PART-I I

BHARAT HEAVY ELECTRICALS LIMITED
INDUSTRIAL SYSTEMS GROUP BANGALORE

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JOB NO - IS – 1 - 10 - 2000

TECHNICAL SPECIFICATION FOR ENGINEERING SERVICES FOR CIVIL, STRUCTURAL & ARCHITECTURAL WORKS OF CHP PACKAGE

HINDUJA NATIONAL POWER CORPORATION LTD.
2X 520 MW VIZAG THERMAL POWER PROJECT

Note: - In case any clarification is required, with regard to technical specification, please contact us over
Email gkp@bhelisg.com

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PREPARED BY	CHECKED BY	APPROVED BY

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SECTION-VIII

1.0 DEFINITIONS

The following terms and expressions used herein shall have the meanings as indicated below:

1.1 OWNER

This has a reference to General Condition of Contract Clause 1.2. The Owner for the Project is – HNPCL, HINDUJA NATIONAL POWER CORPORATION LTD.

1.2 PROJECT ENGINEER

Shall mean the Engineering Officer appointed by BHEL to act as "Coordinator" from time to time on behalf of BHEL in all matters pertaining to this work. He or his nominee(s) shall further direct, supervise, inspect, check, scrutinize, measure, approve and certify for payments some or all the scope of work and be in charge of work defined here-in-below.

2.0 CIVIL AND STRUCTURAL WORKS

2.1 GENERAL

The scope of work, for this area covers Design, Engineering, Preparation of Documentation, Obtaining Approval of BHEL / Owner / Customer's Consultant, Procurement Assistance, Site Assistance etc. for the following:

The Scope of Work shall include but shall not be limited to Preparation of Schemes and Conceptual Designs according to the requirements, Detailed Civil, Structural, Architectural Design and Analysis on the basis of loading parameters, preparation of analysis / design document and preparation of Construction Drawings, including various activities at Contract Stage. The activities **involved shall include furnishing phase-wise requirements of Structural Steel, Reinforcing Steel and Cement for procurement purposes**; detailed Design and Engineering required for the Permanent Works; Preparation of As-Built drawings, Checking of fabrication drawings and connection design, checking of design and drawings of BHEL vendors, providing Design Clarifications during Construction Stage as and when required at Site; and any other activity required for the Contract Stage.

The following services are envisaged in the scope of the Sub-Consultant:

I. The scope of this work includes complete Architectural, Civil and Structural Design and Drawings Services for Civil Works as per 'CIVIL-TABLE-1 in Clause 5.0. The list is only indicative. It is not intended to limit the Engineering work to these Equipments / Buildings / Facilities. Sub-Consultant to carry out Civil Engineering, depending on the BHEL scope.

II. Preparation of List of Documents, Drawings and Submission Schedule w.r.t. Construction Schedule.

III. Submission of Progress Report and Input requirements.

IV. Preparation of 3D Analysis, Design and Drawings for various Buildings, Equipment Foundations, Structures and Services listed in the scope of Civil Works (Enclosure: " CIVIL-TABLE-1" in Clause 5.0).

V. Preparation of advance Bill of Materials for procurement of Cement, Reinforcement Steel and Structural Steel.

VI. Preparation of As-Built drawings.

VII. Checking of structural steel connection designs and fabrication drawings.

VIII. Preparation of Bill of Quantities (BOQ) containing major cost items like Structural Steel, Reinforcement Steel, Concrete, Shuttering etc. for all structures based on 'Released for Construction', drawings and to be updated based on As Built Drawings. However all relevant construction drawings shall contain a table indicating BOQ's for PCC, RCC (grade wise) and Reinforcing Steel (diameter wise) and Structural Steel (Section wise.)

IX. Seismic analysis including dynamic analysis shall be as per IS 1893 / site specific seismic data as applicable.

X. Provide Technical Advice / Recommendations regarding Site related Construction Problems as and when required including Site Visits, participation in meetings with BHEL / Customer / Customer's Consultant.

XI. Checking of architectural, civil & structural drawings, analysis and design submitted by BHEL vendors. The design shall be checked for all CODAL and statutory requirements in addition to checking of all interfaces with mechanical, electrical etc.

XII. Incorporation of Civil Interface details in respective civil drawings using Vendor drawings.

XIII. Sub-Consultant is expected to give a most economical design for the Civil structures, without compromising on Customer Specifications, CODAL and Statutory requirements etc.

XIV. Sub-Consultant shall take care that the items, specifications and details shown in the drawings are strictly in accordance with Technical Specifications. If there is any variation the same must be referred to BHEL for opinion.

XV. Sub-Consultant is expected to bring to the notice of BHEL any aspect of Customer Specification, which is at variance with CODAL provisions and Standard Practice, for BHEL to consider the same and give a decision before Seller / Contractor proceeds with Engineering.

XVI. Sub-Consultant is expected to carry out the Engineering based on the Customer / BHEL specifications, CODAL and Statutory requirements and BHEL standard practices for the project.

XVII. The scope of work also includes Sub-Consultant getting the approval of Customer / Customer's consultant / BHEL for the schemes and detailed calculations, design drawings and construction drawings after incorporation of comments of BHEL / Customer.

2.2 DOCUMENTS TO BE PREPARED/SUBMITTED BY SUB-CONSULTANT

Following documents shall be submitted for approval of the Owner / BHEL. The list is not exhaustive but indicative only. **However, the Sub-Consultant shall submit the documents related only to the specific Scope of Work (as per Table-1, in Clause 5.0).**

- List of Drawings and Document Submission Schedule.
- Architectural concepts for Buildings.
- Architectural Floor plans, Elevations and Cross Sections of all Buildings.
- Structural analysis, Detailed Design and engineering Drawings of all Buildings & Structures under this Contract. Dynamic analysis including Mathematical Models considered in the Structural Analysis shall be furnished. The analysis document shall consist of

analytical model, figures of node and member numbers, analysis philosophy, detailed load calculation, complete analysis results and shall be self explanatory. The design document shall consist of design philosophy, detailed design calculation for critical load case and summary of design calculation for all load combinations. The Sub-consultant shall include all the details / calculations in the analysis/design document and drawings as required by BHEL / Customer / Customers consultant. The Seller / Contractor shall carry out any additional / alternative analysis or design (other than those necessarily stipulated in codes / design memorandum) as required by BHEL / Customer / Customer's consultant at no additional cost to BHEL.

- Detailed Dynamic analysis, Design calculations and Drawings for Machine Foundations.
- Design Calculations and Drawings for all Building Foundations, all Sub-Structures and Super Structures; Channels, Trenches, etc.
- Detailed Design and Drawings of all Pipe & Cable Racks including supporting structures and foundations.
- Detailed Finish Schedule of all Buildings in scope.
- Details of Hot and Cold Water Plumbing and Drainage including Architectural Plans for Toilets, Kitchens and Pantries.
- Detailed Design and Drawings of False Flooring and False-Ceilings.
- Details of connection of Sewage Disposal Pipes to the Sewage Treatment system within battery limit
- Civil Engineering Designs along with detailed Hydraulic Calculations and Drawings of complete Plant Storm Water Disposal System.
- Rigid & flexible design for roads & pavements, as required.
- Detailed Design calculations and drawings of Culverts and Railway Track Crossings.
- Color Scheme, Internal & External for all Buildings & Facilities in scope.
- Details of Doors and Windows and Ventilators.

- Detail landscaping of the entire plant area including details and quantum of plantations (grass, trees, shrubs etc.) with their scientific and local names, water bodies, water distribution system (pipes, sprinklers, enhancer, reducer etc.)

- Detail Bill of Quantity of all items required for landscaping of entire plant area (plantations, pipes, sprinklers, water bodies, soil turning, stone pitching etc).

- As Built Drawings.

- Review of Structural Steel Shop Drawings.

2.3 EXCLUSIONS

Following items are not included in the Scope of Works**:**

i). Preparation of Schedule of Quantities and Technical specification for Sub Contracting of Civil works.

ii). Evaluation and Award of Contract for Civil Works

iii). Site Management.

iv). Temporary Works For Construction.

2.4 INPUT DATA BY BHEL

This shall include but not be limited to the following information:

i) Owner's/ BHEL Technical Specifications and Geo-Technical investigation / Contour Plan and Site survey report. The technical specification shall be binding for all engineering works over and above CODAL and statutory requirements.

ii) Loading Plan of Equipments along with anchoring arrangements for design.

Above data shall be supplied progressively to serve the mutually agreed work schedule.

2.5 GENERAL REQUIREMENTS

i) On receipt of intimation from BHEL, the Sub-Consultant's representative shall collect the Technical Data from the office of BHEL and start working on the job. In case any clarification is

required, the same would have to be discussed by Sub-Consultant with BHEL. Before submitting the designs, drawings and any other document for approval, the Sub-Consultant shall carefully and thoroughly check the same in accordance with Owner's

Requirements so as to minimize re-submissions, if any, which shall be at the cost of the Sub-Consultant. Further while getting the same approved from Owner, the sub-consultant's representative shall be present for providing any clarifications if required.

ii) All works shall be carried out based on functional requirements and Customer / BHEL's specifications and amendments issued from time to time.

iii) All designs, structural analysis and preparation of drawings shall be carried out by computer on BHEL title blocks / formats. All drawings shall be prepared using AutoCAD software(latest version). The analysis of structures shall generally be done by computer using software STAAD Pro(latest version)whereas the design shall be carried out by computer using in-house validated software. Soft copies in editable native format of all calculations / drawings shall be submitted along with hard copies. All computer programmes to be used shall be subject to the approval of Customer / Customer's Consultant / BHEL with necessary validation, if required.

iv) All information, drawings, classified documents provided by BHEL to Sub-Consultant for the purpose of carrying out a project work shall remain the property of BHEL and shall be returned to BHEL on completion of the project. All information generated during the execution of the project, such as details, designs, drawings and documents by Sub-Consultant shall be exclusive property of BHEL and its Intellectual Property rights shall be that of BHEL. BHEL shall have full right to use these in any manner suitable to BHEL Business requirements. Sub-Consultant will execute Non-Disclosure Agreement as required by BHEL in this respect. This section will survive the expiration or termination of contract.

v) The Sub-Consultant shall use only standard A-0/A-1 size sheets with BHEL standard title block and format for drawings unless noted otherwise. All calculations shall be in A4/A-3 size sheets having BHEL standard format. The drawing and design document shall have BHEL number format only and shall not have any Sub-Consultant number format.

vi) Details of loading parameters, Equipment Details etc. required from BHEL / Customer cannot be supplied in one lot and shall be supplied progressively in parts by BHEL / Customer.

vii) The Sub-Consultant shall be required to Add / Alter / Modify the already Approved Design / Drawings and / or include the substitutions in Steel Sections and Reinforcing Bars depending upon Material Availability and Project Time Schedule requirements. These may have to be resorted to even after completion and approval of Construction / Fabrication drawings, without any extra cost to BHEL.

viii) The Bill of Quantities for Major Civil and Structural items shall be furnished in respective Construction Drawings.

ix) Sub-Consultant shall be fully responsible for the adequacy of the Design and Detailing. BHEL / Customer are checking and / or approval shall not absolve Sub-Consultant of their responsibility for Design, its Correctness and Commercial Risk attendant to the same.

x) Sub-Consultant shall also accept the Deletion of any work of the Present Scope subject to maximum of 10% of the Contract Price for Civil Works.

xi) All requirements given in the owner's specifications are included in the sub-consultant's scope, unless specifically excluded from the sub-Consultant's scope.

xii) Any comment received even after approval of design and drawing shall be incorporated by the Sub-Consultant and revise the design & drawing, if necessary, at no extra cost.

xiii) Sub consultant shall use BHEL standard analysis, design and detailing procedures, wherever provided by BHEL.

3.0 TIME SCHEDULE FOR COMPLETION OF ACTIVITIES

Detailed design and release of construction drawings shall match the construction schedule.

VIZAG THERMAL POWER PROJECT

The last Date for Completion of detailed Engineering (DCE) including release of all construction drawings shall be DEC 2011 However the Date

for Completion of Contract (DCC) shall be DEC 2012 for submission of As Built Drawings.

It shall be the Sub-Consultant's responsibility to engage requisite manpower, provide requisite interface inputs for design in BHEL unit's scope and also to check the interface documents from BHEL – units and vendors to maintain progress as per schedule.

4.0 DRAWING / DOCUMENTS SUBMISSION

		FOR TAKING CLEARANCE OF BHEL BEFORE SUBMISSION TO CUSTOMER FOR APPROVAL	FOR APPROVAL	FOR CONSTRUCTION [AFTER APPROVAL]
Drawings	Hard copy	5	12	18
	Soft copy (AutoCAD)	01	2*	3*
	Soft copy (PDF)	01	02*	03*
Designs/ Documents	Hard copy	03	05	06
	Soft copy (Excel/Word)	01	02	02
	Soft copy# (PDF)	01	03*	03*
Analysis Model	Soft Copy (STAAD/Any analysis software input & output file)	01	02	02

A complete compiled single PDF file of the design document shall be submitted by the Sub-Consultant such that BHEL can directly print it to obtain the hard copy of the analysis / design document.

The signatures of 'Prepared by', 'Checked by' & 'Approved by' as required in the drawings and the documents shall be scanned and attached to all the soft copies (PDF format) at specified locations. The soft copy (PDF format) shall not be considered submitted without signatures.

As-built Drawings	Hard Copy	--
	Soft Copy (PDF)	01*
	Soft Copy (AutoCAD)	01*

All soft copies shall be transmitted by Sub-Consultant through E-mail. In addition, the soft copies marked (*) above shall be submitted in consolidated groups at a suitable interval by sub consultant on CDs during the course of execution of project.

Some of the drawings may undergo many revisions during concurrent engineering, which shall be carried out without any additional cost.

5.0 SCOPE & PRICE SCHEDULE

Providing detailed Civil, Architectural & Structural Analysis, Design and Drawings for the under defined scope, meeting specification requirements including providing all resources, incorporation of comments, revision of drawings and designs, etc., providing design clarifications to site as and when required etc including cost of courier charges for sending CD's but excluding cost of visit which will be paid separately as per schedule under - Clause 6.0

The scope of engineering work for each system / building is sub-divided into Superstructure engineering (structural analysis, design, drawing of the superstructure), Sub structure engineering (structural analysis, design, drawing of the substructure), Architectural Engineering (Conceptual design, detail architectural drawing), Layout engineering (planning, drawing), Checking of Fabrication drawings etc.

The scope of work for the project (**VIZAG THERMAL POWER PROJECT),** is given in TABLE 1 below:-

ANNEXURE – 2

UNPRICE FORMAT

(Price shall not be quoted)

DESCRIPTION	DETAILS	QUOTED	NOT-QUOTED
WAGON TIPPLER	SUB STR ENGG		
	SUPER STR. ENGG/REVIEW		
	ARCH. ENGG		
TRACK HOPPER	SUB STR ENGG		
	SUPER STR. ENGG		
	ARCH. ENGG		
TRUCK TIPPLER	SUB STR ENGG		
	SUPER STR. ENGG		
	ARCH. ENGG		
TUNNELS FOR CONVEYORS FROM WAGON TIPPLER PIT AND TRACK HOPPERTO PENT HOUSE	SUB STR ENGG		
TUNNEL FOR CONVEYOR FROM TRUCK HOPPER PIT/RECLAIMHOPPER TO PENT HOUSE	SUB STR ENGG		
UNDER GROUND HOPPER TRUCK TIPPER/RECLAIM HOPPER	SUB STR ENGG		
	SUPER STR. ENGG		
	ARCH. ENGG		
UNDER GROUNDTRANSFER POINTSTP10 AND PENT	SUB STR ENGG		
	SUPER STR. ENGG		

HOUSE	ARCH. ENGG		
CRUSHER HOUSE	SUB STR. ENGG. R.C.C FLOOR & ROOF		
	ARCH. ENGG		
CONTROL ROOMS	SUB STR ENGG		
	SUPER STR. ENGG		
	ARCH. ENGG.		
ELECTRICAL BUILDINGSINCLUDINGS TRANFORMER YARD	SUB STR ENGG		
	SUPER STR. ENGG		
	ARCH. ENGG		
D.S. PUMP HOUSESAND TANKS ETC	SUB STR ENGG		
	SUPER STR. ENGG		
	ARCH. ENGG.		
PIPE AND CABLE RACKS	SUB STR. ENGG.		
	SUPER STR ENGG.		
INTER CONNECTION ROADS, DRAINS-CULVERTS, SEWAGE SYSTEM UP TO DISCHARGE POINT	LAYOUT ENGG.		
	SUB STR ENGG.		
COMPRESSOR HOUSE FOR TRACK HOPPER	SUB STR. ENGG.		
	SUPER STR ENGG.		
	ARCH. ENGG.		
JUNCTION HOUSE 1	SUB STR. ENGG.		
	ARCH. ENGG.		
JUNCTION HOUSE 2	SUB STR. ENGG. R.C.C FLOOR & ROOF		
	ARCH. ENGG.		

JUNCTION HOUSE 3	SUB STR. ENGG. R.C.C FLOOR & ROOF		
	ARCH. ENGG.		
JUNCTION HOUSE 4	SUB STR. ENGG. R.C.C FLOOR & ROOF		
	ARCH. ENGG.		
JUNCTION HOUSE 5	SUB STR. ENGG. R.C.C FLOOR & ROOF		
	ARCH. ENGG.		
JUNCTION HOUSE 6	SUB STR. ENGG. R.C.C FLOOR & ROOF		
	ARCH. ENGG.		
JUNCTION HOUSE 7	SUB STR. ENGG. R.C.C FLOOR & ROOF		
	ARCH. ENGG.		
JUNCTION HOUSE 8	SUB STR. ENGG. R.C.C FLOOR & ROOF		
	ARCH. ENGG.		
JUNCTION HOUSE 9	SUB. STR ENGG. R.C.C FLOOR & ROOF		
	ARCH. ENGG.		
CONVEYOR GALLERY 3 A/B WITH TRESTLES	SUB STR. ENGG.		
	ARCH. ENGG.		
CONVEYOR GALLERY 4 A/B WITH TRESTLES	SUB STR. ENGG.		
	ARCH. ENGG.		
CONVEYOR GALLERY 6A/B WITH TRESTLES	SUB STR. ENGG.		
	ARCH. ENGG.		
CONVEYOR GALLERY 8A/B WITH TRESTLES	SUB STR. ENGG.		
	ARCH. ENGG.		
CONVEYOR GALLERY 9 A/B WITH TRESTLES	SUB STR. ENGG.		

	ARCH. ENGG.		
CONVEYOR GALLERY 10 A/B, WITH TRESTLES (FROM JN5 TO JNT 1)	SUB STR. ENGG.		
	ARCH. ENGG.		
CONVEYOR GALLERY 11 A/B, 12 A/B, 13 A/B & 14 A/B WITH TRESTLES	SUB STR. ENGG.		
	ARCH. ENGG		
CONVEYOR GALLERY 2 WITH TRESTLES	SUB STR. ENGG		
	ARCH. ENGG.		
CONVEYOR GALLERY 5 WITH TRESTLES	SUB STR. ENGG.		
	ARCH. ENGG.		
CONVEYOR GALLERY 7 WITH TRESTLES	SUB STR. ENGG.		
	ARCH. ENGG.		
BULL DOZER HOUSE	SUB STR. ENGG.		
	SUPER STR ENGG.		
	ARCH. ENGG.		
PUMP, COMPRESSOR, FANS AND MISCELLANEOUSEQUIPMENT FOUNDATIONS	SUB STR ENGG.		
WT CONTROL ROOM WITH TRANSFOMER YARD	SUB STR. ENGG.		
	SUPER STR ENGG.		
	ARCH. ENGG.		
WATER TANK FOR D.S. SYSTEM AND WATER SUPPLY	SUB STR. ENGG.		
	SUPER STR ENGG.		
FLOOD LIGHTING TOWERS	SUB STR. ENGG.		
	SUPER STR ENGG..		
STOCK YARD & STOCK YARD DRAINS INDEGINOUS COAL	LAYOUT ENGG.		
	SUB STR. ENGG		
STOCK YARD & STOCK	LAYOUT ENGG.		

YARD DRAINS IMPORTED COAL	SUB STR. ENGG		
STACKER RECLAIMER FOUNDATION & ANCHOR BLOCKS	SUB STR. ENGG.		
COAL SLURRY POND, PUMP HOUSE AND DRAINAGE	SUB STR. ENGG.		
	SUPER STR ENGG.		
	ARCH. ENGG.		
LANDSCAPING	LAYOUT ENGG.		
	ARCHITECTURE		
REVIEW AND APPROVAL OF FABRICATION DRAWINGS & RELATED DESIGN DOCUMENTS	SUPER STR ENGG.		
ALL BALANCE MISCELLANEOUS ITEMS IN CIVIL STRUCTURE DESIGN,	SUB STR. ENGG.		
	SUPER STR ENGG.		
	ARCH. ENGG.		
REVIEW OF CLADDINGS DRAWINGS	ARCH. ENGG.		
		Total	

In case the scope for the system and sub-system changes during the detail engineering stage for each project, the deletion of price shall be worked out based upon the revised CIVIL-TABLE-1.

6.0 SCHEDULE OF CHARGES FOR SUB-CONSULTANT'S VISIT

Sl. No.	Description	No of visit	Rate per visit per person	Amount in number	Amount in words
6.1	Outstation visit to offices in BHEL-ISG BANGALORE as required. (Cost include Boarding / Lodging / Local Conveyance per day)	10			
6.2	Visit to Site / Customer Office / Customer Consultant's Office.	20			

Rate to include all expenses of the Sub-Consultant with no other expenses to be borne by BHEL.

HNPCL- VISHAKAPATANAM TPP (2X520 MW)

COAL HANDLING PLANT

CONSULTANCY SERVICES FOR DESIGN OF CIVIL & STRUCTURAL ENGINEERING WORKS

UNPRICE SCHEDULE

Sl. No	DESCRIPTION	UNIT	Number of Month	UNIT RATE [Rs]	Amount in number	Amount in words
1	Deputation of graduate one civil engineer with min 5 years relevant experience	Month per person	36			
2	Deputation of graduate one mechanical / structural engineer with min 5 years relevant experience	Month per person	36			
	Total Amount					

(Rupees…….....)

Signature of Consultant with Seal

7.0 TERMS OF PAYMENT

Refer commercial conditions.

8.0 VALIDITY OF CONTRACT

The fees and other rates shall remain firm up to contract period.

Additional Terms and Conditions (to be considered by the Bidders)—

The levy of LD shall be as below:

For DCE & DCC refer Clause 3.0.

Detail engineering completion schedule – All construction drawings shall be released by "DCE":

- LD Clause shall be applied by BHEL in case these drawings are not delivered by DCE

Period of contract for submission of 'As built' drawings/docs shall be till "DCC". However in case of delay in completion of project beyond this period, the LD shall be applied after considering the above delay.