor shall use the BHEL / Customer approved quality electrodes only.

3.13.1 The contractor shall provide within finally accepted price / rates, all consumables like welding electrodes (including alloy steel and stainless steel), 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 and bed are to be arranged by him. Sealing compounds, gaskets, gland packing, wooden sleepers, for temporary work, required for completion of work except those, which are specifically supplied by BHEL, are also to be arranged by him.

3.13.2 All consumables to be used for the job shall have to be approved by BHEL prior to use.

3.13.3 All the shims, gaskets and packing, which go finally as part of equipment, shall be supplied by BHEL free of cost.

3.13.4 In the event of failure of contractor to bring necessary and sufficient consumables, BHEL shall arrange for the same at the risk and cost of the contractor. The entire cost towards this along with standard BHEL overhead shall be deducted from the contractor's immediate due bills.

3.14 GASES:

3.14.1 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 shall not be considered as reason for not attaining the required progress.

3.14.2 BHEL reserves the right to reject the use of any gas in case required purity is not maintained.

3.14.3 The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.

3.14.4 The contractor shall ensure safekeeping of the inflammable cylinder at a separate place away from normal habit with proper security etc.

3.15 ELECTRODES SUPPLY AND STORAGE

3.15.1 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. Test certificates for electrodes and other consumables should be submitted to BHEL Engineer as per requirement.

3.15.2 Shortage of any of the electrodes or the equivalent suggested by BHEL shall not be quoted as reason for deficiency in progress or for additional rate. Contractor shall submit weekly/ fortnightly/ monthly statement/ report regarding consumption and available stock of all types of electrodes for avoiding stoppage of work on consumable scarcity.

3.15.3 Storage of electrodes shall be done in an air conditioned / controlled humidity room as per requirement, at his own cost by the contractor.

3.15.4 All low hydrogen electrodes shall be baked / dried in the electrode-drying oven (range 375 deg. C - 425 deg. C) To the temperature and period specified by the BHEL Engineer before they are used in erection work and each welder should be provided with one portable electrode drying oven at the work spot. Electrode drying oven and portable drying ovens shall be provided by contractor at his cost.

3.15.5 In case of improper arrangement of procurement of above electrodes BHEL reserves the right to procure the same from any source and recover the cost from the contractor's first subsequent bills at market value plus departmental charges of BHEL communicated from time to time. Postponement of such recovery is not permitted.

3.15.6 BHEL reserves the right to reject the use of any electrodes at any stage, if found defective because of bad quality, improper storage, date of expiry, unapproved type of electrodes etc. It shall be the responsibility of the contractor to replace at his cost without loss of time.

3.16 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 sets 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.

13.17 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.

3.18 CONTRACTOR'S OBLIGATION ON COMPLETION

On completion of work, all the temporary buildings, structures, pipelines, 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 shall be final.

13.18 POTABLE/DRINKING WATER: Contractor shall make his own arrangements of water suitable for drinking purpose to have uninterrupted work. No separate payment shall be made, for any contingency water arrangement made by contractor, due to delay / failure for providing water supply. Contractor has to make his own arrangements for his water requirement for his labour colony at his cost.

13.19 Other Facilities

i) Adequate water less urinals (male & female both) shall be arranged by the contractor within quoted rates, at site of construction at different level and different areas of works with proper disposal arrangement.
ii) Vendors have to comply requirements of HSE & Statutory requirement in line with IOCL/ BHEL HSE plan.
iii) Vendors have to arrange labour rest sheds, drinking water facility, toilets, canteen facility as per local labour act/BOCW act. Maintaining hygiene and disposal of debris, scraps, canteen items and area cleaning is included in vendor's scope.
iv) Agency has to arrange trained scaffolding experts with accreditation from statutory agencies with proper experience and they will issue fitness certificates for safe use. Such kind of qualified scaffolding experts will vary as per job requirement. At the same time, training has to be given by these experts at regular intervals for their own workers for increasing no. of experts.
v) Agencies HSE officers should have sufficient experience as per rule 209 of BOCW act central rule 1998. Agencies HSE officers will be part of BHEL HSE Team and they will be responsible for giving training on HSE issues in addition to normal field works and other normal site requirements.
vi) Preparation of method statement, HIRA, Job Safety analysis, permit to work, Lifting plans, and all supporting documents as required for starting & continuation of work/job is in vendor's scope.
vii) First aid facilities shall be maintained by contractor at no. of working places as required as per instruction of BHEL Engineer. The basic medical facility will be maintained by BHEL at site.
viii) Vendor has to arrange land within his quoted rate for making labour colony. Vendor's labour colony has to be maintained with proper hygiene, drinking water, bathroom water, lighting arrangement, sewerage system. These facilities are to be regularly maintained including drains, surrounding, and upkeepment of labour colony. BHEL/Customer & local

statutory authorities will visit labour colony from time to time and all healthy conditions are to be maintained by vendor.

ix) Scaffolding pipes, clamps, safety nets, floor grills for working platforms are to be made of good quality with proper certifications as per IS Codes.

3.20 Dewatering: Contractor shall ensure at all times that the 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. All equipments/materials required for dewatering such as pumps, pipes and accessories shall be arranged by the contractor. No separate claim in this regard shall be admitted by BHEL.

3.21 SITE ORGANISATION

i) The contractor shall provide adequate staffing in the following areas in addition to the staffing requirements of execution as instructed/informed by BHEL:
   a) Overall planning, monitoring & control.
   b) Quality control and quality assurance.
   c) Materials management.
   d) Safety, fire & security.
   e) Industrial relations and fulfilment of labour laws and other statutory obligations.

ii) The contractor shall maintain a site organization of adequate strength in respect of manpower, construction machinery and other implements at all times for smooth execution of the contract. This organization shall be reinforced from time to time, as required to make up for slippage from the schedule without any commercial implication to BHEL. The site organization shall be headed by a competent Construction Manager having sufficient authority to take decisions at site.

iii) The contractor should also submit to BHEL for approval a list of construction equipment, erection tools, tackle etc prior to commencement of site activities. These tools & tackles shall not be removed from site without written permission of BHEL.

Chapter IV- Tools & plants to be deployed by Contractor

LIST OF TOOLS AND PLANT:

The following tools and equipment but not limited to, are required for the efficient execution of the works in the scope of this tender. The contractor shall make them available for construction purposes, including all consumables likely to be used at his own cost at the time of mobilization.

SL NO	ITEM	QUANTITY
1	i) Up to 75MT capacity crane for equipment erection and material handling. Note: Including cost of fuel, operators, associated tools etc. all-inclusive.	AS REQUIRED
2	18 T Hydra/25 T Crawler Crane or above capacity as required Note: Including cost of fuel, operators, associated tools etc. all-inclusive.	AS REQUIRED
~~3~~	~~HYDRA CRANE (12T/ 14T)~~	AS REQUIRED
4	TRACTOR-TRAILOR	-DO.
5	ELECTRICAL WINCH 2T/ 5T/ 10T	-DO.
6	HYDRAULIC TEST PUMP 0-16 KG/SQCM	-DO.
7	RESISTANCE HEATING MACHINES WITH ACCESSORIES	AS REQUIRED
8	WELDING GENERATOR, K-320	-DO.
9	WELDING TRANSFORMER (300/450 AMP)	-DO.
10	WELDING RECTIFIER	-DO.
11	INVERTER TYPE RECTIFIER	-DO.
12	HYDRAULIC PIPE BENDING MIC	AS REQUIRED
13	CHAIN PULLEY BLOCK 5T, 3T,	-DO.
14	PULL LIFT (6T, 5T, 3T, 1.5T)	-DO.
15	HYDRAULIC JACK (20T, 10T, 5T)	-DO.
16	SINGLE SHEAVE SNATCH PULLEY (10T, 5T)	-DO.
17	D SHAKLES (20T, 10T, 5T)	-DO.
18	TURN BUCKLES (3T, 5T, 8T, 10T, 15T)	-DO.
19	TIG WELDING SET	-DO.
20	OXYGEN REGULATOR	-DO.

21	ACETYLENE REGULATOR	-DO.
22	CUTOGEN 5	-DO.
23	OXYGEN HOSE 10 MM	-DO.
24	ACETYLENE HOSE 10 MM	-DO.
25	ELECTRODE DRYING OVEN	-DO.
26	PORTABLE ELECTRODE DRYING OVEN	-DO.
27	COPPER WELDING CABLE 600 AMP. 400 AMP	-DO.
28	ALUMINIUM CABLE 600 AMP, 400 AMP	-DO.
29	THERMAL-CHALK 100 DEG c TO 800 DEG C	-DO.
30	ELECTRODE BAKING OVEN	-DO.
31	THEODOLITE (1 SEC ACCURACY)	-DO.
32	SPIRIT LEVEL 12 INCH, 0.1 MM ACCURACY	-DO.
33	MAGNETIC PARTICLE TESTING M/C	-DO.
34	HARDNESS TESTER WC	-DO.
35	DRILLING M/C OF DIFFERENT SIZES	-DO.
36	GRINDING M/C OF DIFFERENT SIZES	-DO.
37	TRIP TORQUE WRENCH	-DO.
38	ALUMINUM TELESCOPIC LADDER	-DO.
39	MANILA ROPES OF DIFFERENT SIZES	-DO.
40	STEEL WIRE ROPES OF DIFFERENT SIZES	-DO.
41	DYE PENETRANT TEST KIT	-DO.
42	RECORDABLE UT MACHINE	As Required
43	PMI MACHINE	As Required
44	RADIOGRAPHY ARRANGEMENT INCLUDING THE SOURCE AND FILM VIEWER	As Required
45	NON CONTACT TEMPERATURE GAUGE	As Required
46	DEWATERING PUMP 5 HP	-DO.
47	AIR COMPRESSOR	As Required
48	DG SET (FOR WELDING IN AREAS IN CASE OF NON AVAILABILITY OF ELECTRCIAL POWER	As Required
	TIG WELDING SET	As Required
	STRESS RELIEVING EQUIPMENT WITH TEMPERATURE RECORDERS	As Required

	MIXER FOR GROUTING OF EQUIPMENT FOUNDATIONS	As Required
	VACUUM CLEANER (INDUSTRIAL)	As Required
	PIPE CUTTING AND BEVELLING MACHINE	As Required
	PIPE BENDING M/C	As Required

Tools required for installation of controtrace panels (need to arrange by contractor):

- Wrenches - 5/8"-(x2) 3/4" 7/8"-(x2) 1-1/16" 1-1/8" 1-1/4".
- ¾" to 1½" Ton Come Along (Chain Lever).
- Hammer (Ball Pein and Sledge Hammer)
- Tin Snips
- Tape Measure, Level & Markers

Sl No	Description	Capacity and Quantity minimum
1	Safety Net (Conforming IS 11057:1984) Safety Net (Net Size: 10m x 5m, Mesh Size: 25 mm, Mesh Rope: 2mm double cord, Border/Tie Cord: 12 mm diameter polypropylene rope (tested as per IS: 5175).Two meters length shall be provided at all four corners.	As required
2	**Fall Arrester** 'Rope grab fall arrester' & anchorage line. Anchorage Line: 14 mm- 16 mm diameter, three strand twisted Polyamide rope. **Rope Grab fall arrester:** Openable & Guided type Fall Arrestor (on flexible line) conforming EN 353-2 & works on 14-16 mm diameter polyamide rope. Material: Nickel Chrome plated Steel Connector: Karbiner conforming to EN 362 (Minimum Strength 22 KN), material: Steel	As required
3	**Horizontal lifeline** Stainless Steel Wire rope of 8 mm diameter. Minimum six nos. of steel U-bolt clips are required for clamping each wire rope to a rigid support (03 nos. of U-bolt clips at each end).	As required

LIST OF CONSUMABLES TO BE PROVIDED BY YOU WITHIN ACCEPTED RATES:

SI.NO.	Description	Quantity	Remarks
1	Gases like O2, CO2, Argon, DIA, LPG and Others as per requirement (FOR CONSTRUCTION PURPOSE AND NOT FOR COMMISSIONING USES	As required	Sufficient stock has been maintained.
2	Filler wire for both SS and others as required	As required	.--do--
~~3~~	~~Ordinary Portland Cement~~	~~As required~~	~~.--do--~~
~~4~~	~~Grouting materials/ Grouting cements~~	~~As required~~	~~.--do--~~
7	Lapping compound	.--do--	For valves servicing
9	Hydraulic oil	.--do--	For uses in different equipment and hydraulic jacks, pumps and Other applications
10	Paints for preservation, touch up painting, normal and final cum finish painting as applicable	.--do--	For painting
11	Different types of electrical lamps, tube lights , halogen lamps, sodium vapor lamps with fixtures	.--do--	As required
12	Electrodes / Filler wires as per requirement	.--do--	.--do--
13	Test pieces for welders test like plates, pipes etc.	.--do--	.--do--
14	Brazing Rods	.--do--	.--do--
15	Soldering consumables	.--do--	.--do--
16	Consumables for welding and NDTs	.--do--	.--do--
17	Thermal chalks Of different ranges	.--do--	.--do--
18	Consumables for Pre-heating, Stress Relieving, Post heating etc.	.--do--	.--do--
19	Consumables for arranging welders' qualifying works	.--do--	.--do--
20	Welders accessories	.--do--	.--do--
22	Services for effluent disposal	.--do--	.--do--
23	Rustling	.--do--	.--do--
~~24~~	-	~~.--do--~~	~~.--do--~~
25	CTC, Acetone as per requirement	.--do--	.--do--

26	Petrol	.--do--	.--do--
27	Diesel	.--do--	.--do--
30	Red Lead	.--do--	.--do--
31	Hemp Fibre	.--do--	.--do--
32	Asbestos Rope (Pure) 2,4,6,8,10, 12,25 mm and Other sizes as required	.--do--	.--do--
33	Insulation Adhesive Tape 20 mm Width and other sizes as per requirement	.--do--	.--do--
34	Emery Tape as per requirement	.--do--	.--do--
35	Hack-shaw of different sizes as per requirement	.--do--	.--do--
36	Emery Paper Gr. 60, 80, 100, 120. 150 , 220 and others as per requirement	.--do--	.--do--
37	Asbestos Cloth in Wax Paper IXI M —as required	.--do--	.--do--
38	PACKING BLACK PAPER IXI M	.--do--	.--do--
39	ADHESIVE TAPE 0.3 mm THICKNESS-as required	.--do--	.--do--
40	WHITE COTTON TAPE 12 mm WIDTH-as required	.--do--	.--do--
41	GRAPHITE POWDER FINE QUALITY - as required	.--do--	.--do--
42	GRAPHITE FLAKES as required	.--do--	.--do--
43	RAW LINESEED OIL as required	.--do--	.--do--
44	DOUBLE BOILED LINSEED OIL AS REQUIRED	.--do--	.--do--
45	CYLINDER OIL AS REQUIRED	.--do--	.--do--
46	ENAMEL PAINT (OF REQUIRED COLOUR) AS REQUIRED	.--do--	.--do--
47	MOBILE VELOCITE OIL 'S' AS REQUIRED	.--do--	.--do--
48	TURPENTINE OIL AS REQUIRED	.--do--	.--do--
49	TRICHLORO ETHYLENE AS REQUIRED	.--do--	.--do--
50	METHYLATED SPIRIT AS REQUIRED	.--do--	.--do--
51	MOBILOX GREASE 2 (IOC) AS REQUIRED	.--do--	.--do--
52	SERVOGEM -2,3 GREASE AS PER REQUIREMENT	.--do--	.--do--

53	OTHER SPECIAL GREASE AS PER REQUIREMENT	.--do--	.--do--
54	RUST BAN (ESSO) AS PER REQUIREMENT	.--do--	.--do--
55	MOLYKOTE PASTE AS PER REQUIREMENT	.--do--	.--do--
56	BIRKOSITE AS PER REQUIREMENT	.--do--	.--do--
57	WASHING SODA AND SOAP AS PER REQUIREMENT	.--do--	.--do--
58	COTTON WASTE AS PER REQUIREMENT	.--do--	.--do--
59	CLEAN RAGS AS PER REQUREMENT	.--do--	.--do--
60	WHITE CLOTH (CEARSE) AND USED CLOTHS AS REQUIRED	.--do--	.--do--
61	SACK CLOTH AS PER REQUIREMNT	.--do--	.--do--
62	JELLEY SOAP OR BAR SOAP AS PER REQUIREMENT	.--do--	.--do--
63	EMERY CLOTH 100 mm WIDTH ROLL GR. 60,	.--do--	.--do--
	100, 120, 150,220 AND OTHERS AS PER	.--do--	.--do--
	REQUIREMENT	.--do--	.--do--
64	SAND PAPERS GR. 60, 80 ,120 AND OTHER AS PER REQUIREMENT	.--do--	.--do--
65	EMERY PASTE (VALVE LAPPING COMPOUND) GR. 60, 80, 100 & 220 AND OTHERS AS PER REQUIREMENT.	.--do--	.--do--
66	GRINDING WHEELS, STONES OF DIFFERENT SIZES AS PER REQUIREMENT	.--do--	.--do--
67	WELDING ELECTRODES (CARBON STEEL, CS NACE, CS HIC+NACE, M.S., ALLOY STEEL AND FILLER WIRES, STAINLESS	.--do--	.--do--
	STEEL BOTH FERROUS AND NON FERROUS) EXCEPTING THOSE SUPPLIED BY BHEL	.--do--	.--do--
		.--do--	.--do--

	REQUIREMENT	.--do--	.--do--
68	SOLDERING STICK (LEAD -TIN ALLOY) AS PER REQUIREMENT	.--do--	.--do--
69	SOLDERING WIRE (SILVER ALLOY) AS PER REQUREMENT	.--do--	.--do--
70	SOLDERING FLUX (SILVER ALLOY) AS PER REQUIREMENT	.--do--	.--do--
71	BRZING FLUX,'BORAX AS REQUIRED	.--do--	.--do--
72	SOLDERING FLUX (LEAD-TIN ALLOY) AS REQUIRED	.--do--	.--do--
73	MS GAS WELDING WIRE AS REQUIRED	.--do--	.--do--
74	DP TEST KIT WITH MAGNIFYING GLASS AS REQUIRED	.--do--	.--do--
75	IRON AND STEEL SECTIONS AS REQUIRED	.--do--	FOR ARRANGING SCAFFOLDING AND FIXTURES ETC.
76	MS BOLTS AND NUTS WITH TWO PLAIN WASHERS AND ONE SPRING WASHER AS REQUIRED.	.--do--	As required
77	MS ANGLES ASSORTED AS REQUIRED	.--do--	.--do--
78	MS CHANNELS ASSORTED AS REQUIRED	.--do--	.--do--
79	ROUNDS FLATS,MS PLATES ASSORTED AS REQUIRED	.--do--	.--do--
80	ENGINEERS BLUE / PRUSSIAN BLUE AS REQUIRED	.--do--	.--do--
81	CHALK PIECES- WHITE,COLOUR AND POWDER AS REQUIRED	.--do--	.--do--
82	TEINE AS REQUIRED	.--do--	.--do--
83	BATTERY CELLS 1.5 VOLTS TORCH LIGHT	.--do--	.--do--
	CELLS, PENCIL BATTERY ETC.AS REQUIRED	.--do--	.--do--
84	RED AND BLUE PENCILS AS REQUIRED	.--do--	.--do--

85	GALVANISED STEEL WIRE Imm DIA AND OTHER SIZES AS REQUIRED	.--do--	.--do--
86	FLANNEL CLOTH 1M WIDTH AS PER REQUIREMENT	.--do--	.--do--
87	SPLIT PINS 2mm TO 6 mm AND OTHER SIZES	.--do--	.--do--
88	WOOD SCREWS 3/4' TO 3 AS PER REQUIREMENT	.--do--	.--do--
89	LEAD SHEET 3 mm AND 4 mm THICKNESS AS PER REQUIREMENT	.--do--	.--do--
90	TARPAULINE3X3 M AND M AND M AND OTHER SIZES AS PER REQUIREMENT	.--do--	.--do--
91	VULCANISED RUBBER FIBRE 0.5 MXO.5 MX15 mm THICKNESS AS PER REQUIREMENT	.--do--	.--do--
92	PLYWOOD 1M X 2M X 3mm AND OTHER SIZES AS PER REQUIREMENT	.--do--	.--do--
93	NAILS-WIRE 1' TO 3'AS PER REQUIREMENT	.--do--	.--do--
94	CANDLES MEDIUM SIZE AS PER REQUIREMENT	.--do--	.--do--
95	PORTABLE SWITCH BOARD CONTAINING 15 AMPS TP METAL CLAD SWITCH WITH FUSE 3X15 AMPS, SWITCHES AND 3 PLUG SOCKETS AS PER REQUIREMENT	.--do--	.--do--
96	WOODEN PLANK PULLEYS AS REQUIRED	.--do--	.--do--
97	ANY OTHER WE-MS AS REQUIRED TO COMPLETE THE JOBS	.--do--	.--do--

Note:

i) All above T&Ps are to be deployed by contractor as and when required as per instruction of BHEL engineer. If works is delayed due to non-availability of above T&Ps, BHEL reserves the right to deploy the same and recover the charges thereof from the contractor as per prevailing market rate/hiring rate/BHEL internal hiring rates + Applicable overhead rates.

ii) This above list of T&Ps is only indicative and neither exhaustive nor limiting. Quantities indicated above are only the minimum required. Contractor shall deploy all necessary T&P to meet the schedules & as prescribed by BHEL engineer and required for completion of work.

iii) Necessary electrical / water / air connection required for operation of any of the tools & tackles shall be to Contractor's account.

iv) Contractor has to submit the Calibration certificates of all the precision Equipment to BHEL. BHEL may ask for recalibration of the MMEs /precision equipments for ensuring quality of work. Contractor must re-ascertain/ recheck range and accuracy of each IMTE from BHEL Engineer well in advance before arranging calibration/ deployment.

v) All Measuring and Monitoring Devices (MMD) used for the work in scope of these tender specifications shall be calibrated by the accredited agencies that are approved by BHEL or calibration tractability is established upto National Physical Laboratory.

vi) Any T&Ps, Cranes, Slings, D-shackles and other lifting tackles, Trailers (Low bed and normal) required for erection and shifting of material from store to site shall be arranged by contractor over and above crane provided by BHEL.

vii) Any T&Ps, Slings, D-shackles and other lifting tackles required for BHEL provided cranes shall be provided by contractor.

viii) T&P and the mobilization shown in the above mentioned list is a suggestive requirement. Mobilization schedule as mutually agreed at site for major T&Ps, have to be adhered to. Numbers / time of requirement will be reviewed time to time at site and contractor will provide required T&P / equipments to ensure completion of entire work within schedule / target date of completion without any additional financial implication to BHEL. Vendor will give advance intimation & certification regarding capacity etc. prior to dispatch of heavy equipments. Also on completion of the respective activity, demobilization of T&P in total or in part can be done with the due approval of engineer in charge. Retaining of the T&Ps during the contract period will be mutually agreed in line with construction requirement.

ix) Contractor has to arrange slings of all sizes for completing the works covered under these specifications.

x) In the event of need of change of type of any of major T&Ps, approval shall be taken from BHEL Engineer in-charge prior to mobilization. The decision of Number of T&P required due to replacing the enlisted T&P as per above table, shall be taken after analyzing the production capacity and suitability of both the T&Ps.

xi) The contractor shall submit the valid test certificate/calibration certificates for all the T&Ps before put into actual use at site. The certificates shall be renewed time to time as instructed by BHEL Engineer.

xii) Crane operators deployed by the contractor shall have valid license for operation of cranes.

xiii) The above list is only indicative and these T&Ps may not be required for entire contract period but contractor shall ensure the availability of the T&Ps as per work requirement

and T&P Deployment schedule. After award of the work, contractor shall submit the crane deployment schedule within 15 Days from the date of award. T&P Deployment schedule shall be finalized at site in consultation with BHEL Engineer based on the work fronts/work requirement. BHEL decision shall be final and binding regarding the T&P deployment schedule. Contractor shall mobilize / maintain the T&P's as per the deployment schedule notified time to time by BHEL Engineer.

xiv) Apart from above mentioned T&P, any additional item required for proper execution of scope of work, contractor has to arrange such T&P within quoted rate as instructed by BHEL Engineer. Deployment schedule of such T&Ps shall be maintained as per the instruction of BHEL Engineer.

xv) Any of the T&Ps deployed by the contractor, will be released from site during contract period / extended period only after completion of work for which the particular T&Ps was envisaged. The written permission shall be taken by contractor from BHEL Construction Manager for releasing the T&Ps.

xvi) In the eventuality of contractor not deploying cranes / abnormal down time of cranes in his scope during the period specified above, and BHEL arranges for the same [either BHEL's own cranes / hired cranes], prevailing BHEL Corporate Crane hire charges (may vary from time to time) shall be recovered from the contractor's running bills. Corresponding pages of Corporate Crane hire charges are enclosed in Annexure-IX.

xvii) The loading, unloading and transportation of contractors T&Ps shall be in the scope of contractor. All necessary items such as Trailers, Cranes, Winches, welding generators, slings, jacks, sleepers, rails etc., are to be arranged by the contractor at his own cost**.**

xviii) The contractor has to furnish a list of Tools and plants including cranes / tractors / trailers / trucks etc. that he proposes to be deployed for this work. This list shall be submitted by the contractor within 15 Days from the date of award of the work.

xix) The contractor shall arrange crane operator, diesel, petrol and other consumables required for the tools and plants, equipments etc. Preventive and routine maintenance of T & P are also to be arranged by the contractor at his cost without any delay. Required number of experienced mechanics and helpers for routine maintenance of the above cranes shall be arranged by the contractor within his quoted rate.

Chapter IV-A- Cranes to be deployed by BHEL

1.0 LIST OF CRANES FREE OF HIRING CHARGE TO BE PROVIDED BY BHEL:

Sl No	Description & Capacity of Crane	Quantity	Remarks
1	Cranes of Capacity above 75MT.	As per approved Crane Deployment Schedule	

1.1 Contractor shall submit crane deployment schedule within 15Days from the date of award of contract. Crane deployment schedule shall contain following details as a minimum:

1.1.1 Type of crane, crane capacity in MT, number of each crane

1.1.2 Schedule of crane requirement in bar chart format, including start date and end date.

1.1.3 Equipment wise crane requirement.

1.1.4 Any other details

1.2 BHEL shall review the crane deployment schedule submitted by the contractor and approve the same after discussion with contractor.

1.3 Contractor shall transport the cranes from BHEL stores, install, operate, carry out maintenance, dismantle after use and return to BHEL stores all T&Ps mentioned in Sr no 1.0 for his use.

1.4 These cranes are hired by BHEL. Operator for BHEL owned crane would be arranged by BHEL.

1.5 Contractor shall make necessary arrangements like providing and laying of special sleeper beds and steel plates , assembly and dismantling of heavy attachment, boom, jib etc for movement and operation of the crane. Contractor shall provide necessary manpower assistance for initial and final assembly & dismantling and for subsequent operations of boom extension and reduction during execution of work.

1.6 Contractor shall provide the fuel, Lubricants and consumables for BHEL provided cranes for his use. Major maintenance/ overhauling shall be in the scope of BHEL.

1.7 The day-to-day and routine maintenance including providing and replacement of spares for the BHEL T&Ps will be carried out by the contractor at his own cost.

1.8 Any loss/damage of tools by the contractor shall have to be replaced or otherwise cost there of shall be recovered from the contractor.

1.9 The contractor shall make necessary arrangement like laying of special sleeper beds, assembly & dismantling of heavy lift attachment, boom, jib etc. for movement and operation of crane.

Chapter V- Time Schedule

5. TIME SCHEDULE and MOBILIZATION

5.1 Initial mobilization: After receipt of fax/Email LOI, Contractor shall discuss with Project Manager / Construction Manager regarding initial mobilization. Contractor shall reach site, make his site establishment and be ready to commence the erection work within 15 days from the date of issue of Letter of Intent or as per the directions of Construction Manager/ Project Manager of BHEL. Such resources shall be progressively augmented to match the schedule of milestones and commissioning.

5.2 MOBILIZATION FOR ERECTION, TESTING, ASSISTANCE FOR COMMISSIONING ETC.

The activities for erection, testing etc. shall be started as per directions of Construction Manager of BHEL. Contractor shall mobilize further resources (in addition to those required for activities under clause no. 6.1) as per requirement to commence the work of erection, testing etc. and progressively augment the resources to match schedule of the project.

5.3 The entire work of "Mechanical Equipment Erection and Piping Works" as detailed elsewhere in the Tender Specification shall be completed within **18 Months** from the date of commencement of work at site.

5.4 During the total period of contract, the contractor has to carry out the activities in a phased manner as required by BHEL and the program of milestone events.

5.5 The 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.

5.6 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 will be final.

5.7 Tentative Schedule

Sl No	Activity Description	Start Date	End Date
1	Structure Erection	Feb 2022	Sep 2022
2	BOS Equipment Erection	Mar 2022	Dec 2022
3	Reaction Furnace Package	Aug 2022	Nov 2022
4	Incinerator Package	Aug 2022	Nov 2022
5	Piping Works	Feb 2022	Dec 2022
6	Pre commissioning works	October 2022	January 2023
7	Commissioning and Handing Over	January 2023	March 2023

5.4 CONTRACT PERIOD

For the purpose of contract, the period shall be taken as **18 Months.** Completion of the work shall be as per BHEL Bar Charts revised from time to time. In order to expedite the work, the contractor has to deploy manpower as per site requirement without any extra cost to BHEL.

5.5 GUARANTEE PERIOD

The guarantee period of twelve months shall commence from the date of completion of all works as certified by the BHEL site engineer.

5.6 PROTECTION OF WORK

The contractor shall have total responsibility for protecting his works until it is taken over by the Employer. No claim will be entertained by the Employer or the representative of the Employer for any damage or loss to the Contractor's works and the Contractor shall be responsible for complete restoration of the damaged works to original conditions to comply with the specification and drawings. Should any such damage to the Contractor's Works occur because of other party not being under his supervision or control, the Contractor shall make his claim directly with the party concerned.

If disagreement, conflict, or dispute develops between the Contractor and the other party or parties concerned regarding the responsibility for damage to the Contractor's Works the same shall be rectified. The Contractor shall not cause any delay in the repair of such damaged Works because of any delay in the resolution of such disputes. The Contractor shall proceed to repair the Work immediately and no cause thereof will be assigned pending resolution of such disputes.

5.7 Availability of required cranes, tools & tackles, establishment of Construction power supply arrangement shall be completed within 15 Days from the date of commencement of work.

Chapter VI- Statutory Regulation

6.1 BUILDING & OTHER CONSTRUCTION WORKERS (REGULATION OF EMPLOYMENT AND CONDITIONS OF SERVICE) ACT, 1996 (BOCW Act) AND RULES OF 1998 READ WITH BUILDING & OTHER CONSTRUCTION WORKERS CESS Act, 1996 & CESS RULES, 1998 and

INTER-STATE MIGRANT WORKMEN ACT, 1979 (IN CASE BIDDER ENGAGE MANPOWER FROM OTHER STATE)

In case any portion of work involves execution through building or construction workers and/or inter-state migrant workers, then compliance to the above titled Acts as applicable shall be ensured by the contractor and contractor shall obtain license and deposit the cess under the Act. In the circumstances, it may be ensured as under:-

It shall be the sole responsibility of the contractor in the capacity of employer to forthwith (within a period of 15 days from the award of work) apply for a license to the Competent Authority under the BOCW Act and/or ISMW Act as applicable and obtain proper certificate thereof by specifying the scope of its work. It shall also be responsibility of the contractor to furnish a copy of such certificate of license / permission to BHEL within a period of one month from the date of award of contract.

It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under these acts and rules including that of payment / deposit of cess as per the applicability under above referred Acts within a period of one month from the receipt of payment.

It shall be the responsibility of the sub-contractor to furnish the receipts / challans towards deposit of the cess together with the number, name and other details of beneficiaries (building/Inter-state Migrant workmen) engaged by the sub-contractor during the preceding month.

It shall be the absolute responsibility of the sub-contractor to make payment of all statutory payments & compensations to its workers including that is provided under the Workmen's Compensation Act, 1923.

Chapter VII: HSE (Health, Safety, Environment) and PPE (personal Protective Equipment) Guidelines

1. Contractor shall follow all the HSE guidelines as mentioned chapter IX off SCC and IOCL (Annexure-II).
2. Contractor shall deploy one (1) number of qualified and experienced safety officer for the entire period of contract.
3. Contractor shall submit the biodata of safety officer to BHEL/Customer (IOCL), for approval.
4. In case of any dispute/ contradiction, IOCL HSE rules and guidelines shall prevail.

Chapter VIII- Field quality control plan

1. Work shall be executed as per approved field quality control plan (FQCP). Indicative quality control plan of IOCL is attached as Annexure-IV. Contractor shall prepare, submit the field quality control plan in line with IOCL QCP.

Submitted FQCP shall be reviewed and approved by BHEL/IOCL/ TECHNIP.

Chapter IX- Equipment List and Piping Details

1. Equipment Details:

Sl No	Equipment Description	ID No	Weight in MT
1	Pipe Rack structure	088-PR-01	336
2	Air Preheater	088-E-002	25
3	Amine Acid Gas preheater	088-E-001	16
4	Amine Acid Gas KO drum pumps	088-P-001 A/B	3
5	SWS acid gas KO drum pumps	088-P-002 A/B	3
6	Condensate pumps	088-P-006 A/B	1
7	Sealing cooling water sump pump	088-P-010 A/B	2
8	Seal Bearing cooling water sump	088-SU-002	
9	Blowdown Drum	088-V-010	5.8
10	Condensate Drum	088-V-009	6.5
11	SWS Acid gas KO drum	088-V-002	9
12	Acid Gas KO drum	088-V-001	6.5
13	Condensate drum vent Condenser	088-AC-001	12.5
14	Blowdown Cooler	088-AC-002	8.5
15	Pipe Rack structure	090-PR-02	185
16	TSP Dosing Package	090-A-002	6
17	Fuel Gas KO drum	090-V-008	4.5
18	1st Condenser	088-E-003	40
19	2nd Condenser	088-E-005	40
20	Final Condenser	088-E-007	50
21	Tech Structure	088-TS-01	Shall be intimated after design approval
22	1st Reheater	088-E-004	42

23	2nd Reheater	088-E-006	43
24	1st Condenser seal pot	088-V-005	5
25	2nd Condenser seal pot	088-V-006	5
26	Degassing seal pot	088-V-008	5
27	Sulphur Cooler	088-E-009	2.5
28	Tech Structure	088-TS-01	Shall be intimated after design approval
29	Ejectors	088-EJ-001 A/B	0.9
30	Final Condenser seal pot	088-V-007	5
31	1st Converter	088-R-001	85
32	2nd Converter	088-R-002	85
33	Tech Structure	088-TS-01	Shall be intimated after design approval
34	BFW Preheater	088-E-008	1.5
35	Degassing Contactor	088-C-001	35
36	Sulphur pit	088-SU-001	NA
37	Degassing Pumps	088-P-004A/B	5
38	Sulphur pit pumps	088-P-005A/B	5
39	Waste Heat Exchanger 2nd Pass	088-WHB-002	130
40	Waste Heat Exchanger 1st Pass	088-WHB-001	120
41	Waste Heat Exchanger Steam Drum	088-V-004	45
42	Reaction Furnace	088-F-002	240
43	Reaction Furnace Burner	088-F-001	10
44	TSP Dosing Package (Skid Mounted)	088-A-002	5
45	Incinerator Fans	090-K-001A/B	100
46	Incinerator stack	090-SK-001	200

47	Incinerator WHE Mud Drum	090-V-007	
48	Incinerator WHE Steam Drum	090-V-006	
49	Incinerator Waste Heat Exchanger	090-WHB-001A/B	
50	Incinerator HP steam desuperheater	090-DS-002	
51	Incinerator burner	090-F-001	6
52	Incinerator	090-F-002	120
53	Analyzer Enclosure	090-AH-001	0.5

2. Piping System Details

Table-1

ESTIMATED WEIGHT OF PIPING SYSTEMS INCL VALVES (IN MT)

CONSOLIDATED SUMMARY

				NON IBR BREAKUP	
MATERIAL	**IBR**	**NON IBR**	**TOTAL**	NON IBR ***NACE (+HIC)***	NON IBR ***NON NACE***
Alloy Steel (P11)	**5.17**	**-**	**5.17**	**-**	**-**
Stainless Steel (304L, 316L)	**-**	**5.78**	**5.78**	**-**	**5.78**
Carbon Steel (Plain)	**254.07**	**823.30**	**1,077.37**	**347.26**	**476.04**
Carbon Steel (Galvanised)	**-**	**11.62**	**11.62**	**-**	**11.62**
Carbon Steel (Internal Epoxy Coated)	**-**	**11.67**	**11.67**	**-**	**11.67**
TOTAL	**259.24**	**852.37**	**1,111.60**	**347.26**	**505.11**

TABLE-2

ESTIMATED WEIGHT OF PIPING SYSTEMS INCL VALVES (IN MT)

ITEM WISE SUMMARY

				NON IBR BREAKUP	
MATERIAL	**IBR**	**NON IBR**	**TOTAL**	NON IBR *NACE (+HIC)*	NON IBR *NON NACE*
PIPES					
Alloy Steel (P11)	**2.19**	**-**	**2.19**	**-**	**-**
Stainless Steel (304L, 316L)	**-**	**4.38**	**4.38**	**-**	**4.38**
Carbon Steel (Plain)	**183.99**	**582.55**	**766.54**	**253.28**	**329.27**
Carbon Steel (Galvanized)	**-**	**8.45**	**8.45**	**-**	**8.45**
Carbon Steel (Internal Epoxy Coated)	**-**	**10.76**	**10.76**	**-**	**10.76**
SUB TOTAL	**186.18**	**606.14**	**792.32**	**253.28**	**352.86**
FITTINGS (ELBOW, TEE, REDUCER, CROSS, STUB)					
Alloy Steel (P11)	**0.28**	**-**	**0.28**	**-**	**-**
Stainless Steel (04L, 316L)	**-**	**0.24**	**0.24**	**-**	**0.24**
Carbon Steel (Plain)	**19.89**	**104.78**	**124.66**	**41.96**	**62.82**
Carbon Steel (Galvanised)	**-**	**0.71**	**0.71**	**-**	**0.71**
Carbon Steel (Internal Epoxy Coated)	**-**	**0.52**	**0.52**	**-**	**0.52**

SUB TOTAL	**20.17**	**106.25**	**126.42**	**41.96**	**64.29**
FLANGES (FLANGE, BLIND FLANGE, FIG 8 BLANK, SPACER & BLANK)					
Alloy Steel (P11)	**0.57**	**-**	**0.57**	**-**	**-**
Stainless Steel (304L, 316L)	**-**	**0.40**	**0.40**	**-**	**0.40**
Carbon Steel (Plain)	**15.03**	**71.13**	**86.16**	**20.75**	**50.38**
Carbon Steel (Galvanised)	**-**	**0.34**	**0.34**	**-**	**0.34**
Carbon Steel (Internal Epoxy Coated)	**-**	**0.39**	**0.39**	**-**	**0.39**
SUB TOTAL	**15.60**	**72.25**	**87.85**	**20.75**	**51.50**
GASKETS (METALLIC SPIRAL WOUND, NBR SHEET)					
Alloy Steel (P11)	**-**	**-**	**-**	**-**	**-**
Stainless Steel (304L, 316L)	**-**	**-**	**-**	**-**	**-**
Carbon Steel (Plain)	**-**	**3.23**	**3.23**	**0.81**	**2.42**
Carbon Steel (Galvanised)	**-**	**-**	**-**	**-**	**-**
Carbon Steel (Internal Epoxy Coated)	**-**	**-**	**-**	**-**	**-**
SUB TOTAL	**-**	**3.23**	**3.23**	**0.81**	**2.42**
BOLTING (STUD WITH 2 NUTS, STUD WITH 3 NUTS)					
Alloy Steel (P11)	**0.19**	**-**	**0.19**	**-**	**-**
Stainless Steel (304L, 316L)	**-**	**-**	**-**	**-**	**-**

Carbon Steel (Plain)	**-**	**15.73**	**15.73**	**4.17**	**11.56**
Carbon Steel (Galvanised)	**-**	**0.07**	**0.07**	**-**	**0.07**
Carbon Steel (Internal Epoxy Coated)	**-**	**-**	**-**	**-**	**-**
SUB TOTAL	**0.19**	**15.80**	**15.99**	**4.17**	**11.64**
VALVES (GATE, GLOBE, CHECK, PLUG, BALL, BUTTERFLY)					
Alloy Steel (P11)	**1.94**	**-**	**1.94**	**-**	**-**
Stainless Steel (304L, 316L)	**-**	**0.77**	**0.77**	**-**	**0.77**
Carbon Steel (Plain)	**35.17**	**45.88**	**81.05**	**26.29**	**19.59**
Carbon Steel (Galvanised)	**-**	**2.05**	**2.05**	**-**	**2.05**
Carbon Steel (Internal Epoxy Coated)	**-**	**-**	**-**	**-**	**-**
SUB TOTAL	**37.10**	**48.70**	**85.80**	**26.29**	**22.41**

TABLE-3

ESTIMATED INCH-DIA OF PIPING SYSTEMS

				NON IBR BREAKUP	
MATERIAL	**IBR**	**NON IBR**	**TOTAL**	NON IBR *NACE (+HIC)*	NON IBR *NON NACE*
Alloy Steel (P11)	**212**	**-**	**212**	**-**	**-**
Stainless Steel (304L, 316L)	**-**	**343**	**343**	**-**	**343**

Carbon Steel (Plain)	**9,348**	**25,755**	**35,103**	**11,493**	**14,262**
Carbon Steel (Galvanised)	**-**	**687**	**687**	**-**	**687**
Carbon Steel (Internal Epoxy Coated)	**-**	**481**	**481**	**-**	**481**
TOTAL	**9,560**	**27,266**	**36,826**	**11,493**	**15,773**

TABLE-4

ESTIMATED INCH-METER OF PIPING SYSTEMS

				NON IBR BREAKUP	
MATERIAL	**IBR**	**NON IBR**	**TOTAL**	NON IBR ***NACE (+HIC)***	NON IBR ***NON NACE***
Alloy Steel (P11)	**339**	**-**	**339**	**-**	**-**
Stainless Steel (304L, 316L)	**-**	**1,233**	**1,233**	**-**	**1,233**
Carbon Steel (Plain)	**34,216**	**1,04,195**	**1,38,411**	**43,154**	**61,041**
Carbon Steel (Galvanised)	**-**	**2,662**	**2,662**	**-**	**2,662**
Carbon Steel (Internal Epoxy Coated)	**-**	**2,260**	**2,260**	**-**	**2,260**
TOTAL	**34,555**	**1,10,350**	**1,44,905**	**43,154**	**67,196**

3. Fire detection and Protection System

Water Based Fire Protection System					
Sl. No.	**Item Description**	**Quantity**	**Unit of Measurement (Nos./Sets etc.)**	**Unit Weight (in MT)**	**Total weight (in MT)**
A. HYDRANT SYSTEM					
1	Pipe				
1.1	250 NB	650	Mts	0.060	39.16
1.2	150 NB	240	Mts	0.028	6.78
1.3	100 NB	176	Mts	0.016	2.83
1.4	80 NB	40	Mts	0.011	0.45
1.5	50 NB	12	Mts	0.005	0.07
1.6	40 NB	12	Mts	0.004	0.05
2	SS Hydrant Valve	36	No.	0.020	0.7
3	Air release valve (25 mm dia)	3	No.	0.001	0.0
4	Drain Valve-50 NB	3	No.	0.015	0.0
5	Hose Pipe (15 M length)	40	No.	0.020	0.8
6	Hose Box				
6.1	External + Internal	20	No.	0.015	0.3
7	Branch Pipe with Nozzle	20	No.	0.010	0.2
8	Hose Reel	7	No.	0.025	0.2
9	Water Monitor	5	No.	0.080	0.4
10	Gate Valve				
10.1	250 NB	10	No.	0.200	2.0
10.2	150 NB	11	No.	0.076	0.8
10.3	100 NB	20	No.	0.044	0.9
10.4	40 NB	7	No.	0.010	0.1
11	Isolation Valve for Riser (BFV)				
11.1	150 NB	1	No.	0.011	0.01
11.2	100 NB	2	No.	0.006	0.01

12	Fittings, Flanges and Structural Steel etc	1	lot		14.8
13	Wrapping and coating of UG pipe (150NB Pipe)	400	sqmt		
14	Paint Material	1	LOT		
B. MANUAL SPRAY SYSTEM (Acid Gas KO Drum and SWS acid Gas KO drum)					
1	Pipe				
	150 NB	30	Mtrs	0.028	0.85
	100 NB	50	Mtrs	0.016	0.80
2	150 NB Strainer	2	No.	0.12	0.24
3	GATE Valve-150 NB	2	No.	0.076	0.15
ii	50 NB	380	Mtrs	0.005	2.05
iii	25 NB	40	Mtrs	0.003	0.10
3	Spray Nozzle	60	No.	0.001	0.03
4	Structural Steel, Pipe Fittings, Flanges, nut blot & gasket, Pipe clamps	1	Lot		0.49497
5	Paint & Primers	1	Lot		

Gas Detection System

Sl. No.	Item	Quantity	Unit Weight (in Kg)	Total Weight (in Kg)
1	COMBUSTIBLE GAS DETECTOR (INFRA-RED POINT TYPE)	3	2.5	7.5
2	COMBUSTIBLE GAS DETECTOR (OPEN PATH	1	10	10
3	HYDROGEN GAS DETECTOR		2.5	0
4	FLAME DETECTOR (ULTRAVIOLET / INFRA-RED TYPE)	11	7.5	82.5
5	TOXIC GAS DETECTOR (H2S)	19	2.5	47.5
6	SOUNDER	3	5	15
7	TOXIC GAS DETECTION (BLUE FLASHING BEACON)	3	5	15

8	COMBUSTIBLE GAS DETECTION (YELLOW FLASHING BEACON)	3	5	15
9	FIRE DETECTION (RED FLASHING BEACON)	3	5	15
10	TOXIC GAS DETECTOR (SO2)	6	2.5	15
11	TOXIC GAS DETECTOR (NH3)	2	2.5	5
13	Junction Boxes for Hooter & Beacons	20	10	200

Portable Fire Extinguishers

Sl No	Item	Quantity	Unit Weight (in Kg)	Total Weight (in Kg)
1	DCP 6kg	10	10	100
2	DCP 9kg	10	15	150
3	DCP 50kg	4	125	500
4	CO2 4.5kg	10	20	200
5	CO2 6.5kg	10	30	300
6	Self-contained Breathing Apparatus	1	10	10

Chapter X- Payment Terms

1. Following shall be the payment terms for Section-A of the Un-Priced bid format.

Item no.	Section No.	Description	Remarks
1	**Section-A1**	**Erection, Testing and Commissioning of Piping system:** Receipt from BHEL store, transportation to site, inspection, obtaining statutary approvals/ certificates as applicable, pre-assembly, erection, alignment, welding, NDT, fixing of hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing including temporary piping and pumps required for testing, surface finish, supply & application of primer & finish paints of all the pipes including pipe fittings and support structures as per requirement / as given in the drawings including labeling & flow direction on the piping / over insulation & hangers and supports, pre-commissioning, commissioning, trial operation & handing over to customer and supply & application of final painting, etc. for all the piping systems of Standby Sulphur Recovery Unit (SRU) Train Of 525 TPD along with Incinerator and Waste Heat Exchanger, Stack and Interconnecting works for IOCLl Paradip Refinery, Odisha, India.	Payment Terms: Payment shall be as per following methodology: 1. 90% after completion of respective line item of the BOQ. 2. 10% after final testing, pre-commissioning, commissioning, touch up painting and punch point completion and handing over.
2	**Section-A2**	**Equipment Erection:** Erection, Testing, commissioning, trial operation and handing over to customer including receipt, unloading, handling of materials at BHEL strores and transportation to site, supply and application of touch up painting, obtaining statutary approvals/ certificates as applicable of; Reaction furnace package, Incinerator package, Heat exchangers, Vessels, Drums and all other BOS (Balance of Supplies) equipment of Standyby Sulphur Recovery Unit (SRU) Train Of 525 TPD along with Incinerator and Waste Heat Exchanger, Stack and Interconnecting works for IOCLl Paradip Refinery, Odisha, India.as per technical specifications and approved drawings	Payment Terms: Payment shall be as per following methodology: 1. 80% after transportation, placing in position on foundation/structure/alignment & Torqueing/welding/grouting as applicable for respective equipment. 2. 20% After touch up painting, testing, pre-commissioning, commissioning, punch point completion and handing over.
3	**Section-A3**	**Contro® Trace Works**	Payment Terms: Payment shall be as per following methodology: 2. 85% after erection (Laying in position) 2. 15% After , final testing, pre-commissioning, commissioning

			punch point completion and handing over.
4	**Section-A4**	**Insulation Works**	Payment Terms: Payment shall be as per following methodology: 1. 85% after installation 2. 15% After pre-commissioning, commissioning, punch point completion and handing over.
5	**Section-A5**	**Expert Manpower for Commissioning Works:** Providing expert manpower for commissioning of the total project as per of TCC	Payment Terms: 1. 85% After pre-commissioning, commissioning 3. 15% after punch point completion and handing over.
6	**Section-A6**	**Structural Steel Works:** Erection, Testing and commissioning of all structural steel works.	Payment Terms: Payment shall be as per following methodology: 1. 90% after completion of respective line item of the BOQ. 2. 10% after punch point completion and handing over.

Note: Retention Amount shall be 5% of executed contract value and shall be recovered at the rate of 5% from each Running Bill admitted, over and above the stage payment as mentioned above**.** For more detail refer the GCC clause no.2.22.

Chapter XI- List of Documents

Work shall be performed as per below listed documents, customer/ BHEL specifications, and approved drawings issued by BHEL:

Sl No	Description	Reference	Remarks
1	Plot Plan	Annexure-I	
2	HSE & PPE	Annexure-II	
3	Erection Scheme of Incinerator Stack (Sample)	Annexure-III	
4	Quality Control Plans	Annexure-IV	
5	Construction Specification	Annexure-V	
6	Job Specifications	Annexure-VI	
7	Mechanical Completion and Commissioning Guidelines	Annexure-VII	
8	Controtrace brochure for Installation	Annexure-VIII	
9	BHEL T&P Hire Charges	Annexure-IX	

Chapter-XII :- SCRAP AND EXCESS MATERIALS:

Piping material will be issued at lengths (as per drawing) as stocked by the Bharat Heavy Electricals Limited. The surplus pipes is represented by the difference between the quantity received and the quantity required (BHEL Certified quantity as per drawing and specification) and utilized on the work with an allowance of 2.5% (By weight MT) towards scrap.

All Scrap shall belong to BHEL; Contractor has to remove all the scrap from the site to BHEL designated Place/Store as directed by BHEL Site engineer.

Excess consumption of piping wrt the actual quantities of materials consumed in excess of the actual requirements as per design/drawing shall be charged for at punitive rates of Rs.1,14,000/ton plus 5% administrative Charges after allowance of 2.5% towards scrap, will be recovered.