



BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS ENGINEERING MANAGEMENT
TRANSMISSION BUSINESS GROUP
SEC – 142, NOIDA

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TITLE FIRE PROTECTION AND DETECTION SYSTEM (GIS PORTION)				SIGN				
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				GROUP	TBEM			
CUSTOMER	UTTARAKHAND JAL VIDYUT NIGAM LTD. (UJVN Ltd.)							
PROJECT	2 X 60 MW VYASI HEP - 220 kV GIS SUBSTATION							
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SECTION 1

INTENT, SYSTEM REQUIREMENT, DESIGN CRITERIA AND SCOPE

1.0 INTENT OF SPECIFICATION

- 1.0.0 This specification is intended to cover following activities and services in respect of all the equipment of the **Fire detection and protection System to be provided for 220 kV GIS Substation of 2 x 60 MW Vyasi Hydro Electric Project, Uttarakhand by BHEL** and shall include the following:
- Detailed design of all the equipment and equipment system(s).
 - Complete manufacturing including shop testing.
 - Providing engineering data, drawings, and O & M manuals as per specified format etc. for owners/purchaser's review, approval and records.
 - Packing and transportation from the manufacturer's works to the site including customs clearance/port clearance, if required.
 - Fabrication, pre-assembly, if any, erection testing and putting into satisfactory operation all the equipment including successful completion of trial operation.
 - Performance and Guarantee tests after successful completion of trial operation and guarantee for two years for the fire fighting system in scope.
- 1.0.1 The requirements specified under SECTION 2, SECTION 3, SECTION 4 & SECTION 5 of the specification shall be considered as part of this section. In the event of any conflict between the various sections/sub-sections of this specification, SECTION 1 shall prevail. *UJVNL contract specification attached with SECTION 2 shall be referred strictly and the contractor shall provide requirements of the same regarding systems applicable for GIS portion of the project.*
- 1.0.2 It is not the intent to specify herein all the details of design and manufacture. However, the equipment and the system shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to Purchaser/ Owner, who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgment is not in full accordance herewith.
- 1.0.3 The contract shall be on Unit Rate Basis for the package. In case of change in the input after placement of order the additions / deletions to the scope shall be settled on the basis of unit rates agreed between the Purchaser and Contractor.
- 1.0.4 During contract stage, quantities of various items of BOQ may vary to any extent and same rates will be applicable so far the resultant variation in total contract value is within $\pm 30\%$. Variations beyond $\pm 30\%$ shall be negotiated mutually.
- 1.0.5 The Bidder shall deem to have understood completely all the tender drawings and documents and quoted accordingly.
- 1.0.6 **Deviation:** There shall preferably be no deviation on technical specification. The bidder shall sign and stamp the "Certificate for No Deviation" enclosed in Schedule-2, Section-5 towards confirmation. Except for these deviations/variations covered under Deviation Schedules which are accepted by the Purchaser before the award of the Contract, it will be the responsibility of the

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Bidder to fully meet the intent and the requirements of the specification within the quoted price. *Deviations in any other form including clarifications / assumptions / etc will not be considered and it will be construed that the bid conforms strictly to the specification.*

- 1.0.7 The Bidder to note carefully that the parameters, estimated capacities of equipment indicated and the tender drawings in the specification are only for the guidance of the Bidder. The system shall be designed as per relevant standards/ codes and exact capacities and quantities are to be estimated by the Bidder. All such estimations and design calculations shall be submitted for Purchaser's approval.
- 1.0.8 It is the responsibility of the successful Bidder to obtain necessary approval/ clearance from statutory organizations wherever applicable for the equipment/ systems under the scope specified.
- 1.0.9 The term '**Owner**' appearing in this specification shall refer to **Uttarakhand Jal Vidyut Nigam Ltd. (UJVN Ltd)**, the term '**Purchaser**' shall refer to **BHEL** and the term '**Contractor**' shall refer to the **successful Bidder**.

2.0 FIRE FIGHTING REQUIREMENTS FOR VARIOUS AREAS

The makes/models and technical features offered for various firefighting system components/ equipment shall comply with the standards of TAC/ BIS/ UL/ VDs and FM / NFPA/ FOC as applicable. The key elements of fire protection cum detection scheme and the related areas are presented as under:

System	Areas Protected
Hydrant System	i. GIS floor (at EL. 544) ii. Pot head yard (at EL. 535)
Addressable Fire Detection & Alarm System	
Portable Fire Extinguisher	

3.0 SYSTEM REQUIREMENT, DESIGN PHILOSOPHY & CONTRACTOR'S SCOPE

This system shall be designed to provide fire detection and protection services for Switchyard and its control Building. Design criterion shall be based on "**Light Hazard Occupancies**" classification as described in Tariff Advisory Committee's (TAC) guidelines. All equipment or systems in the designed fire detection cum protection arrangement shall be completely in compliance with the regulations of Tariff Advisory Committee (TAC) of India/ Loss Prevention Association (LPA) / National Fire Protection Association (NFPA)/ LPCB/ VDs.

3.1 DETECTION SYSTEM

Scope of fire detection & alarm system

Fire alarm detection and protection system shall consist of the following major devices: -

- I. One (01) lot of Detectors.



- II. One (01) lot of manual call points.
- III. One (01) lot of notification appliances (hooter).
- IV. One (01) lot of interface modules.
- V. One (01) lot of cables.

Miscellaneous Items: -

- VI. Self-Illuminating exit signs shall be provided in 220 kV GIS building.
- VII. Isolator modules shall be provided as per IS 2189.

All equipment such as fire detectors, notification appliances shall be approved or listed by UL/FM/LPCB/Vds.

3.1.1 General Description of the System

- a) This system is provided for the GIS building and Pothead Yard within the scope.
- b) The Fire Detection and Alarm System shall comprise of a network of Addressable Detectors (fire/smoke), Manual Call Points, Modules, Notification Appliances, Cables and other accessories required to form a network (i.e. Terminal Boxes and Junction Boxes).
- c) In view of very large height of GIS building Beam smoke detectors shall be provided there because regular spot type smoke detectors will not be effective in detecting the smoke to the required sensitivity levels.
- d) Automatic Fire Detection and Alarm System detect fire / over-heating by means of the attendant phenomena of fire, such as smoke or heat, It initiates alarm in fire alarm control panel and actuates pre-programmed control actions. Detection of fire at an early stage permits rapid intervention by fire fighting forces. Thus the automatic fire detection and alarm system reduces damage to property and risk to human lives.
- e) The fire detectors shall be wired on a common connecting line called loop.
- f) Detectors/devices for Fire detection and alarm system for GIS Building area is beam detectors, manual call points, I/O modules etc.
- g) In case of fire, the detector or device in the respective area shall pick up appropriate signal and conveys it to fire alarm panels located in main plant control room. These signals triggers audio alarms in Control room and affected area. It initiates tripping of fans in ventilation system, fire dampers, etc. related to the affected area.
- h) The detectors for GIS area shall be looped in Main Fire Alarm Panel of powerhouse; there shall be no dedicated Fire Alarm Panel for GIS area. All the switchyard fire alarm signals shall be annunciated in the main fire alarm panel located in central control room.
- i) Layout and Coverage of detectors/ devices in GIS area of Power House areas shall be as mentioned below: -
 - Spacing of detectors shall be as per Cl. No. 6 of IS 2189.
 - Manual call points shall be located as per cl. no. 6.3.8 of IS 2189. The call points will normally be provided for every 30m distance in indoor areas and for every 45 m in outdoor areas. **Manual call points shall be break glass type.**



- Outdoor manual call points shall have flameproof enclosure of reputed make. Its structural stand and underground loop cabling shall be ensured suitably.
 - Hooter cum strobe shall be located as per cl. no. 4.3 of IS 2189.
 - Detectors will be installed at the highest point of the ceiling (as per IS 2189) and coverage indicated by OEM will be considered.
 - The number of Detectors and their location will be so selected such that the internal area of the building is completely covered by the detectors. The zones of individual Detectors will overlap and no blind zone will be left.
 - The number of detectors and their location will be finalized during detailed engineering stage as per provisions of contract and statutory requirements.
- j) The detector cable and other control cable shall be armored, screened and twisted pair FRLS type which shall be cleated to roof/ wall surface.
- k) Cable shall be 1100V grade, multicore, annealed, high conductivity stranded copper conductor, extruded PVC insulated, laid up inner sheathed, galvanized steel strip /wire armoured, outer FRLS extruded PVC sheathed cable as per IS-1554-Part - I, 1988.
- l) **Signal Boards**
- A Lot of fluorescent directional signals to direct the personnel trapped inside to the escape route and staircases to be decided during detailed engineering.

➤ **INTERFACES**

Fire detection & alarm system shall have following interfaces-

- i) Interface with Ventilation system of GIS building to shut down the equipment in case of fire.
- ii) Interface with fire dampers to close it in case of fire.

3.2 Protection System

3.2.1 Hydrant System

- a. Hydrant points for the GIS area shall be tapped off from main hydrant header for main powerhouse running at EL.535, pipe from tap-off shall be routed along the wall/ roof to GIS Floor at EL. 544. Drawings for EL.535 & EL 544 are enclosed with this Specification for reference. Also Tap-off point will be provided at EL535 outside powerhouse building to extend hydrant connection for pothead yard. The purchaser will provide these tap-off points however routing to the respective hydrant points shall be in scope of the contractor.
- b. **Hydrant system is designed for Light Hazard Classification.**
- c. The Hydrant System of Fire Protection shall consist of pipes running on the wall & underground pipe that will feed water to hydrants in pothead yard area.
- d. System shall be designed in a way so that minimum terminal pressure of 3.5 kg/cm² can be maintained at the farthest/remotest hydrant point of the yard.
- e. This system is in accordance with the clause no 7.6 of the FP manual of TAC.



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- f. The velocity of flow of water is generally not exceeding 2.5 m/sec in delivery header and anywhere in the system (as per Cl. 7.5.10 of FP Manual-TAC).
 - g. The Hydrant system shall be provided for the GIS area (EL544) and pothead yard area (EL 535).
 - h. Fire Water Piping shall be laid in switchyard area to distribute the water for Hydrant system. Firewater requirement shall be as per TAC requirements.
 - i. The hydrant system shall consist of the following:
 - i. Double headed stand post type yard hydrants of 65 mm size shall be provided for pothead yard and 100 mm inlet with water supply.
 - ii. Hose cabinet for each external hydrant (double headed) consisting of two no. of 15 m long RRL hose as per IS: 639 type-A, one no. of SS branch pipe &/or stream jet type nozzle as per IS: 903. The dimensions of the hose boxes shall be as per manufacturer's standard.
 - iii. Isolation valve shall be provided in the pipeline as per requirement for easy maintenance.
 - iv. Hose reel of length – 35 m (min) along with hose drum shall be provided for internal hydrant to be installed inside GIS building at EL. 544.
 - v. Fire buckets in suitable nos. along with its stand/ frame shall be provided in the pothead yard. Details of the same will be finalized during detailed engg. stage.
 - vi. Hydrant pipes
 - a. Inside the building the pipes shall be supported from the roof of the building/ supported on the floor as per layout considerations.
 - b. At approach roads where it shall be laid underground, in Hume pipes.
- Design calculations, drawings etc. shall be supplied. Minor civil works like inserts, clamping, channels, hangers, brackets, supports etc. shall be provided.

3.2.2 MATERIAL OF CONSTRUCTION (MOC) OF MAJOR EQUIPMENTS

The major items of FPS system and their MOC are listed in the table below:-

SL. NO.	ITEM	MOC
i.	Fire Water Pipes	Mild steel, Black, ERW to IS: 1239 Part-1 Medium & IS: 3589
ii.	Hose Pipe	Reinforced Rubber Lined Fire Hose as per IS 636, Type – A
iii.	Valves	
a	Gate Valves	C.I as per IS 14846, FG260
b	Hydrant Valve	SS 304 as per IS 5290
iv.	Branch Pipe	SS 304, IS: 3444
v.	Air Release Valve	Gun Metal as per IS 318
vii.	Flanges	Fabricated from Plate conforming to IS: 2062 Gr. B
vii.	Fittings	IS: 1239, Part-II

3.2.3 Portable Fire Extinguishers

- I. Portable fire extinguishers are provided as per TAC guidelines for GIS area and pothead yard areas.



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- II. Following type of fire extinguishers shall be provided.
- Portable Carbon Dioxide type
 - Portable Dry Chemical Powder type
 - Fire Buckets with frame
- III. Distribution of these extinguishers in various locations shall be as per the guidelines of TAC. (Separate document shall be submitted for Portable & Mobile Fire extinguishers titled as “Fire Extinguisher Distribution Schedule”)

3.2.4 Spares

- Mandatory Spares for Fire Protection system envisaged as per contract are mentioned below.

S. No.	Description	Qty.
1.	Beam Detectors	10% of each type
2.	Fire resistant control cable	100 m.
3.	Manual pull station	10% of each type
4.	Hydrant valve	10% of total quantity
5.	Branch pipe and nozzle for hydrant system	10% of total quantity
6.	Portable Extinguishers	5% of Each type

- General spares, Tools & tackles provision as per Annexure – II to Section 2 shall be ensured along with the mandatory spares. List of such spares & tools will be finalized during detailed engg. stage.

4.0 SCOPE OF SUPPLY & SERVICES

- 4.1. The equipments and services to be furnished under this contract are detailed here under Cl. No. 9 of this section is for reference. Bidders shall work out the actual requirement based on the building layout enclosed with this specification during detailed engg. stage.
- 4.2. The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, General and Special Conditions of Contract, Technical Specifications, and Drawings.
- 4.3. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Purchaser and valued at the rates and prices bid in the priced Bill of Quantities.
- 4.4. A rate or price shall be entered against each item in the priced Bill of Quantities. The cost of Items against which the Contractor has failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.
- 4.5. The whole cost of complying with the provisions of the Contract shall be included in the Items provided in the priced Bill of Quantities, and where no Items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related Items of Work.
- 4.6. General directions and descriptions of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant sections of the Contract



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documentation shall be made before entering prices against each item in the priced Bill of Quantities.

- 4.7. Miscellaneous items like hardware, fixtures, fittings etc. shall be deemed to be included under the relevant BOQ items and bidders shall consider the same while quoting for BOQ items.
- 4.8. Exact requirements shall be worked out during detailed engineering after award of contract.
- 4.9. Bidders shall consider makes for various equipments as per Annexure B, which shall be subjected to Owner's approval during design engineering stage. Price implication to BHEL later on account of non-acceptance of proposed vendors by Owner shall not be considered.

4.10. Bidder shall also consider the following while quoting for the system:

- i) Power & Control cables for fire protection system (except for cable for detection and alarm system) shall be supplied on free issue basis to contractor. BHEL shall procure various sizes of cables (as per Annexure 'A' of this section) for the complete requirement of sub-station. Contractor shall have to choose their cables from the available sizes only and contractor shall make necessary modifications in their equipment for termination of these cables.
- ii) Since laying & termination of all power & control cables is in contractor's scope, supply of cable accessories such as lugs, glands, cable tags & markers etc. shall be included by the bidders in their offers alongwith supply of cable (2C X 1.5 sq.mm, FRLS, twisted pair, armoured Cu cable & FO cable) for fire detection and alarm system.
- iii) Necessary cable trays shall be supplied on free issue basis to the contractor, however necessary hardware for fixing the same on walls or elsewhere shall be included by the bidders in their offers.
- iv) Earthing material viz. GS flat & wire shall also be supplied on free issue basis to contractor; however requirement shall be given by the bidders in their respective bids.
- v) Bidder shall ensure that sufficient quantities of commissioning spares are made available for timely completion of commissioning of the system. The bidder shall furnish a list of Commissioning spares that shall be brought by him. The unused commissioning spares shall be returnable to the bidder.
- vi) The contractor shall lay the underground piping required for hydrant system and also shall construct RCC pedestals & pylon supports for above ground pipe if required.
- vii) Pipe size for pylon, size of Anchor fasteners etc. shall be adequate for the support to provide sufficient rigidity against vibration & load during operation. The whole arrangement shall be in bidder's scope. The contractor shall justify adequacy of design during engineering.
- viii) Conducting performance guarantee tests as per approved procedure to the satisfaction of Owner / Purchaser and handing over an operational system to the owner. Contractor for customer review and approval shall submit procedure for performance guarantee test.
- ix) *Hose reel, Fire buckets, Exit Sign boards, pipe fittings, reducers, General spares, Tools etc. are not listed as BOQ items, however these items shall be provided as per the requirements of technical specification.*



4.11. Scope of services

A. Erection, Testing & Commissioning (ETC) requirements

- i) The scope of ETC shall include handling of equipment/ material at site, erection of equipment /material at site including fabrication, equipment and system testing, commissioning of the entire system, conducting performance guarantee tests to the satisfaction of Owner / Purchaser and final handing over to the owner of the entire system.
- ii) Furnishing technical calculations in support of equipment selection or sizing as and when required.

B. With Other Electrical System

- i) Preparations of cable interconnection diagram for equipment supplied under this contract and accordingly offer guidance to the purchaser for laying necessary cables. Termination details shall also be furnished in the said interconnection table.
- ii) Laying & Termination of Power and Control cables for the equipment under the scope of this specification. Bidders shall include all cable accessories like lugs, glands, cable tags, markers etc in their respective bids.
- iii) Earthing of all installations (to the nearest earth mat/ earthing pad) supplied under the scope of this specification.

C. With Civil System

- i) Providing location of pipes crossing the road & trenches and laying of adequately sized Hume pipes.
- ii) Making RCC pedestals for above ground piping wherever required.

D. All machinery tools & tackles and consumables required for erection/testing / commissioning of the system shall be arranged by the Bidder.

E. Minor modifications, alterations in system installation as per customer's specific requirements shall be done without any extra cost to purchaser.

F. Bidders to ensure that sufficient quantity of spares are made available for timely completion of commissioning of the system. The bidder shall furnish a list of commissioning spares that shall be brought by him. The unused commissioning spares shall be returnable to the bidder.

G. Obtaining statutory approval from accredited agency on documents & installations.

- i) Obtaining, "As Built" certification from purchaser or owner on applicable drawings. Completing documentation as per specification requirement.
- ii) Obtaining customer's written acceptance of satisfactory completion of job. (Acceptance of PG + handing over of plant and mandatory spares (if any)).
- iii) Any other service not explicitly illustrated herein but which may be required to complete the system with its desired functionality or in the spirit of contract shall also deemed to be under the scope of bidder.



H. Civil Works

Major civil works such as foundations, cut outs etc., shall be in Purchaser's scope. The Bidder shall however supply foundation bolts & hardware and undertake minor civil works such as grouting, filling up of crevices/ cut outs etc. Any damage caused to civil works during ETC work of the equipment/system shall have to be made good to the original finish by the Contractor at no extra cost to the Purchaser.

In addition the following shall be in the scope of Contractor:

- i) Laying of underground piping and construction of RCC pedestals to support the above ground piping for hydrant wherever required.

5.0 Exclusions

- a) Supply of Fire Alarm panel.
- b) Supply of power & control cables except for detection cable. However laying and termination of these cables shall be in contractor's scope. **The bidder shall furnish quantity and type of cables required complete system in their respective bids. Laying & termination is in contractor scope.**
- c) Supply of necessary cable trays for laying power and control cables, however hardware for fixing the same on wall trenches or elsewhere shall be included by the bidder in his bid.
- d) Supply of GI flat for earthing of equipments.
- e) Unloading & storage of materials at site.

6.0 Deleted

7.0 Engineering Drawings/ Documents

Engineering shall start immediately after the award of the contract.

Submission of all drg. / data sheet – Within 6 weeks from the PO date.

Approval of all drg. / data sheet – Within 6 weeks from PO date.

7.1 OPERATION & MAINTENANCE (O&M) MANUAL

Operation and Maintenance manuals shall be specifically compiled for the project by the bidders. The draft O&M manual shall be submitted along with the supply of the items. The O&M manual shall contain the following information:

- a. Description of the system and equipment with design particulars.
- b. Instruction for erection.
- c. Instruction for operation, maintenance and repair.
- d. Ordering information for all replaceable parts.

8.0 Handing & Taking Over

It is the responsibility of the contractor to maintain the plant till it is handed over. The contractor shall rectify any defect noted during the period without any price implication to BHEL. Also suitable PG tests shall be conducted by the contractor to show the achievement of guaranteed parameters in line with the requirements of specification/ standards/ codes and to the satisfaction



of Purchaser/ Owner.

9.0 Various Heads to be quoted for

9.1.1 Based on the above input it is recommended that the bidders shall submit their unit rate offers for supply and ETC scope in the prescribed format only

TABLE- I

Sl. No.	Items	Unit	Qty
1	SUPPLY: MS ERW PIPE 150NB (MEDIUM GRADE)	MTR	50
2	SUPPLY: MS ERW PIPE 100NB (MEDIUM GRADE)	MTR	18
3	SUPPLY: MS ERW PIPE 80NB (MEDIUM GRADE)	MTR	6
4	SUPPLY: GATE VALVE 150NB	NO	1
5	SUPPLY: GATE VALVE 100NB	NO	1
6	SUPPLY: SINGLE HEADED HYDRANT VALVE	NO	1
7	SUPPLY: DOUBLE HEADED HYDRANT VALVE	NO	2
8	SUPPLY: HOSE PIPE - 15M LONG	NO	6
9	SUPPLY: BRANCH PIPE WITH NOZZLE	NO	3
10	SUPPLY: HOSE BOX	NO	3
11	SUPPLY: BEAM DETECTOR SET	NO	3
12	SUPPLY: INPUT/OUTPUT MODULE	NO	6
13	SUPPLY: MANUAL CALL POINT (INDOOR)	NO	4
14	SUPPLY: MANUAL CALL POINT (OUTDOOR)	NO	1
15	SUPPLY: HOOTER	NO	1
16	SUPPLY: LOOP CABLE	MTR	500
17	SUPPLY: DRY CHEMICAL POWDER - 6 KG	NO	3
18	SUPPLY: CO ₂ TYPE EXTINGUISHER - 6.5 KG	NO	3
19	SUPPLY: CO ₂ TYPE EXTINGUISHER - 22.5 KG	NO	1
20	SPARES: DOUBLE HEADED HYDRANT VALVE	NO	1
21	SPARES: BEAM DETECTOR SET	NO	1
22	SPARES: MANUAL CALL POINT (OUTDOOR)	NO	1
23	SPARES: 2CX1.5 SQMM ARMoured CONTROL CABLE FOR FIRE DETECTION AND ALARM PANEL	MTR	100
24	SPARES: DRY CHEMICAL POWDER - 6 KG	NO	1
25	SPARES: CO ₂ TYPE EXTINGUISHER - 6.5 KG	NO	1
26	SPARES: CO ₂ TYPE EXTINGUISHER - 22.5 KG	NO	1

10.0 Inspection & Testing

All the equipments shall be inspected prior to dispatch in line with relevant IS, approved GTP/ drawing and technical specification, BHEL/ customer approved QAP



ANNEXURE-‘A’

CABLE SIZES BEING PROCURED BY BHEL FOR SUB-STATION

2C x 2.5 sq. mm PVC/Copper, Armoured Control Cable
5C x 4 sq. mm PVC/Copper, Armoured Control Cable
5C x 2.5 sq. mm PVC/Copper, Armoured Control Cable
7C x 2.5 sq mm PVC/Copper, Armoured Control Cable
10C x 2.5sq. mm PVC/Copper, Armoured Control Cable
14C x 2.5 sq. mm PVC/Copper, Armoured Control Cable
19C x 2.5 sq. mm PVC/Copper, Armoured Control Cable
2C x 10 sq. mm XLPE/Aluminium, Armoured Auxiliary Power Cable
4C x 16 sq. mm XLPE/Aluminium, Armoured Auxiliary Power Cable
3.5C x 35 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
3.5C x 95 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
3.5C x 400 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
1C x 50 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
1C x 630 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable



ANNEXURE- B TO SECTION-1

11.0 Sub-Vendor List

Bidder shall choose make of materials from list enclosed in Annexure-B to this section only. However final applicable make is subject to ultimate customer approval. Bidder can provide any other make that is not included in the list only if it is acceptable to ultimate customer without any cost implication to BHEL.

SUB-VENDOR LIST FOR FIRE FIGHTING SYSTEM

S.N.	ITEMS	APPROVED SUB-VENDOR	PLACE
1	HYDRANT VALVES & BRANCH PIPE, NOZZLES & COUPLINGS	SHAH BHOGILAL SUKAN NEWAGE WINCO	AHMEDABAD AHMEDABAD SURENDRA NAGAR AHMEDABAD
2	FITTINGS & FLANGES	M S FITTINGS METAL LLOYDS BHARAT FORGE TUBE PRODUCTS NITIN PROFILE	KOLKATA MUMBAI PUNE BARODA BARODA
3	MS/ GI ERW PIPES	JINDAL SURYA ROSHINI GOOD LUCK TUBES TATA	GHAZIABAD BAHADUR GARH SIKANDRABAD JAMDESHPUR
4	FIRE HOSES	NEWAGE CHATTARIA RUBBER	SURENDRA NAGAR BARUCH
5	COATING & WRAPPING MATERIAL/TAPE	MP TAR PRODUCTS RUSTECH IWL	BHILAI MUMBAI
6	CAST IRON GATE VALVE	H.SARKAR KALPANA VENUS NEW AGE SHAH BHOGI LAL	KOLKATA JALLANDAR KOLKATA



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7	AIR RELEASE VALVE	H.SARKAR LEADER KALPANA VENUS WINCO	KOLKATA JALLANDAR KOLKATA KOLKATA AHMEDABAD
8	PRESSURE GAUGE	AN INSTRUMENTS H GURU MANOMETER FORBES MARSHALL (HYD)	KOLKATA KOLKATA THANE HYDERABAD
9	PRESSURE SWITCH	INDFOS SWITZER SOR INC. DRESSER INDUSTRIES INC.	GHAZIABAD CHENNAI USA USA
10	PAINT	SHALIMAR ASIAN PAINTS BERGER	
11	POWER & CONTROL CABLE	NICCO TORRENT POLYCAB DELTON PARAMOUNT	
12	FIRE EXTINGUISHER	KANEX SAFEX	

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	PROJECT: 2 x 60 MW VYASI HEP - 220 KV SWITCHYARD	Rev. 0
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SECTION - 2

EQUIPMENT SPECIFICATION

2.0 CODES AND STANDARDS

The design, manufacture, inspection and testing of complete system shall comply with the latest applicable Indian/British/American standards. The equipment shall conform to the latest edition to the following standards: FP Manual regulations, Spray & Fire Alarm system of Tariff Advisory Committee (TAC)/NFPA.

- a. Wherever TAC is not applicable following National Fire Protection Association (NFPA) guidelines shall be followed:
 - NFPA-1 (Fire Prevention Code)
 - NFPA-10 (Portable Fire Extinguishers)
 - NFPA-14 (Standpipe and Hose System)
 - NFPA-25 (Water based Fire Protection Systems)
 - NFPA-72 (National Fire Alarm Code)
 - NFPA-72A (Local Protective Signaling System)
 - NFPA-72E (Automatic Fire Detectors)
 - NFPA-101 (Life Safety Code)
- b. Indian Standards (IS)
 - i. IS 1239 (Steel Tubes, Tubular and Other Wrought Steel Fittings - Specification - Part 1: Steel Tubes)
 - ii. IS 3589 Gr 410 (Steel Pipes for Water and Sewage (168.3 to 2540 mm Outside Diameter)
 - iii. IS 4736 (Specification for Hot-dip Zinc Coatings on Mild Steel Tubes)
 - iv. IS 15337 (Coal Tar Based Anticorrosion Tape for Protection of Underground Mild Steel Pipelines)
 - v. IS 14846 (Sluice Valve for Water Works Purposes, 50 to 1200 mm Size)
 - vi. IS 5290 Type A (Specification for landing valves)
 - vii. IS 636 (Non-percolating flexible firefighting delivery hose)
 - viii. IS 884 (Specification for first-aid hose reel for firefighting)
 - ix. IS 2871 (Specification for branch pipe, universal for firefighting purposes)
 - x. IS 15683 (Portable Fire Extinguishers - Performance and Construction)
 - xi. IS 3844 - Code of Practice for Installation & Maintenance of Internal Fire Hydrants and Hose Reels on Premises
 - xii. IS 2189 – Code of practice for selection, installation and maintenance of automatic fire detection and alarm system.



- xiii. IS 2190 - Code of Practice for selection, installation & Maintenance of first- aid - fire extinguishers.
- xiv. IS 9668 - Code of Practice for Provision & Maintenance of Water Supplies for firefighting.

2.1 GENERAL DESIGN AND CONSTRUCTIONAL REQUIREMENT

It is not the intent to specify herein all the details of design and manufacture. However the equipment and the system shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser /Owner who shall interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgment is not in full accordance herewith.

- ❖ UJVN Ltd. technical specification for firefighting system is provided as Annexure- I to Section-2. This Annexure contains specification for the entire thermal power plant however contractor shall adhere to requirements mentioned in this annexure that is applicable to switchyard portion of the project.
- ❖ UJVN Ltd. General Technical requirements specification having details of general requirements like General spares, tools tackles is also provided as Annexure – II to section 2 of this specification shall be adhered to by the contractor.

2.2 SHOP & SITE TESTS

2.2.1 SHOP TESTS

All acceptance and routine tests in accordance with relevant IS codes/standards shall be carried out by the contractor/manufacture as per BHEL/ Customer approved QAP. Charges for all these routine and acceptance tests for all the equipment & components shall be deemed to be included in the bid price.

Contractor shall submit the QP for all such equipments calling inspection/ testing for purchaser's approval in the prescribed format enclosed as Schedule-5 in Section 5 of the technical specification. This Owner/Purchaser approved QP shall be the basis of inspection/ testing.

2.2.2 SITE TESTS

The Contractor shall prepare and submit detailed field quality plans in the format prescribed, setting out the quality practice and procedures to be adopted by him for assuring quality of each equipment/material from pre-commissioning to final commissioning of the system. These procedures shall necessarily include all checks/tests conducted at site for preservation, assembly, alignment, positioning of equipment, foundation preparation, welding/bolting heat treatment, non-destructive examination, hydraulic test, running test, performance test etc.

Performance test and guarantee

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After erection at site, the Fire Protection system shall be subjected to tests to show achievement of guaranteed parameters in line with the requirements of specification/ standards/ codes and to the satisfaction of Purchaser/ Owner.

The Contractor shall take full responsibility for the safe and efficient operation of each of the equipment as well as the whole system. If the shop/ site tests indicate failure of the equipment or if the system does not meet the guarantee in any respect, the Contractor may be required to make alterations in the system/ equipment. Such alterations shall be carried out after purchaser's/ Owner's approval at no extra cost to purchaser. Additional tests required to show the effect of such alterations should also be performed at no extra cost to Purchaser. Above mentioned tests shall be carried out separately for each sub-system. All the testing instruments shall be tested/ calibrated in accordance with the applicable codes & standards. Under PG testing, interlocks, protections, vibrations & noise levels shall also be checked. Detailed procedure for PG test shall be submitted by the contractor in advance. The Contractor shall give guarantee of satisfactory and trouble free operation of the equipment/ systems for a duration described in Section-3 of this specification.

The following codes and standards shall be applicable for conducting test unless otherwise modified or supplemented by the enclosed procedure and mutually agreed to between the purchaser and contractor.

1. NFPA – 72 E3: Standard on Automatic Fire Detectors.
2. Fire Protection manual of TAC (Latest edition) IS 3034: Fire safet

25.

This specification is for entire power house. Bidder shall refer portions of this specification for the scope applicable for Switchyard or GIS portion of the project as stipulated in Sec-1 of this TS.

25.1.

Scope of Work

Scope of work under this section covers the provision of labour, tools, plants, material and performance of work necessary for the detailed design and engineering, manufacture, quality assurance, quality control, shop assembly, shop testing, transportation, delivery at site, site storage and preservation, erection, testing and commissioning, performance testing, field acceptance testing, training of the Employers personnel, handing over to the Employer and guarantee for two years, of fire fighting system complete with detection, alarm and protection system for safety and protection of equipment, area and personnel, with all equipment, accessories and spares for making the system complete and for a trouble free and safe operation for the entire power plant including control block and switch yard.

~~25.1.1.~~~~**Detailed Scope of Supply**~~~~The fire fighting system shall consist of:~~

- ~~• Tapping from unit penstock at a location upstream of butterfly valve into B.F. valve house comprising adequate bosses, pipes and minimum two (2) nos. isolating/ gate valves of adequate pressure rating for each tapping including other necessary devices & accessories for connecting the tapping from Unit Penstock to the fire fighting water tank located at other suitable location to be decided during detailed engineering.~~
- ~~• Tapping from common cooling water header in power house comprising adequate bosses, pipes, minimum two (2) nos. isolating/ gate valves and other accessories & devices for connecting it to the fire water tank installed at other suitable location.~~
- ~~• One No. (1) pump of suitable capacity and head for boosting the pressure of fire protection header in 220 KV outdoor switchyard along with control panel, pressure switches and gauges, necessary piping, valves, accessories and instrumentation.~~
- ~~• Two nos. (2) of high velocity water spray system for fire protection of GSU transformers.~~
- ~~• Necessary pressure and level sensing devices for fire water headers and fire water storage tank respectively.~~
- ~~• One no. (1) of high velocity water spray system for fire protection of station service transformers.~~
- ~~• Two nos. (2) of medium velocity water spray system for fire protection of cable spreading room and cable tunnel from power house to 220 KV outdoor switchyard.~~

- Portable fire extinguisher system for mechanical and electrical utility areas at EL 506.60 m and EL 511.40 m, EL 515.30 m, EL 520.30 m EL 529.00 m & EL 535.00 m and at 220 KV outdoor switchyard area as per guide lines of TAC, of Govt. of India.
- Fire hydrant system for the power station.
- Fire hydrant system for the 220 KV GIS switchyard.
- Fire hose cabinets along with hydrant valve and hose reel for fire fighting cabinet as per approved drawings and bill of materials.
- Automatic fire detectors and manual pull stations as per approved drawings and bill of materials.
- Necessary piping including piping for drainage of fire tank, non return valves, air scouring arrangement, maintenance valves, Pressure & temperature sensing devices, all type of consumables and other materials including welding electrodes etc.
- Necessary cabling and wiring for fire detection system including associated accessories, consumables etc.
- ~~Alarm panels and misc. items for the fire fighting system including~~
 - ~~Micro processor based fire detection system.~~
 - ~~One (1) main fire alarm panel located in control block.~~
 - ~~One (1) main mimic installed in the control panel, located in the control room.~~
 - ~~One (1) set of signal and evacuation signs installed in the plant areas and the plant in accordance with the specification and the codes.~~
 - ~~One (1) set of cabling~~
 - ~~One (1) fire alarm printing device to be located in control room~~
- One (1) fire alarm telephone system with two master stations and individual stations shall be installed.
- Coordination and provision of necessary contacts and/ or ports for integration with plant SCADA system.
- Portable fire extinguishers as per approved drawings and bill of materials
- Door closing mechanism including cabling.

- Other items not specified but required to complete the system in all respects to make it functional.
- Spares.

25.2. Special Design and Layout Conditions

schematic diagram showing complete fire protection system comprising of high velocity deluge system for GSU transformers and station service transformers, medium velocity deluge system for cable spreading room, cable tunnel area and fire hydrants for various floors in power house, and 220 KV outdoor switchyard have been enclosed in section XIII – Tender Drawings.

The scheme indicated in the schematic drawing is only for guidance. The tenderer may suggest modifications in the proposed scheme giving merits of the same.

The water for fire fighting system shall be drawn from a tap-off taken from common cooling water header located in the power house fed from the unit penstocks through duplex strainers, cyclone separators etc. The water so drawn shall be fed into an overhead tank placed in the vicinity of 220 KV outdoor switchyard area at a suitable elevation and location to be finalised by the contractor during detailed engineering subject to approval of the employer. The other alternative source for filling fire fighting water tank shall be from penstock tap-off in up-stream of butterfly valve in B.F valve house. The water from power house cooling water header or B.F valve penstock header shall reach the fire water tank by gravity flow (with out pumps). The tank should have a capacity for at least 4 hours supply of the single largest deluge in the power house complex. The tank shall be located at an elevation to suit the pressure requirement at the highest sprinkler head or fire hydrant. The overhead tank shall have level switches for remote indication. The over head tank for the proposed fire fighting system shall be constructed by the civil contractor.

After filling of overhead water tank to desired level there should be provision for automatic closure of intake water.

For the high velocity deluge system, the deluge valve header shall be located at GSU transformer deck at EL 535.00 m. The spray system for each GSU transformer and SST shall be connected to this header.

For the medium velocity deluge system also there will be a common header located in the turbine floor at EL 515.30 m. For the fire hydrant requirement at various floors, the water shall be tapped from this common header.

The fire fighting system shall have smoke sensors, temperature detector bulbs, deluge valves, water sprinkler system, pipes, and pumps, fire hoses, portable fire extinguishers, control panels etc. to complete the system. Alarm cabling between detectors and panels with conduits and signal cabling between panel etc. with tray or conduits shall also be done by contractor.

The fire fighting system shall have suitable extinguishing media (viz. water, gaseous extinguishing media, foams and powders), installations and control of fixed systems and extinguishing equipments (viz. hydrant systems, automatic water systems, portable fire extinguishers, foam systems, powder systems etc.) with suitable fire detectors, alarm & signalling systems (viz. fire-sensing detectors, manual call points etc.) with signal initiation, transmission, notification and annunciation along with other items required to complete the system in all respect.

The type of fire fighting arrangement for various equipments with sensing devices is given below. It is the responsibility of the Contractor to complete the system in all respects.

S. No.	Equipment/ Area	Fire sensing device	Fire fighting arrangement
1	Oil pressure units of governor & MIV	Smoke detection system/ manual pull stations	Foam type fire extinguisher suitable for oil, fire hydrant at suitable points in the turbine floor.
2	Generator transformers	Temperature sensing bulbs/ manual pull stations	High velocity Water (HVW) spray system (Deluge system)
3	Cable spreading area including cable trays	Photo-electric detectors together with ionisation detectors / manual pull stations	Medium Velocity Water (MVW) spray system.
4	Cable Tunnel between power house and outdoor switchyard	Photo-electric detectors with ionisation detectors. Manual pull stations at the entry & exit of the tunnel.	Medium Velocity Water (MVW) spray system
5	Control, Relay, Computer & Communication room	Smoke detection system/ manual pull stations	Portable fire extinguishers
6	Offices	Smoke detection systems/ manual pull stations	Portable fire extinguishers
7	Power house floors	Smoke detection systems/ manual pull stations	Portable fire extinguishers and fire hydrants
8	Switchyard	Smoke detection	Portable fire extinguisher,

	area	systems/ manual pull stations	fire hydrant .
9	Mechanical & Electrical Utility Areas	Smoke detection system/manual pull stations	Portable fire extinguisher
10	Misc. areas	Smoke detection system/manual pull stations	Portable fire extinguishers and fire hydrants

~~Except the Generator Transformer area, cable trays & cable tunnel where the equipment shall be covered by automatic water spray / water sprinkler system, other areas in the power house including 220 KV outdoor switchyard area shall be covered by portable fire extinguishers of suitable type and fire hydrants with sufficient fire hose cabinets equipped with hose reel etc.~~

Each fire alarm system shall consist of one central unit receiving the signals from the detectors grouped in lines for each supervised area separately. The supervised area shall be the same or part of the corresponding fire fighting zone defined by the building.

All alarms coming from the detectors shall be line wise transmitted to the main fire alarm panel. The alarms of this system shall be transferred first to the pertaining panels for alarming and releasing and then be transferred to the main fire alarm panel for each line. In parallel, each line shall be printed out on a fire alarm printer and indicated at the main mimic control panel. A general mimic with reduced details shall be installed in the main control building.

25.3. Basic Design Requirement, Dimensions and Ratings

The complete fire protection detection and alarm system shall be designed erected and commissioned in accordance with the regulations of Tariff Advisory Committee (TAC). The responsibility of getting complete fire protection system approved by TAC shall be exclusively of the contractor.

If there is any need to provide any additional equipment over and above those mentioned in these specification to satisfy TAC requirements, the same shall be provide by the contractor without any additional cost.

The fire fighting system shall be designed in accordance with applicable NFPA standards. Dimensions and ratings of various equipment/system shall be as prescribed in the relevant NFPA Code.

25.3.1. Standards and Codes

All work shall be performed in accordance with the most advanced practice in engineering for each class of equipment and completed in a workmanlike manner following the best modern practice in the

manufacture of high-grade equipment. The standards under which the equipment is to be designed, constructed, erected and tested shall be the following:

Indian Standards	IS
International Standard Organization (for machine work tolerances)	ISO
Deutsche Industries-Norm	DIN
American Society for Testing and Material for material	ASTM
National fire protection association	NFPA
British Standards	BS
Under Writers Laboratories	UL

25.4. Performance Criteria and Guarantee

The fire fighting system shall be capable of performing all intended duties and it is the responsibility of the contractor to supply all the necessary equipments for fire protection system as per guaranteed technical particulars to make the system foolproof and functional.

25.5. Design and Construction

To ensure suitable fire prevention and fire protection system, a thorough fire risk evaluation shall be carried out by the Contractor keeping in view of the plant's specific considerations with respect to design, layout and anticipated operating requirements which shall result in list of recommendations based on acceptable means for separation, control of hazards, control or elimination of ignition sources and suppression of fire.

The complete fire protection system shall be designed by the contractor so as to detect the fire in the incipient stage itself, give alarm and protect the life and property in the power station by effectively extinguishing it.

25.5.1. Distributing Manifold

A water header in the power house, control block, transformer area and switchyard shall be laid to distribute the fire hydrant water to deluge systems for the transformers, wet sprinkler system for mechanical and electrical utility areas, hydrants at various floors as per approved drawing. The size of the pipe for water header shall be sufficient to suit the requirement.

25.5.2. ~~Over Head Tank~~

~~An overhead tank constructed near the switch yard, having minimum capacity for at least 4 hours supply of the sprinklers and hydrant systems available including /or of the single largest deluge in the power house complex shall be sufficient to meet the fire water requirement.~~

~~The overhead/elevated tank shall be located at an elevation to suit the pressure requirement at the highest sprinkler head or fire hydrant. The tank shall have level switches for remote level indication.~~

~~The overhead water storage tank of the required design capacity suitable for fire fighting purposes of the power plant shall be constructed by the civil contractor. However, accessories such as filling pipes, discharge pipes, air vent pipe, water level switches for remote level indication etc. shall be in the scope of the contractor.~~

25.5.3. Piping, Valves & Appurtenances

All required type of pipes, flanges, fittings, supports, fasteners, valves and other related material necessary for completion of the system shall be supplied as a part of this contract. Minimum pipe wall thickness and the material shall be as per relevant standard for medium/heavy duty pipes. All water pipes shall be insulated against condensation with approved type insulation and be provided with vapour proof cover.

25.5.4. Fire Detection and Notification Devices

25.5.4.1. Automatic Fire Detectors

The type of the detectors to be installed shall conform to the relevant standards/codes in the zones classified with regards to the nature of hazard as per relevant standards keeping in view the air velocity in the area to be protected. Detector base shall generally be screw connected and shall not be soldered.

In general, to minimize the different types of detectors in the plant the following shall be installed. In case a different type is required, a separate approval shall be obtained from the Engineer-in-charge.

25.5.4.1.1. Smoke detectors

The smoke detectors shall be designed with minimised effect of environmental conditions like air velocity, altitude, humidity, temperature, colour of smoke, electrical and mechanical influences like abnormal pressure or vibration and the influence of aerosols and any particulate matter. It shall be plug-in type with detector base containing terminals for making connections. Provision of visual indication of detector's alarm condition shall be visible from a distance of 6 m and visually different from indications of other conditions. The openings of the smoke entry shall be at least 30 mm below the ceiling level assumed to be smooth and flat.

25.5.4.1.1.1. Ionization Type Smoke Detectors

Ionization type smoke detectors shall be assembled and engineered for flush or surface ceiling mounting with a standard outlet box. The detector shall be of dual chamber type responsive to both visible and invisible particles of combustion. The base material shall be steel for

open and machine areas and plastic for offices. The detector head shall have no moving parts and shall not initiate alarm for anticipated fluctuation in relative humidity. The detector shall be able to withstand ambient warm air velocity in accordance with relevant standards. A pilot light (red light emitting diode) shall indicate the alarm status of the detector. All wires shall be connected into the mounting base.

25.5.4.1.1.2. Photo-electric Detectors

Photo-electric detectors shall not initiate alarm during failure of its LED light source and its sensitivity shall be factory set. Detectors shall have an obscuration rate in accordance with suitable standards.

25.5.4.1.2. Thermal Detectors

Thermal/Heat Detectors shall be designed to operate when the rate of temperature rise at the detector exceeds a predetermined value irrespective of the actual temperature. The detectors spacing and rating shall be in accordance with the applicable standards/codes.

25.5.4.1.3. Other types

Flame detectors for wiring circuits, duct photoelectric detectors for ducts and control of HVAC system.

25.5.4.2. Manual Pull Stations

Manual pull stations/alarm boxes shall be installed in accordance with suitable standards and codes at points where the personnel are able to initiate an alarm easily. Each manual fire alarm boxes of wall mounting type shall be securely mounted, the operable part of which shall not be less than 1.1 m and not more than 1.4 m above floor level. The manual pull stations/alarm boxes shall preferably be located at access ways at a distance within 1.5 m of the exit doorway opening at each exit on each floor. The number and distance shall also be based upon the travel distance to the nearest fire alarm box measured horizontally on the same floor, which shall not exceed 50 m.

The manual pull stations/alarm boxes shall be equipped with a glass cover that breaks during alarm annunciations and shall sound both in the zone as well as in the main control fire panel with visual indication.

The front colour of the station shall be fire red with white inscription in English as per relevant standards.

25.5.4.3. Notification appliances

If an alarm in a fire zone occurs, an electric hooter, a bell, horn, speaker, light or text display providing audible, tactile, or visible outputs or any combination thereof shall be actuated. The no. of these items shall be sufficient to alert the complete zone. These devices shall have separate screw terminal for each conductor and the sounders/audible

appliances shall generate sound in the range of 500-1000Hz different from the equipments and other devices provided in the area and in the building. A minimum sound level of either 65dB (A) or 5dB (A) above any other noise likely to persist for a period longer than 30 seconds, whichever is greater but not exceeding 120 dB (A) shall be produced by the sounders at any point which can be occupied in the building. Visual notification appliances shall conform to the applicable standards and shall be surface mounted.

25.5.5. Fire Extinguishing System

25.5.5.1. Fire Hydrant Systems and hose reels

Fire hydrants provided to serve hose reels on the transformer deck and switchyard area shall have two 65 mm instantaneous female outlets with separate control valve for each outlet and 100 mm inlet with water supply. The hydrants shall be complete with caps and chains.

Fire hydrants and their components shall be designed and installed in conformity to relevant code/standard of practise.

Hose reels with shut-off nozzle shall preferably be installed in recesses so that they do not form obstruction on a route of escape and shall be sited in accessible positions at each floor level adjacent to exits in corridors on exit routes. One hose reel shall be provided to cover 800 m² of floor space or part thereof. Hose reel brackets shall be firmly fixed to the wall so that the casual knocks or during stresses does not render it from being non-functional. The space requirement, location, maximum overall size, component case, water supply for hose reels, materials, appliances etc. shall be in accordance with relevant standards.

25.5.5.2 Fire hose cabinet

Fire hose cabinets shall be made of sheet steel and front glass panel and shall be of suitable size to accommodate 30 meters of 60 mm size standard unlined flax canvas hose folded on automatic rack bracket and provided with single headed hydrant landing valve, brass nozzle of appropriate length and orifice, branch pipe, hose coupling and nozzle spanner. The unlined hose shall meet requirement of relevant Indian Standard all hoses must be tested to understand an internal water pressure of not less than 35 kg/ cm² without bursting.

25.5.5.3 Water Sprinkler and Spray Systems

Each of the high velocity water spray system (Deluge System) shall consist of the deluge valve, flow switch, distribution piping, nozzles, thermal/ heat detector and a deluge panel. The deluge panel shall provide a connection point from the deluge system through the power house annunciation and detection system, as well as transfer the signal from the heat detectors to the electrically operated deluge valves.

Each deluge system shall consist of an electrically monitored isolating valve, normal dry distribution piping, flow switch and bulb type air charged monitoring system which automatically gets activated at a rated temperature.

The Contractor shall coordinate the system design with all oil filled transformer manufacturer (s) to ensure complete transformer protection system and to design the water requirement.

Each sprinkler system shall consist of an electrically monitored isolating valve, normal wet distribution piping (Except in deluge system), flow switch and glass type sprinklers which automatically get activated at a rated temperature.

All automatic sprinklers shall have temperature-sensitive sealing. The type, size and design of each sprinkler installation used in the system shall be appropriate to the hazards covered by the installation.

All exposed metal works in the system shall be efficiently earthed to prevent the metal work becoming electrically charged.

The temperature rating of sprinkler shall not be less than 30°C and greater than the highest expected ambient temperature of the location. Sprinkles shall be suitably coated with corrosion-resistant material.

The system design shall be in accordance with relevant standards.

25.5.5.4. Portable fire extinguishers

The type and number of portable fire extinguishers shall be determined according to the recommendations of the TAC, on the basis of classification of fires anticipated in the area, the construction and occupancy of the individual property, ambient-temperature conditions etc. Necessary provision of hand appliances like fire buckets shall also be made. Fire buckets shall be of mild steel and shall conform to relevant standards.

25.5.6. Fire Alarm and Signalling System

25.5.6.1. Power Supplies

Fire alarm systems shall be provided with at least two independent and reliable power supplies, one primary and one secondary (standby), each of which shall be of adequate capacity for the application and performance of the fire alarm system. A secondary supply shall be supplied from rechargeable sealed-type storage batteries of adequate capacity to operate the fire alarm system for 24 hrs. which together with the battery charger, protection, metering and supervision, as per relevant standards, shall be permanently identified in the fire alarm control panel. Battery charger shall be completely automatic, with 24Vdc high/low charging rate, capable of restoring the batteries from fully discharged condition (18Vdc) to fully charged condition within 48 hrs. The changeover from primary supply to secondary supply and vice-versa shall be fully automatic without affecting the transmission of

signal via the fire reporting system upon operation of the initiating devices.

25.5.6.2. Main Fire Alarm Control Panel

One (1) no. micro processor based fire alarm, annunciation and control panel shall be provided for annunciation and automatic operation of the system. The panel should be suitable for indoor floor mounting in the control room.

The main fire alarm control panels shall provide an automatic, supervised, multi zone detection and alarm system. Each fire alarm panel and wiring inside the panel shall comply with applicable requirements of relevant standards of modular type installed in a mounted steel cabinet with hinged door and cylindrical lock consisting of one or more cubicles of modular free standing construction which shall be provided as part of the system. The panels shall be clean, uncluttered and orderly assembled containing all necessary operating and supervising elements/ components, using a solid state technique. Ample gutter space shall be provided to allow proper clearances between the cabinet and live parts of the panel components.

The start-up shall be automatic after restoration of power either primary or secondary. Signals and LEDs/ LCDs together with visual annunciation shall be provided to indicate by zone any alarm, supervisory or trouble condition on the system as an integral part of the control panel with suitable identification.

Plug in modules for the alarm lines shall be provided

The operational features of the modules shall have at least the following functions. Other additional features required to make the system fully functional shall also be incorporated in accordance with relevant standards.

- Monitoring electrical supervision of different circuits viz. initiating device circuits, circuits used for supervisory signal services viz. sprinkler system, valves etc.
- Monitoring electrical supervision of power supply, battery voltage, transmitter tripping circuit integrity etc.,
- Trouble buzzer and trouble LEDs/ LCDs against any fault due to loss of power supply and battery supply , single break, open, or ground fault condition, panel fault and panel door open etc. impeding the normal functioning of the system.
- Evacuation alarm signal switch & transmitter disconnect switch.
- Confirmation or verification of all smoke detectors.

- Provision of supervised addressable relay for HVAC shut-down but shall not override at the HVAC panel, monitoring and supervised control outputs for elevator recall.
- Monitoring and control of fire sprinkler system, release of deluge system and other fire extinguishing system.

- One person test mode

Control panels and field panels shall have suitable software programme enabling expansion and modification of the system without replacement of hardware or firmware viz addition or deletion of zones etc.

An alarm condition in the circuit shall automatically annunciate in the mimic shall have at least the following functions but shall not be limited to make the system fully functional. These alarms shall also be printed out.

- Transmission of signal over the telephonic fire reporting system.
- Visual indication of the alarm device on the fire panel control panel display.
- Continuous operation and sounding of alarm notification appliances as per the applicable standards
- Operation of smoke control system and de-activation of air handling units in the alarmed area
- Automatic discharge of the respective fire suppression system with maximum 15 seconds delay for deluge system and 30 seconds for wet pipe system.

The fire alarm initiating device circuit and notification appliance circuit shall be connected to single module to power and supervise the circuit. Unacknowledged alarm signals shall not be interrupted if a fault on a fire detector circuit or a signalling line circuit occurs while there is an alarm condition on that circuit.

Fire alarm system components requiring power, except for the control panel power supply, shall operate on 24V DC.

All major devices installed in the panel shall have 10% spare capacity. Fire alarms, supervisory signals and trouble signals shall be distinctively and descriptively annunciated.

25.5.6.3. Main Mimic

The main mimic shall show the plant appearance with fire zones with the alarm lights in actual position. An individual horn for each shall be provided.

If an alarm, fault or release occurs, the pertaining light shall glow. After acknowledgement the horn shall be silent and the light shall remain steady and go off after resetting.

The following information at least shall be at the main mimic but shall not be limited to

- Alarms
- Release signals
- Air conditioning fire dampers and plant stops
- Release commands
- Evacuation signal release for sections
- General plant evacuation release

The data transmission between the fire alarm panels and the main mimic shall be executed via bus coupler and bus or cable.

25.5.6.4. Signs and Evacuation Signals

For deluge areas, the warning signs and releasing signs according to applicable codes may be installed.

The general evacuation signal for the entire plant shall be differentiated from the main mimic.

~~25.5.6.5. Fire Alarm Printing~~

~~Fire alarms printing shall be printed in the alarm printer installed in the central control room.~~

~~The printers shall have a memory, which enables the printing system to print out the alarms and events in the sequence they occur. The printer shall have an internal clock system supervised by the master clock every 24 hours.~~

~~25.5.6.6. Fire Alarm Bus Interface~~

~~All signals going to the alarm printer shall also be transferred to the main data logger via a bus coupler system in the sequence they occur.~~

~~The signals shall be stored in the main data logger for at least one year, shall be reachable via the bus system from the common visual display unit, and be printed out on request.~~

~~25.5.6.7. Fire Telephone~~

~~An emergency fire telephone system shall be installed throughout the plant based on a two-way communication system connecting the individual stations with the central control room. Two telephone lines at the central control room shall be connected to the public switched telephone network, each having its own telephone instrument, to meet the intent of this requirement.~~

25.5.7. Cables & Wires

The cables, wires and conduits/raceways shall be in accordance with relevant standards. The cables and wires shall be braided-sheathed laid down in suitable sized conduits, electrical tubings, metal molding or metallic raceways and shall afford protection against fire and mechanical injury as per relevant standards and specifications. The use of wire nut type connection for wiring shall be prohibited. Screw terminals and screw terminal boxes shall be preferably used. All the cables and wires shall be suitably tagged for proper identification by colour bands and by ferrules at junctions respectively.

25.5.8. Name Plates and External Indicators

For easy identification, each detector and manual pull station shall be equipped with a name plate showing at least line number, detector identification number and fire zone number. Major components of the equipment shall at least have manufacturer's name, address, catalogue no., voltage & current rating non-corrosive and heat resistant plate securely attached to the equipment. A record of these shall be provided prior to installation of the system.

25.6. Quality Control and Assurance

The contractor shall follow the quality assurance and testing requirements specified separately in Section XII – Quality Assurance Plan.

25.7. Drawings, Documents and Design Calculations

25.7.1. Drawings and Documents

The Contractor shall submit the all the drawings and documents as per clause no. 2 of Section VIII. The fire alarm specifications forming part of the documents covered under Clause no. 2 of Section VIII shall include, but shall not be limited to, the following:

- Applicable codes, standards and other design criteria to which the system is required to comply.
- Annunciator locations and type of fire alarm system with type of initiating devices, notification appliances etc. to be provided.
- Complete list of detection, evacuation, signalling and annunciator zones/areas.
- Complete list of fire safety control functions with complete sequence of operations detailing all inputs and outputs in the form of input/output matrix.
- A completion certificate stating compliance of the system with the applicable standards referred to with details of departure and recommendations, if any.
- Complete set of operating instructions and as-installed drawings with proper identifications.

25.7.2. Design Calculation

The Contractor is required to submit the design calculation for following to the Engineer for approval during detail engineering.

- Sizing of piping for distribution manifold
- Selecting the pump capacity and working head for pumps
- Size of the overhead tank
- Deluge system for transformers
- Sprinkler system for mechanical and electrical utility areas, cable trays and offices
- Numbers and type of automatic fire detectors and manual pull stations, types and quantities of notification appliances like bells, horns, speakers, flashlights etc.
- Capacity and number of the rechargeable storage batteries.
- Calculations for secondary supply and voltage drop calculations

25.8. Shop Tests

The pump, pipes, valves, Deluge system, sprinkler system, automatic detectors etc. to be supplied shall be routine tested as per relevant IEC/IS/NFPA at the work's of Contractor in presence of the Employer. The Contractor is required to submit type test certificates and routine test reports of equipment.

25.9. Installation and Commissioning

The contractor shall furnish all labour, supervision, tools, supplies, suitable bracing, spiders, shims and supports and all other provisions or materials necessary to assemble, erect, install, test and commission the equipment in a thorough workman like manner following the best modern practices and standards available.

The equipment and all its components shall be corrosion resistant and shall be placed with great care and accuracy. They shall be aligned correctly to provide an installation consistent with the close tolerances used in the erection of modern equipment. The proper elevations and centrelines to which equipment is to be set shall be established by the contractor. Moreover, devices and appliances shall be located and mounted so that accidental operation or failure is not caused by vibration or jarring. Circuits and equipments shall be properly protected against the possibility of induced transients.

The power supply shall be equipped with locking mechanism and marked in red with proper identification.

Detectors shall be located at strategic positions and arranged in zones to facilitate proper indication of fire location, transmission of audio-visual signals to fire control panels and actuation of the appropriate fire fighting system. Detectors installed in concealed areas shall have suitable visual indication in a visibly located area. Smoke detectors shall not be installed until construction is essentially complete and the building thoroughly cleaned.

All types of pipe and fixtures used in this fire protection system shall be spaced according to accepted standards and with due allowances made for thermal expansion and contraction and shall not be subjected to mechanical, chemical or other damage. Before installation all system components shall be checked for cleanliness and after installation, the systems shall be effectively flushed out with clean water and filled up for testing before the nozzles and discharge horns are fitted.

The power plant fire alarm system must be in any case, ready for operation prior to the commissioning of the first generating unit, the control block fire alarm prior to the main control building finish date.

25.10. Field Test

After installation, the fire fighting system with all its equipments and devices shall be field tested for performance/operational tests etc. as per General Technical Specifications - Section VIII - Clause 9.2.6 & Clause 9.2.4 in accordance with, but shall not be limited to, relevant NFPA codes. If the system shall be tested in sections, the same applies for each section.

The tests at site should at least include the following:

- Hydrostatic pressure tests of the whole piping system
- Pump output test
- Leakage test
- Test for megger value of insulation as per relevant IEC
- Test for sensitivity range of sensors/detectors
- The tests for the piping system shall be completed prior to installation of the equipment in the pipes.

All test equipment and instruments necessary to complete the tests in all respect shall be furnished by the contractor except otherwise specified and shall remain the contractor's property after the fulfilment of all field tests. All necessary materials and labour for performing all the above tests shall be provided by the contractor. Any defects or leaks disclosed in the tests shall be duly mended/ repaired to meet the desired function.

The contractor shall prepare and hand over to the Employer details of all test results in a report in a mutually agreed format.

25.11. Spares

25.11.1. General Spare Parts

The Contractor shall supply the general spare parts as per clause no. 3.1.1 of Section VIII. The supply of this spares shall be as per the approved list of spares for each component / equipment / item during detail engineering.

25.11.2. Recommended Spare Parts

The Contractor shall furnish the list of recommended spare parts as per clause no. 3.1.3 of Section VIII.

25.11.3. Specified Spare Parts

The following specified spare parts, as defined in clause no. 3.1.2 of Section VIII, which shall comprise the total requirement for Fire Fighting system under this Contract, shall be supplied.

S. No.	Description	Qty
1	Complete pump with motor	1 No.
2	Gaskets (SS) for pump	2 Nos.
3	Detector of each type	5 sets
4	Electric plug-in cards for the main panel	2set
5	Electric plug-in cards for the deluge panels and sub panels	2set
6	Each type of bulb and LED installed in the system	5 sets
7	Fire telephone set	2 Nos.
8	Intelligence interface unit for pressure switch	10Nos.
9	Fire resistant control cable	100 m
10	Digital type heat sensor cable	50 m
11	Nozzles for HVW and MVW water spray system.	10% of total requirement of each type
12	Deluge valves / sprinkler valves	1 no. per size
13	Manual pull station	5 nos.
14	Portable fire extinguisher	5% of total requirement of each type
15	Hydrant valve	2 nos.
16	Branch pipe and nozzle for hydrant system	10 nos.
17	Battery of CO ₂ cylinders required for generator protection	1 set

Note: A set is defined as the total number required for one unit.

25.12. Special Tools

In addition to the tools listed in general technical specification the Contractor shall provide one set of software, connecting cables, proprietary equipments, other necessary special tools necessary for maintenance, testing and reprogramming of the equipment of the fire fighting system as recommended by the manufacturer.

A list of such tool shall be approved during detailed engineering.

3. SPARE PARTS AND TOOLS

3.1 This specification is for entire power house. Bidder shall refer portions of this specification for the scope applicable for Switchyard or GIS portion of the project as stipulated in Sec-1 of this TS including spares applicable for GIS portion.

Specifications and shall be of the same material and workmanship. They shall be replaceable without cutting or destruction of adjacent components. Before issue of the Taking-Over Certificate the spare parts shall be checked at the Site by the Contractor in presence of the Engineer in charge/Employer.

Acceptance of any spare part will not take place before the Contractor has submitted the complete final detailed list of all spare parts and tools.

All spare parts shall be protected against corrosion and shall be marked with identification labels in English. The identification shall be in accordance with the agreed Works Identification System.

All spare parts, tools and materials shall be delivered in marked boxes of sufficient sturdy construction to withstand long term storage.

3.1.1 General Spare Parts

At least the quantity of general spare parts specified below shall be included in the Total Tender Price and consequently in the scope of Works of the Contract.

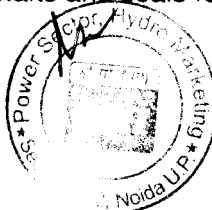
If the same spare parts are listed twice under "General Spare Parts" as well as under "Specified Spare Parts", the quantity listed under "Specified Spare Parts" shall take priority over the quantity stipulated under "General Spare Parts".

➤ Spare Parts subjected to Wear and Tear.

For each installed assembly such as Servomotors, Pumps, Motors, Main Inlet Valves, Pressure Oil Units, Gates, Valves, Compressors, Cranes, Machine Tools etc. the following general Spare Parts shall be delivered.

Two (2) complete sets of:

- Facing rings of mechanical seals
- Protection sleeves
- Carbon brushes for motors (if applicable)
- Inserts of filters
- Bearing bushings
- Brake liners
- Pickings
- Roller bearing for rotating shafts and seals for rotating shafts



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- Driving belts
- Wearing parts of couplings
- Frequently actuated springs
- Outdoor installed pressure hoses

Wear and tear items shall be defined as such, which require replacement several times during the service life of the assembly.

➤ Customary Spare Parts:

For a number of like and identical assemblies the following spare parts shall be delivered, whereas one set shall be defined as the total quantity for one assembly:

- "X" Complete Sets related to "Identical Assemblies"
- Seals, gaskets and packing
- Thermometer, manometer, flow meter, level indicator (with and without contacts)
- Transducer 4/20 mA for position, pressure, temperature, flow
- Indoor installed pressure hoses
- Lamps, signal lamps, push button and switches
- Fuses, clamps
- Limit switches, auxiliary relays, pressure switches
- Roller bearings, sleeves and bushings for movable parts including for spherical joints
- Ball bearings.
- Resistance thermometer without indicator
- Motor-starters, contacts for feeder switches
- Springs
- "X" Complete Valves and Gates:

Related to "Identical Installed Standard Valves and Gates" (manually, hydraulically or electrically driven) including Drive like

- Shut-off valves and cocks
- Globe valves, needle valves or butterfly valves
- Non-return valves
- Pressure relieve valves
- Pressure reducing valves
- All solenoid valves
- Safety valves
- Aeration and venting valves



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➤ Float controlled valves

The quantity "X" which shall be furnished is a function of the number "N" of supplied "Assemblies" or "Valves and Gates" identical in type and size.

$$N < 3 \quad X = 1$$

$$N < 10 \quad X = 2$$

$$N > 10 \quad X = N/10 + 1, \text{ rounded-up to the next higher whole number}$$

The Contractor shall provide 5%, but at least two pieces of all bolts, screws, nuts, washers, spanner rings and cotters. The quantity may be taken from the surplus handed over to the Employer after completion of the installation as described under 5.2 "Bolts, Screws, Nuts, etc." of this Section.

For all items under this Contract the Contractor shall deliver 5 % of the quantity of painting material, but at least one litre, in new sealed containers, for later repair work other than the Contractor's.

Parts with a special size or properties, as listed below are excluded as General Spare Parts:

- Bolts, screws, nuts, washer, spanner rings and cotters with a nominal diameter of more than 80 mm
- Roller bearings, bearing shells, sleeves and bushings for movable parts including for spherical joints with an inner diameter of more than 200 mm
- All valves and gates with a nominal diameter of more than 600 mm
- Main seals for gates, valves, access doors and openings with a total length of more than 2.40 m in straight length or circumference.

3.1.2

Specified Spare Parts

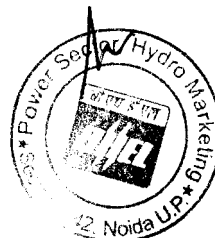
The required specified spare parts are listed separately in the Particular Technical Specifications. The price for each listed special spare part shall be quoted individually in the Price List; the total price shall be included in the Total Tender Price.

3.1.3

Recommended Spare Parts

If any additional spare parts are recommended by the Contractor, these shall be stated in quantity and description in the Technical Data Sheets for each item.

Orders for recommended spare parts shall be optional to purchase by the Employer for a period of five (5) years after the date of the completion of the project. However optional spare parts will not be considered in tender evaluation.



3.2 Tools and Appliances

The scope of work shall include all customary and special tools, as well as auxiliary devices including lifting devices, ropes, etc. necessary for total assembly and disassembly of all parts of the supplied Works. Furthermore, all accessories for maintenance shall be supplied and included in the Tender. The total price for tools and devices as required by this article shall be included in the Total Tender Price.

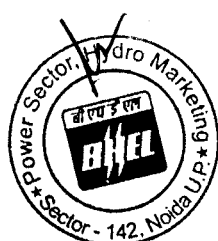
The tools, wrenches, etc. shall be unused. Customary tools for erection shall be of the forged and polished chrome-vanadium type. Use of special tools and devices for erection shall be allowed, but shall be approved by the Engineer in each case. Special tools and devices shall be provided with means for ready identification.

All lifting devices and wire ropes slings to be used at site shall be tested at works and test certificate shall be supplied to the Engineer.

Suitable hardwood or steel boards arranged for wall mounting as well as tool carts and/or toolboxes shall be included in the delivery. An itemised list and description of all provided tools, auxiliary devices, storage equipment, etc. shall be included in the Tender. Acceptance of any tool or device shall not take place before the Contractor has submitted the complete final detailed List of Tools and Appliances.

Ropes, slings etc. shall be handed over in new condition. The Employer shall be entitled to take over from the Contractor the entire erection tools, appliances, instruments at mutually agreed conditions.

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SECTION-3

3.0 GENERAL

This section stipulates the General Technical Requirements under the Contract and will form an integral part of the Technical Specification.

The provisions under this section are intended to supplement general requirements for the materials, equipments and services covered under other respective sections and are not exclusive. However in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall hold good.

3.1 PROJECT INFORMATION AND SYSTEM PARAMETERS

a)	Customer/ Purchaser/ Owner	Uttarakhand Jal Vidhyut Nigam Limited
b)	Project Title	220kV switchyard for 2 X 60MW Vyasi HEP
c)	Location	Village Vyasi, 5.0 Km.d/s of Lakhwar, Dehradun
d)	Elevation above MSL	535 mtr.
e)	Transport Facilities	Airport ,Railways at Dehradun, accessible by Road from National Highway NH-123 at Barawala (3 km from Dakpathar).
f)	Postal Address	To follow

SITE CONDITIONS

a)	Max. temp.	42.8°C
b)	Min. temp.	0.3°C
c)	Design ambient temp.	50°C
d)	Latitude/Longitude	30° 31' 00" N/ 77° 53' 00" E
e)	Maximum Relative humidity	100 %
f)	Minimum Relative humidity	8%
g)	Pollution Severity	Less Polluted
h)	Seismic acceleration	0.18g
i)	Seismic zone	Zone-IV
j)	Wind Velocity & Zone	47 m/s Zone IV
k)	Normal Rain fall in Catchment	1250-2000MM

SYSTEM PARAMETERS

Nominal system voltage	220 kV
Highest system voltage	245 kV
Rated Normal Current at Nominal System Voltage	1250A
Basic Impulse level	1050kVP
Power frequency withstand voltage	460kVrms
Switching Impulse voltage	850kV -
Maximum Permissible Switching Over Voltage to Earth (kV)	487kV
Frequency	50 Hz $\pm$ 5%
Rated short time current	50 kA for 1 sec
Creepage distance	25mm/kV
System Earthing	Solidly Grounded

Note:-**Seismicity**:-The project is situated in a seismic zone and falls within Zone IV of the seismic zoning Map of India. Value of peak ground acceleration has been recommended as 0.36g for maximum Credible Earthquake (MCE) and 0.18g for Design basis Earthquake (DBE).

Wind Load:- The basic wind load as per IS875 (part-3) shall be applied on the vertical projected area, multiplied with the applicable factor for different type of structures.

AUXILIARY POWER SUPPLY

3 phase A.C power supply	415V, 50 Hz, 3-phase 4 wire, solidly earthed with variation in frequency of $\pm$ 5% and variation in voltage $\pm$ 10%.
1 phase A.C power supply	240V, 50 Hz, 1-phase, AC supply with variation in frequency of $\pm$ 5% and variation in voltage $\pm$ 10%.
D.C. power supply	220V(variation under worst condition from 198V to 242V) , 2-wire ungrounded, 50V, 2 wire system (+) earthed , 48V $\pm$ 20%

Transportation Limitations:- For shipments, the Manufacturer shall pack the items to meet size and weight restrictions of the Indian railways and road systems. Shipments from Manufacturer's work (in case of foreign manufacturer) shall travel to the Port of entry in India, from where these will be transported, after necessary port clearances etc., by the Contractor to Dehradun , which shall be the nearest rail head for the Project, and further transported to site. However, in certain cases the Contractor may be required to transport the materials from Port of entry to Dehradun and further to Vyasi HE Project site directly by road transport. However, Indian contractors shall be

responsible in all respects for transportation of all materials and equipment up to the project site. Manufacturers shall consult with the concerned authorities of railways and highways to ensure that their packaging will be such as to permit them to transport the plant and equipment within such imposed limits. Manufacturers shall arrange to deliver the maximum size subassemblies consistent with safe and convenient transport. All materials and equipment etc. arrived at Dehradun will be unloaded from rail wagons and reloaded on to road transport for shipment to project site by the Contractor. The roads and bridges enroute shall be made suitable for 70R loading capacity.

3.2 GENERAL TECHNICAL REQUIREMENT

3.2.1 QUALIFYING REQUIREMENT

As per section-1 of item Specific QR

3.2.2 TYPE TESTS

For all the items of equipment's, bidder shall furnish copies of Type Tests Certificates for the equipment's of the type and ratings similar to those specified. Type Tests Certificates furnished shall be as per the provisions of relevant standards for such equipment's. In case the contractor is not in position to furnish, such type tests certificates or the type tests certificate furnished by him are not as per the relevant standard for such equipment and, therefore, not acceptable to the Employer, Type Test for such items and equipment's will have to be got conducted by the contractor at his cost.

All the switchyard equipment's shall be type and routine tested as per relevant IS / IEC- Publication or Type tests certificate shall be furnished to prove that the equipment fulfils all characteristics defined in Specifications. The contractor is required to carry out all type tests on one apparatus of each type and routine tests on all apparatus and submit the reports to the Employer. If approved by the Employer, type test certificates can be accepted in place of type tests in case of the same have been carried out on same type & similar capacity. All equipment/systems to be supplied shall conform to type tests as per relevant standards and proven type.

The Bidder / Contractor shall furnish the reports of all the type tests carried out in within **last ten years from the date of bid opening (i.e. 08.05.2017)** as listed in relevant clauses in respective electrical specification and relevant standards for all components / equipment / systems. These reports should be for the tests conducted on identical/similar components/equipment/systems to those offered/proposed to be supplied under this contract.

Type tests done in an independent government laboratory or in the presence of representative of State Electricity Board or other reputed public undertakings, the type test reports of the same shall be submitted for scrutiny /approval. If these are found suitable and technically acceptable, conducting of type tests shall be waived off.

In case Contractor is not able to submit report of type test(s) conducted in last ten years, or in case type test report(s) are not found to be meeting the specification/relevant standard requirements, then all such tests shall be conducted under this contract by the Bidder free of cost to Employer/Purchaser, and reports

shall be submitted for approval. No charges shall be paid under this contract. All acceptance and routine tests as per relevant standards and specification shall be deemed to be included in the bid price.

3.2.3 CODES AND STANDARDS

All materials and equipment shall generally comply in all respect with the latest edition of relevant international electro-technical commission (IEC) or any other internationally accepted standard which ensure equal or better quality or relevant Indian standard(IS) mentioned against each equipment and this specification.

3.3 MATERIAL/WORKMANSHIP

3.3.1 General Requirement

Where the specification does not contain characteristics with reference to workmanship, equipment, materials and components of the covered Equipment it is understood that the same must be new, of highest grade of the best quality of their kind conforming to best engineering practice and suitable for the purpose for which they are intended. All design calculations, materials, works, manufacturing and testing shall conform to the latest applicable standards.

The design of the Works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements and shall be used throughout the design. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfill their required function. In general screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from purchaser.

Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall be interchangeable with, and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be constructed as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, leveling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances and instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re-establish the manufacture's limits suitable guards shall be provided for the protection of personal on all exposed rotating and / or moving machine parts and shall be designed for easy installation and removal for

maintenance purpose. The spare equipment(s) shall be installed at designated locations and tested for healthiness.

The Contractor shall apply oil and grease of the proper specification to suit the machinery, as is necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for applying the lubricant required for operation. The Contractor shall apply all operational lubricants to the equipment installed by him.

All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Contractor has any special requirement for the specific application of a type of oil or grease not available in India. In such is the case he shall declare in the proposal, where such oil or grease is available. He shall help purchaser in establishing equivalent Indian make and Indian Contractor. The same shall be applicable to other consumables too.

3.3.2 Provisions For Exposure to Hot and Humid climate

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favorable to the growth of fungi and mildew. The indoor equipments located in non-air conditioned areas shall also be of same type.

3.4 COLOUR SCHEME AND CODES FOR PIPE SERVICE

The contractor shall propose a color scheme for those equipment/Items for which the colour scheme has not been specified in the specification for the approval of purchaser. The decision of purchaser shall be final. The scheme shall include:

Finishing colour of Indoor equipment

Finishing colour of Outdoor equipment.

Finish colour of all cubicles.

Finishing colour of various auxiliary system equipment including piping

Finishing colour of various building items.

All steel structures, plates etc shall be painted with non-corrosive paint on a suitable primer. It may be noted that normally all electrical equipment in switchyard are painted with shade RAL 7032. All The indoor cubicles shall be of same colour scheme and for other miscellaneous items, colour scheme will be approved by the purchaser.

3.5 PROTECTION

All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic

protecting device. All ends of all valves, pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage.

All equipment accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects and corrosion. The parts which are likely to get rusted, due to exposure to weather should also be properly treated and protected in a suitable manner. Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent entry of insects.

3.6 FUNGISTATIC VARNISH

Besides the space heaters, special moisture and fungus resistant varnish shall be applied on the parts, which may be subjected or predisposed to the formation of fungi due to the presence or deposit of nutrient substances. The varnish shall not be applied to any surface of part where the treatment will interface with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application to the varnish.

3.7 SURFACE FINISH

All surfaces that are so indicated on the drawings or those that require machining for their intended function, or those that are usually machined according to good workshop practice shall be machined. Surface finish qualities shall be adequate for the intended use and shall be indicated on the Contractor's Drawings. Suitable measuring device such as scatter meter or other acceptable measuring device will be used to determine compliance with specified surface finish.

All interiors and exteriors of tanks, control cubicles and other metal parts shall be thoroughly cleaned to remove all rust, scales, corrosion, greases or other adhering foreign matter. All steel surfaces in contact with insulating oil as far as accessible, shall be painted with not less than two coats of heat resistant, oil insoluble, insulating paints.

All metal surfaces exposed to atmosphere shall be given two primer coats of zinc chromate and two coats of epoxy paint with epoxy base thinner. All metal parts not accessible for painting shall be made of corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound and suitably wrapped or otherwise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather within the limit specified. The paint shall not scale off or wrinkle or be removed by abrasion due to normal handling. All external painting shall be as per RAL 7032.

Before delivery, all exposed, unfinished metal surfaces shall be cleaned and shop painted. Cleaning and Preparation of steel surfaces shall be in accordance with relevant standards and they shall be given at least one prime coat the same day. Paint shall be in accordance with applicable portions of relevant Indian and International standards. The colours of the paint will be selected at the Employer's option. All interior surfaces of the crane those are accessible for maintenance inspections shall also be completely painted. All other interior surfaces shall be painted with only the 1 coat of primer. The inside of all gear housings shall be painted with 2 coats of oil resisting enamel as recommended by the gearhousing manufacturer. A

quantity and type of paint equal to 15% of the paint used for the second and third coats shall be provided for field touchup work. Monorail hoists shall be painted with the manufacturer's standard finish. The colour of the paint will be subject to approval of the Employer/Customer.

3.8 GALVANIZING

All structural steel including ladders, platforms, hand rails and the like and all exterior and interior steel surfaces of outdoor Works, as well as bolts and nuts associated with galvanised parts shall be hot-dip galvanised, electrolytic galvanised or serialised, as may be appropriate to the particular case. Galvanising shall be performed in accordance with VDE Standard 0210 (Verband Deutscher Elektrotechniker) or IS 4795:1996. For galvanizing, only original blast furnace raw zinc shall be applied, which shall have a purity of 98.5%. The thickness of the zinc coat shall be for bolts and nuts, approx. 60 micrometer.

Conforming to latest version of IS:2629 or any other equivalent authoritative standard. However, hardware less than M12 size shall be electro-galvanized. Minimum weight of zinc coating shall be **610 gms. per square meter** and minimum thickness of coating shall be 85microns for all items thicker than 6mm. For items lower than 6 mm thickness, requirement of coating shall be as per relevant ASTM.

3.9 PACKING

The following details are to be clearly indicated in the material forwarding documents:

- a) Name and address of the consignee.
- b) Purchase order number.
- c) Name of supplier/s.
- d) Description of equipment / material.
- e) Net weight.
- f) Gross weight.

All the equipment's shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. On request of the purchaser, the Contractor shall also submit packing details/associated drawing for any equipment material under his scope of supply, to facilitate the purchaser to repack any equipment/ material at a later date, in case the need arises. Any material found short inside the packing cases shall be supplied by the supplier without any extra cost.

The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbol i.e. fragile, handle with care, use no Hooks etc. All electrical parts shall be carefully protected from damage by sand, moisture, heat or humid atmospheric conditions by packing them in high-pressure polyethylene foil.

All the cable shall be supplied on nonreturnable wooden drums with adequate barrel diameter so as to avoid any damage to the cables and to withstand rough handling during transportation and storage. A layer of waterproof paper shall be applied to the surface of the drums and over the outer cable layer.

A circular space of at least 40mm shall be left between the cable and the lagging. Each drum shall carry the name of the manufacturer, the name of the Employer, his address, order number, item number, type, size length of cable, net and gross weight duly stencilled thereon.

3.10 HANDLING, STORING AND INSTALLATION

Contractor may engage manufacturer's Engineers to supervise if required for unloading, transportation to site, storing, testing and commissioning of the various equipment being procured by them separately. In case of any doubt/misunderstanding as to the correct interpretation of manufacturer's drawings or instructions, necessary clarifications shall be obtained from the purchaser. Contractor shall be held responsible for any damage to the equipment consequent to not following manufacturer's drawings/instructions correctly.

Where assemblies are supplied in more than one section, contractor shall make all necessary mechanical and electrical connections between sections including the connection between buses. Contractor shall also do necessary adjustments/alignments necessary for proper operation of circuit breakers, isolators and their operating mechanisms. All components shall be protected against damage during unloading, transportation, storage, installation, testing and commissioning.

Contractor shall be responsible for examining all the shipment immediately of any damage, shortage, discrepancy etc. for the purpose of Purchaser's information only. Any demurrage, pilferage and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor. The Contractor shall be fully responsible, for the equipment/material until the same is handed over to the purchaser in an operating condition after commissioning.

The minimum phase to earth, phase to phase and section clearance along-with other technical parameters for the various switchyard voltage levels to be maintained shall be strictly as per the approved drawings.

The design and workmanship shall be in accordance with the best engineering practices to ensure satisfactory performance throughout the service life. If at any stage during the execution of the Contract, it is observed that the erected equipment(s) do not meet the above minimum clearances, the Contractor shall immediately proceed to correct the discrepancy at his risks and costs.

3.11 DEGREE OF PROTECTION

The supplier shall propose following Degree of protection for those equipment/Items for which the degree of protection has not been specified in the specification for the approval of BHEL/UJVNL. The decision of BHEL/UJVNL shall be final. The enclosures of the Control Cabinet, Junction boxes and Marshalling boxes panels etc. to be installed shall be provided with degree of protection as detailed here under:

- a) Installed outdoor: IP-55
- b) Installed indoor in air conditioned area: IP-42
- c) Installed in covered area IP:52
- d) For LT switchgear (AC & DC distribution Boards): IP-54

The degree of protection shall be in accordance with IS:13947, (Part-1)/IEC-947(Part-1). Type test report/or degree of protection test on each type of the box shall be submitted for approval. If necessary the cubicles shall be equipped with automatically controlled heating elements for protection against internal condensation and moisture. All panels/cubicles shall have approximately 20% space for mounting of future devices. Door operated interior illuminating lamps, power socket for 240V 5 /15A and communication socket shall be provided in all panels.

3.12 RATING PLATES, NAME PLATES AND LABELS

The switchyard equipment shall have a rating plate with the information required by relevant IEC i.e. at least the following:

- Manufacturer's name
- Type number
- Serial number
- Rated Voltage
- Rated impulse withstand voltage
- Rated power frequency withstand voltage
- Rated frequency
- Rated current
- Rated short circuit breaking current
- Rated short time current (r.m.s), & duration Each instrument transformer must have its own rating plate with the information as required in IEC 600441 and IEC 60186.

3.13 EARTHING

The operating mechanism housing, control cabinets, support structure etc. shall be provided with two separate earthing terminals suitable for bolted connection to 50x6mm mild steel flat to be provided for connection to station earth mat.

Circuit breakers, LA, Isolator, CVT, CT, BPI shall be provided with two grounding pads suitable for connection to galvanized steel flat of Size 75X12 mm. Control panels, Relay panel, outdoor marshalling

boxes, Junction boxes, Lighting panels and distribution board shall be provided with two grounding pads, for connection to galvanized steel flat. The two pads shall be provided, one each at the middle of the two opposite sides of the bottom frame of the equipment. Earthing of hinged door shall be done by using a separate earth wire.

The Contractor shall connect all equipment included in the scope of delivery to the grounding system. In addition to the grounding through cable screens, all equipment such as cubicles, motors, etc. shall be connected directly to the grounding system using copper wire of area not less than 50 mm sq. at two different points. In general, all iron parts such as supports, covers, railing, etc. shall be connected to the grounding system. Each conductor shall have its own separate connection point. Pressed on closed shoes shall be used for connections to bars.

3.14 TERMINAL BLOCKS AND WIRING

Wiring within cubicles and equipment enclosures shall conform to requirements of this section unless otherwise specified. Control wiring shall be stranded copper and shall be not smaller than 1.5 mm sq. except as otherwise agreed by the Engineer.

Larger size wiring shall be used where needed for the current carrying capacity requirements. Cables shall have at least 1000 V grade PVC insulation except for 110V DC and telemetering or communication system equipment for which 650V and 300 V ratings respectively may be acceptable.

For current and potential transformer secondary circuits the minimum cross section of the conductors shall not be less than 2.5mm sq. Wiring shall terminate at terminal blocks at one side only. Where tap connections are required, they shall be made on terminal blocks. Wiring shall be neatly arranged and laid in plastic conduits accessible from the front door. The conduits shall not be filled more than 70 %.

Each cubicle shall be provided with an earthing bar (PE) of sufficient cross section carrying any possible fault current without undue heating. All metallic parts of the cubicle not forming part of the live circuits, all instrument transformer terminals to be earthed and other earthing terminals as well as all cable screens and PE-wires shall be connected to the earthing bar.

The terminal blocks shall be located to allow a neat and easy connection work and shall be safely accessible while the equipment is in service. Control circuits and power circuits shall be completely separated by use of divided or separate terminal blocks. Power terminal blocks shall be rated in accordance with applicable standards and shall be provided with covers. Control wiring terminal shall be equipped with facilities for opening the circuit. It shall be possible to interchange a single terminal block for a new one without dismantling a whole row. Current transformer terminal blocks shall have provisions for short-circuiting and disconnecting. Not more than two wires shall be connected to any one terminal. Terminal blocks using screws acting directly on the wire will not be accepted. At least **20%** spare terminals shall be provided. Terminals shall be marked with printed labels.

Terminal blocks shall be 1100 V grade and have continuous rating to carry the maximum expected current

on the terminals. Those shall be of moulded piece complete with insulated barriers stud type terminals, washers nuts and lock nuts. Screw clamp, overall insulated, insertion type, rail mounted terminals can be used in place of stud type terminals. But preferably the terminal blocks shall be non-disconnecting stud type equivalent to Elmex type CATM4, Phoenix cage clamp type of Wedge or equivalent. The Insulating material of terminal block shall be nylon 6.6 which shall be free of halogens, fluorocarbons etc.

Terminal block for current transformer and voltage transformer secondary leads shall be provided with test links and isolating facilities. The current transformer secondary leads shall also be provided with short circuiting and earthing facilities.

The terminal shall be that maximum contact area is achieved when a cable is terminated. The terminal shall have a locking characteristic to prevent cable from escaping from the terminal clamp unless it is done intentionally. The conducting part in contact with cable shall preferably be tinned or silver plated however Nickel plated copper or zinc plated steel shall also be acceptable. The terminal blocks shall be of extensible design. The terminal blocks shall have locking arrangement to prevent its escape from the mounting rails.

The terminal blocks shall be fully enclosed with removable covers of transparent, non deteriorating type plastic material. Insulating barriers shall be provided between the terminal blocks. These barriers shall not hinder the operator from carrying out the wiring without removing the barriers.

The arrangements shall be in such a manner so that it is possible to safely connect or disconnect terminals on live circuits and replace fuse links when the cabinet is live. At least 20 % spare terminals shall be provided on each panel/cubicle/box and these spare terminals shall be uniformly distributed on all terminals rows.

There shall be a minimum clearance of 250mm between the first bottom row of terminal block and the associated cable gland plate. Also the clearance between two rows of terminal blocks shall be a minimum of 150 mm. The Supplier shall furnish all wire, conduits and terminals for the necessary inter-phase electrical connection (where applicable) as well as between phases and common terminal boxes or control cabinets.

All input and output terminals of each control cubicle shall be tested for surge withstand capability in accordance with the relevant IEC Publications, in both longitudinal and transverse modes. The supplier shall also provide all necessary filtering, surge protection, interface relays and any other measures necessary to achieve an impulse withstand level at the cable interfaces of the equipment.

3.15 CONTROL CABINETS, JUNCTION BOXES, TERMINALS BOXES AND MARSHALLING BOXES FOR OUTDOOR EQUIPMENTS

All types of boxes, cabinets etc. shall generally conform to and be tested in accordance with IS-5039, IS-8623 or IEC-439, as applicable and the clause given below.

Control cabinet, Junction boxes, Marshalling boxes & Terminal boxes shall be made of sheet steel or aluminium and shall be dust, water and vermin proof. Sheet used shall be least 2.0 mm cold rolled or 2.5mm hot rolled. The box shall be properly braced to prevent wobbling. There shall be sufficient

reinforcement to provide level surfaces, resistance to vibrations and rigidity during transportation and installation. In case of aluminium enclosed box the thickness of aluminium shall be such that it provides adequate rigidity and long life as comparable with sheet of specified thickness. Cabinet/boxes shall be free standing floor mounting type, wall mounting type or pedestal mounting type as per requirements.

Removable plates with gaskets shall be fitted at the top and bottom of the box to provide the entry for conduit or cable. The door shall be provided with suitable gasket and fitted with a lock type handle. The door shall be hung on hinges having brass bodies and stainless steel pins. Each cable junction box shall be provided with terminals of adequate rating on the terminal strip of suitable thickness. Disconnecting (sliding) type terminal blocks shall be provided, to facilitate testing & maintenance without disconnecting the cables.

Multi block terminal board of 15 A, 500 V rating shall be provided to form in assembly of number of terminal block. Assembly may be secured with only two screws on the surface. There shall be provision on the strips to add more terminal in case of further requirement.

Cabinet /boxes shall be provided with double hinged doors with padlocking arrangements. The distance between two hinges shall be adequate to ensure uniform sealing pressure against atmosphere. The quality of gaskets shall be such that it does not get damaged/cracked during the operation of the equipment.

All door, removable covers and plates shall be gasketed all around with suitably profiled EPDM gaskets. The gasket shall be tested in accordance with approved quality plan. The quality of gasket shall be such that it does not get damaged /cracked during the years of the equipment or its major overhaul whichever is earlier. All gasketed surfaces shall be smooth, straight and reinforced if necessary to minimize distortion and to make a tight seal. Ventilating Louvers, if provided, shall have screen and filters. The screen shall be fine wire mesh made of brass.

All boxes/cabinets shall be designed for the entry of cables from bottom by means of weather proof and dust-proof connections. Boxes and cabinets shall be designed with generous clearances to avoid interference between the wiring entering from below and any terminal blocks or accessories mounted within the box or cabinet. Suitable cable gland plate projecting atleast 150 mm above from the base of the Marshalling Kiosk/box shall be provided for this purpose along with the proper blanking plates. Necessary number of cable glands shall be supplied and fitted on this gland. The gland shall project at least 25mm above gland plate to prevent entry of moisture in cable crutch. Gland plate shall have provision for some future glands to be provided later, if required

3.16 SPACE HEATERS

The space heaters shall be suitable for single phase 50 Hz AC supply from an independent source, which should automatically switch off before starting of unit. However, once the dehumidification unit is switched ON, it shall be controlled automatically with a thermostat. The dehumidification unit shall be designed to avoid hot spot. The heater shall be suitable for continuous operation at 240 V AC supply voltage and shall be provided with on – off switch and fuse shall be provided for heater.

One or more adequately rated, thermostatically connected heaters shall be supplied to prevent

condensation in any compartment. The heater shall be installed in the lower portion of the compartment and electrical connections shall be made from below the heater to minimize deterioration of supply wire insulation. The heaters shall be suitable to maintain the compartment temperature to prevent condensation.

The heaters shall be suitably designed to prevent any contact between the heater wire and air and shall consist of coiled resistance wire centered in metal sheath and completely encased in a highly compacted powder of Magnesium Oxide or other material having equal heat conduction and electrical insulation properties, or they shall consist of a resistance wire wound on a ceramic and completely covered with a ceramic material to prevent any contact between the wire and air. Alternatively, they shall consist of resistance wire mounted into a tubular ceramic body built into an envelop of stainless steel or the resistance wire is wound on a tubular ceramic body and embedded in glaze the surface temperature of the heaters shall be restricted to a value which will not shorten the life of the heater sheaths or that of insulated wire or other component in the compartments

3.17 QUALITY

BHEL quality plan to be followed subject to TBEM / customer's approval.

3.18 GUARANTEE:

The supplier shall guarantee that the goods under the Contract are new, unused of the most recent or current models and incorporated all recent improvements in design and materials unless provided otherwise in the Contract. The supplier shall further guarantee that the goods supplied under this Contract shall have no defects arising from design, materials or workmanship, installation and erection, if that may develop under normal use of the supplied goods. The supplier shall also guarantee the performance of the works executed by him including the performance of all the materials/goods supplied by him.

BHEL shall promptly notify supplier in writing of any claims arising under guarantee in respect of goods. Upon receipt of such notice, the supplier shall, with all reasonable speed, repair or replace the defective works or parts thereof, free of cost at site. All the expenses towards transportation of defective parts to supplier's works and of repaired/replaced parts to site shall be borne by the Supplier.

If the Supplier, having been notified, fails to remedy the defects within 14 days, the BHEL will proceed to take such remedial action as may be necessary, at the supplier's risk and expenses. All expenses in this regard will be recovered from Supplier.

3.19 DOCUMENTATION

3.19.1 LIST OF DOCUMENTS

The bidder shall submit a detailed list of drawings / documents along with the bid proposal which he intends to submit to the Employer after award of the contract.

The supplier shall necessarily submit all the drawings / documents unless anything is waived.

All engineering data submitted by the Contractor after final process including review and approval by the Employer shall form part of the Contract Document and the entire works performed under this specification shall be performed in strict conformity, unless otherwise expressly requested by the Employer in Writing.

3.19.2 DRAWINGS

All drawings submitted by the Contractor including those submitted at the time of bid shall be in sufficient detail to indicate the type, size, arrangement, material description, Bill of Materials, weight of each component, break-up for packing and shipment, the external connections, fixing arrangement required, the dimensions required for installation and interconnections with other equipment's and materials, clearances and spaces required for installation and interconnection between various portions of equipment's and any other information specifically requested in the specifications.

Each drawing submitted by the Contractor shall be clearly marked with the name of the Employer, name of consultant, the unit designation, contract no., and the name of the Project .If standard catalogue pages are submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.

Further work by the Contractor shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the Employer if so required.

All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawing shall be at the Contractor's risk. The Contractor may make any changes in the design which are necessary to make the equipment conform to the provisions and intent of the Contract and such changes will again be subject to approval by the Employer. Approval of Contractor's drawing or work by the Employer shall not relieve the contractor of any of his responsibilities and liabilities under the Contract.

3.19.3 APPROVAL PROCEDURE

The scheduled dates for the submission of these as well as for, any data/information to be furnished by the Employer would be discussed and finalized at the time of award. The supplier shall also submit required no. of copies as mentioned in this specification of all drawings/design documents/test reports for approval by the Employer. The following schedule shall be followed generally for approval.

i.	Approval/comments/by employer on Initial submission	Within 2 weeks of receipt
ii.	Resubmission	Within 2 (two) weeks (whenever from date of comments required) Including both

		ways postal time.
iii.	Approval or comments	Within 2 weeks of receipt of resubmission
iv.	Furnishing of distribution copies	2 weeks from the date of last approval.

Note: The contractor may please note that all resubmissions must incorporate, all comments given in the submission by the Employer failing which the submission of documents is likely to be returned. Every revision shall be a revision number, date and subject, in a revision block provided in the drawing, clearly marking the changes incorporated.

The title block of drawings shall contain the following information incorporated in all contract drawings.

Title Block

Customer	M/s Uttarakand Jal Vidyut Nigam Ltd.
Project:	2X60 MW Vyasi HEP
Contractor	BHEL

3.19.3 DOCUMENTS TO BE SUBMITTED ALONGWITH OFFER

- 1) Drawings
- 2) Guaranteed Technical Particulars
- 3) Type Test Reports
- 4) Manufacturing Quality Plan

3.20 DOCUMENTATION SCHEDULE

S. No.	DESCRIPTION	TENDER STAGE	CONTRACT STAGE FOR APPROVAL	FINAL DOCUMENTATION	
				Prints	CDs
1	Drawings and Data Sheets	1	10	13	-
2	Drawings "As Built "	-	-	13	05
3	Type Test Reports	1	05	13	-
4	Erection Manuals	-	11	13	-
5	Operation and Maintenance Manuals	-	11	13	-
6	Manufacturing Quality Plan	1	11	13	-
7	Field Quality Plan	1	11	13	-
8	Inspection Test Reports	-	-	13	-

Drawings will also be submitted in mini cartridges in AUTOCAD Release -14 package or any other CAD package along with conversion files for all major items.

Final Documentation shall be submitted in bound volumes with Customer & Project etc. written on top .



SECTION 4

LIST OF DOCUMENTS

1.0 LIST OF TECHNICAL DATASHEETS

In this section Technical Datasheets (TDS) of various equipment/items and system drawings that are required to be generated is furnished herewith. List of datasheets/drawings and numbers to be accorded is also given below.

The list furnished here is tentative and additional documents may be required during detailed engineering.

List of Data Sheets		
Sl. No.	Item Description	BHEL's Doc. No.
01.	D.S. For FPS Items [Pipe & fittings/ Hydrant Valve/ Branch pipe with nozzle/ Hose box/ Gate Valve/ Air Release Valve/ Wrapping Coating	TB-DS-398-552-01
02.	D.S. For Extinguishers	TB-DS-398-552-02
03.	D.S. For Twisted Pair Control Cable	TB-DS-398-552-03
04.	D.S. For Fire Detection items	TB-DS-398-552-04
05.	BOQ – FPS	TB-BQ-398-552-05
List of Drawings		
01.	P & I Diagram	TB-DG-398-552-002
02.	Fire Water Piping Layout	TB-DG-398-552-003
03.	Distribution of Extinguisher Layout	TB-DG-398-552-004
04.	Schematic of Fire detection system	TB-DG-398-552-005
05.	Fire Alarm & Detection system Layout	TB-DG-398-552-006

	CLIENT – UTTARAKHANAD JAL VIDYUT NIGAM LTD.	TB-398-552-031
	PROJECT: 2 x 60 MW VYASI HEP - 220 KV SWITCHYARD	Rev. 0
	TECHNICAL SPECIFICATION FOR FIRE FIGHTING SYSTEM	Page 1

SCHEDULES AND ENCLOSURES

SECTION- 5

ENCLOSURES TO SPECIFICATION

SCHEDULES TO BE FILLED UP BY THE BIDDER

- Schedule 1 Schedule of makes of Equipments
- Schedule 2 Schedules of Deviations
- Schedule 3 Schedule of past experience and qualifying requirements
- Schedule 4 Schedule of performance certificates
- Schedule 5 Details of contact persons (technical & commercial)
- Schedule 6 Enclosures to Specification

ANNEXURE-A Drawings

SCHEDULE - 1

MAKES OF IMPORTANT ITEMS / COMPONENTS OF EQUIPMENTS AND THEIR DETAILS

ITEM NAME	NAME OF MANUFACTURER	PLACE OF MANUFACTURE OF ITEM	PLACE OF TESTING AND INSPECTION	COMPLIANCE WITH ISO 9001 (YES/NO)

Place

Bidder

Signature of the authorized representative of

Name -----

Date

Designation-----

Company seal-----

	CLIENT – UTTARAKHANAD JAL VIDYUT NIGAM LTD. PROJECT: 2 x 60 MW VYASI HEP - 220 KV SWITCHYARD TECHNICAL SPECIFICATION FOR FIRE FIGHTING SYSTEM	TB-398-552-031
		Rev. 0
		Page 3

SCHEDULE - 2

SCHEDULE OF TECHNICAL DEVIATION

The following are the deviations / variations / exceptions from the specification:

Section	Clause No. / Page No.	Statement of deviation/ Variations/Exceptions
---------	--------------------------	--

- 1) In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract are deemed to be in compliance with the specification.
- 2) If there is NIL deviation, even then the format to be filled as **NIL DEVIATION**
- 3) Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

Place

Signature of the authorized representative of Bidder

Name -----

Date

Designation-----

Company seal-----



CLIENT – UTTARAKHANAD JAL VIDYUT NIGAM LTD.
PROJECT: 2 x 60 MW VYASI HEP - 220 KV SWITCHYARD
TECHNICAL SPECIFICATION FOR FIRE FIGHTING SYSTEM

TB-398-552-031

Rev. 0

Page | 4

SCHEDULE – 3

SCHEDULE OF PAST EXPERIENCE AND QUALIFYING REQUIREMENT

Following is the list of earlier orders executed by us for supply of equipment / material of similar nature over the last past five years:

S.No.	Item	Brief rating	Qty	customer	Date Of order	Date of supply	Order value
-------	------	--------------	-----	----------	------------------	-------------------	----------------

Place

Signature of the authorized representative of Bidder

Date

Name-----

Designation-----

Company seal -----

Note: Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

	CLIENT – UTTARAKHANAD JAL VIDYUT NIGAM LTD. PROJECT: 2 x 60 MW VYASI HEP - 220 KV SWITCHYARD TECHNICAL SPECIFICATION FOR FIRE FIGHTING SYSTEM	TB-398-552-031
		Rev. 0
		Page 5

SCHEDULE – 4

SCHEDULE OF PERFORMANCE CERTIFICATE

Bidder shall furnish the performance certificate of the similar equipment having
The following details:

S.No.	Item	Brief rating	Qty	Customer	Date Of supply
-------	------	--------------	-----	----------	-------------------

Place _____ Signature of the authorized representative of Bidder

Date _____ Name-----

Designation-----

Company seal -----

Note: Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

	CLIENT – UTTARAKHANAD JAL VIDYUT NIGAM LTD.	TB-398-552-031
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	TECHNICAL SPECIFICATION FOR FIRE FIGHTING SYSTEM	Page 6

SCHEDULE - 5

DETAILS OF CONTACT PERSON BOTH TECHNICAL AND COMMERCIAL

Name

Address for correspondence

Phone No.

Fax No.

Email

Place

Signature of the authorized representative of Bidder

Date

Name-----

Designation-----

Company seal -----

Note: Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

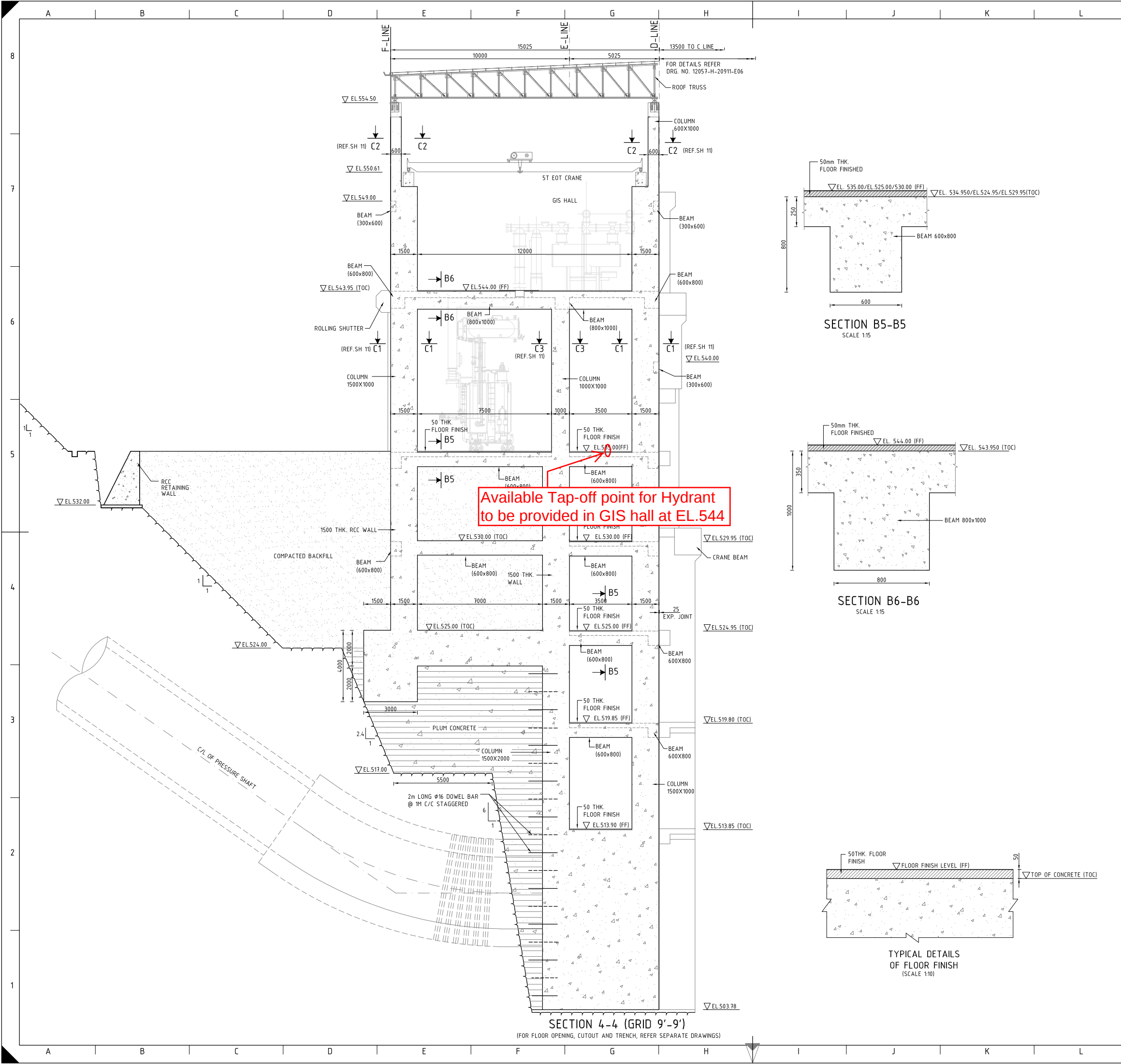
	CLIENT – UTTARAKHANAD JAL VIDYUT NIGAM LTD.	TB-398-552-031
	PROJECT: 2 x 60 MW VYASI HEP - 220 KV SWITCHYARD	Rev. 0
	TECHNICAL SPECIFICATION FOR FIRE FIGHTING SYSTEM	Page 7

SCHEDULE – 6

ENCLOSURES TO SPECIFICATION

DRAWINGS (ANNEXURE-A)

1. ARCHITECTURAL DRGS. FOR GIS BUILDING
(8 SHEETS)
2. LAYOUT DRG. WITH EXISTING PIPE HEADER AT EL.535.



NOTES

- ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
- FOR NOTES AND REFERENCE, REFER DRAWING NO. 12057-H-20911-E56 SH. 1 OF 13.

LEGENDS

	CONCRETE		PLUM CONCRETE/LEAN CONCRETE
	COMPACTED BACK FILL		HATCH COVER
	FLOOR FINISH		WATER STOP
	TOP OF CONCRETE		

BASED ON DRAWING / DOCUMENTS	
DRG./DOCUMENT NO.	SUBJECT
SKETCH RECEIVED THROUGH MAIL FROM M/S UJVNL DATED 27.07.2016	
REFERENCE DRAWINGS	
DRG. NO.	SUBJECT

SCALE 0 1.0 2.0 5.0 10.0 M

Autocad release : 2008

FOR APPROVAL

-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
REV. No.	DATE	STAGE	DESCRIPTION	CIVIL	HM E&M
				CHECKED	

UJVNL LIMITED
(A Govt. of Uttarakhand Enterprise)

TRACTEBEL ENGINEERING PVT. LTD.
CONSULTING ENGINEERS, GURGAON

DESIGN BY/ DRAWN BY	NAME	SIGN	PROJECT
CHECKED BY	H GUPTA		VYASI H. E. PROJECT (2x60 MW)
APPROVED BY	A K JHA		DRAWING TITLE
			POWER HOUSE GIS & TRANSFORMER HALL CONCRETE OUTLINE DETAILS SECTION 4-4
DATE:-	18-07-2019	DRG NO.	12057-H-20911-E56
SHEET SIZE	A1	SCALE	1:100
		REV.	A
		SHEET	12 OF 13

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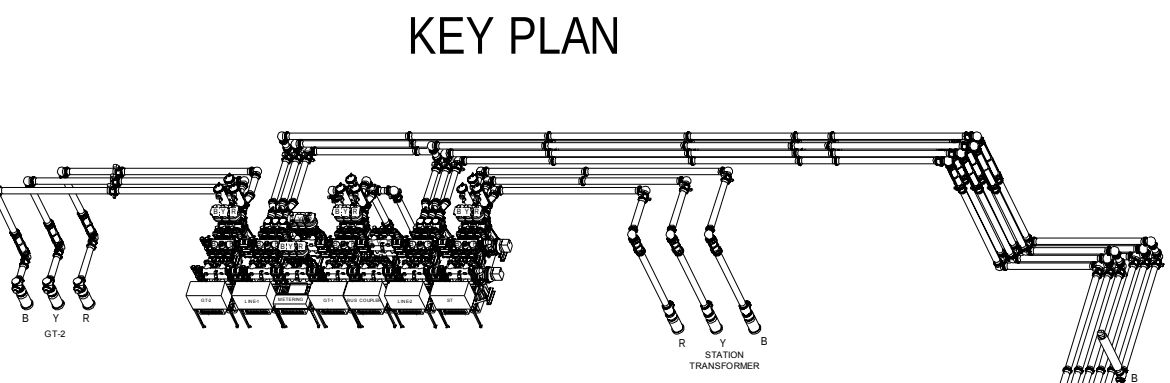
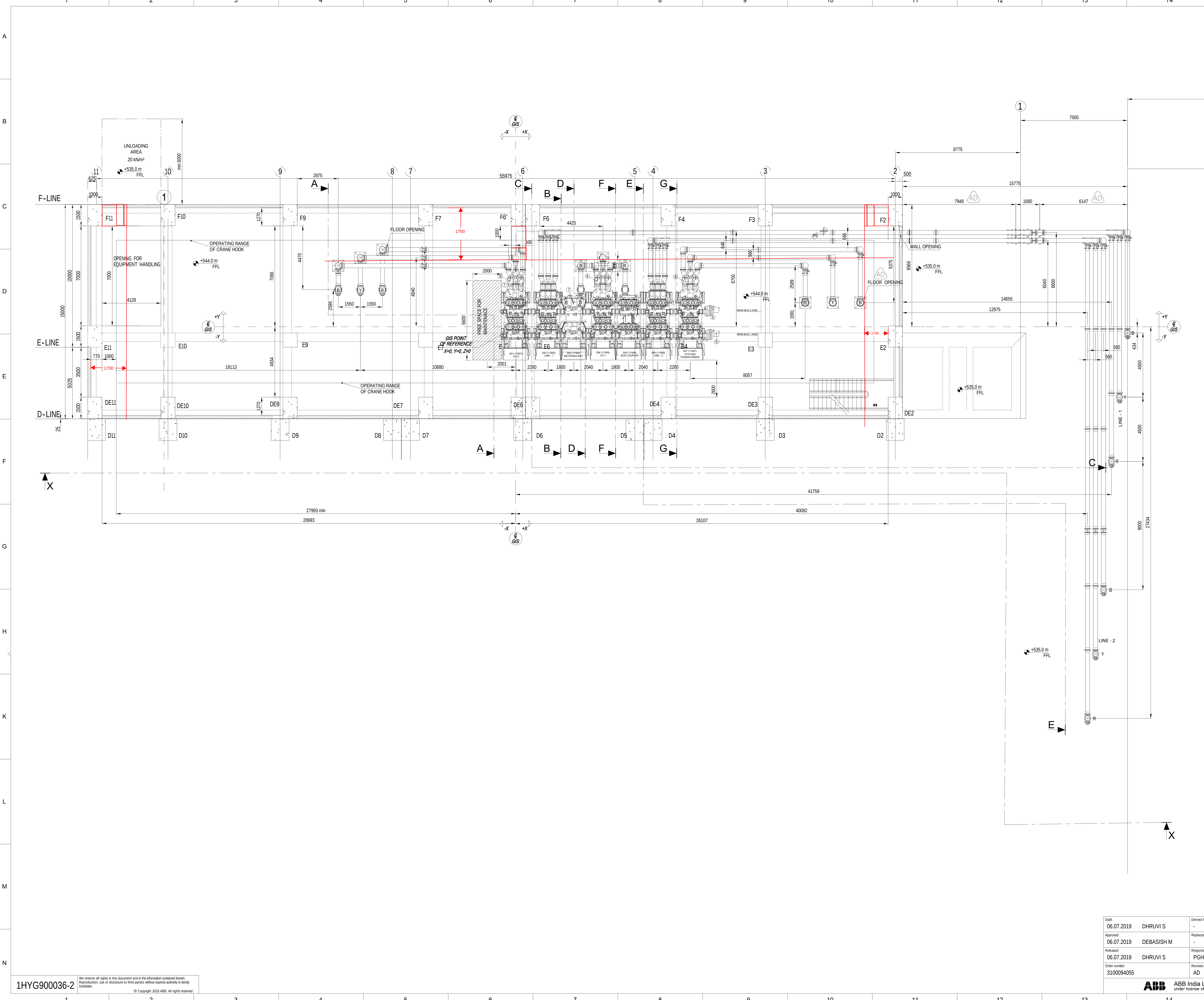


	CONCRETE		PLUM CONCRETE/LEAN CONCRETE
	COMPACTED BACK FILL		HATCH COVER
	FLOOR FINISH		WATER STOP
	TOP OF CONCRETE		

1. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.

2. FOR NOTES AND REFERENCE, REFER DRAWING NO. 12057-H-20911-E56 SH. 1 OF 13.

BASED ON DRAWING / DOCUMENTS										
DRG./DOCUMENT NO.				SUBJECT						
REFERENCE DRAWINGS										
DRG. NO.			SUBJECT							
SCALE 01.02.05.010.0 M										
Autocad release : 2008										
FOR APPROVAL										
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REV. No.	DATE	STAGE	DESCRIPTION					CIVIL	HM	E&M
								CHECKED		
CLIENT UJVNL LIMITED (A Govt. of Uttarakhand Enterprise)				TRACTEBEL ENGINEERING PVT. LTD. CONSULTING ENGINEERS, GURGAON						
TRACTEBEL ENGINE										
			NAME	SIGN	PROJECT					
DESIGN BY / DRAWN BY			KKD/SKP		VYASI H. E. PROJECT (2x60 MW)					
CHECKED BY			H GUPTA		DRAWING TITLE					
APPROVED BY			A K JHA		POWER HOUSE GIS & TRANSFORMER HALL CONCRETE OUTLINE DETAIL PLAN (EL. 544.00)					
DATE:-		18-07-2019			DRG. NO.			REV.	SHEET	
SHEET SIZE		A1	SCALE	1:100	12057-H-20911-E56			A	7 OF 13	
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EOT Crane Specification (minimum) - Inside GIS Hall	
Capacity	Min 10.0T
Type	RADIO Controlled with remote
HOISIT Lifting Speed	0.315 to 3.15MPM step less speed through VVVF AC Drive
C.T Speed	1.6 to 16 MPM step less speed through VVVF AC Drive
L.T Speed	2 to 20 MPM step less speed through VVVF AC Drive

TRANSFORMER CONNECTION
INTERFACE ACCORDING IEC 62271-306, 30C, IEC603870 REV AF

- NOTES
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
 - CIVIL DETAILS (DOORS / STAIRS /) AND STEEL STRUCTURE ON THIS DRAWING ARE FOR INFORMATION ONLY. FOR DETAILS REFER TO RELEVANT DRAWINGS.
 - CIVIL CONTRACTOR SHOULD INFORM ABB ABOUT OTHER INSTALLATION (SUCH AS AIR CONDITIONING, LIGHTING, PANELS, ETC) IN GIS HALL, IN ORDER TO AVOID COLLISION WITH GIS / GIS SUPPORT STRUCTURES.
 - ALL CIRCUIT BREAKERS ARE EQUIPPED WITH 3 DRIVES FOR 3 PHASES.
 - ALL DISCONNECTOR & EARTHING SWITCHES ARE EQUIPPED WITH 1 DRIVE FOR 3 PHASES UNLESS OTHERWISE STATED.
 - EACH GAS COMPARTMENT IS EQUIPPED WITH A GAS VALVE, A DENSITY MONITOR AND A PRESSURE RELIEF DEVICE.
 - ALL THE CIVIL INPUTS PERTAINING TO GIS WILL BE INDICATED IN SEPARATE DRAWING NAMED "CIVIL WORK REQUIREMENTS".
 - ALL THE DETAILS OF THE SUPPORT STRUCTURE & ASSOCIATED FOOTING PERTAINING TO GIS WILL BE INDICATED IN SEPARATE DRAWING NAMED "SUPPORT LAYOUT". HOWEVER FREE SPACE REQUIRED FOR GIS SUPPORT STRUCTURE IS INDICATED IN THE DRAWING AND IT SHOULD BE ENSURED THAT THIS SPACE IS NOT UTILIZED FOR ANY OTHER INSTALLATION.
 - ALL THE DETAILS OF GIS EARTHING & ITS ASSOCIATED STRUCTURE EARTHING WILL BE INDICATED IN SEPARATE DRAWING NAMED "EARTHING LAYOUT".

LEGEND	
1	- CIRCUIT BREAKER
2	- DISCONNECTOR
3	- DISCONNECTOR & EARTHING SWITCH
4	- MAINTENANCE EARTHING SWITCH
5	- HIGH SPEED EARTHING SWITCH
6	- CURRENT TRANSFORMER
7	- VOLTAGE TRANSFORMER
8	- SURGE ARRESTER
9	- SF6 TO AIR BUSHING
10	- CABLE END BOX
11	- TRANSFORMER CONNECTION
12	- LOCAL CONTROL CUBICLE (LCC)
13	- LATERAL DISMANTLING UNIT
14	- COMPENSATOR

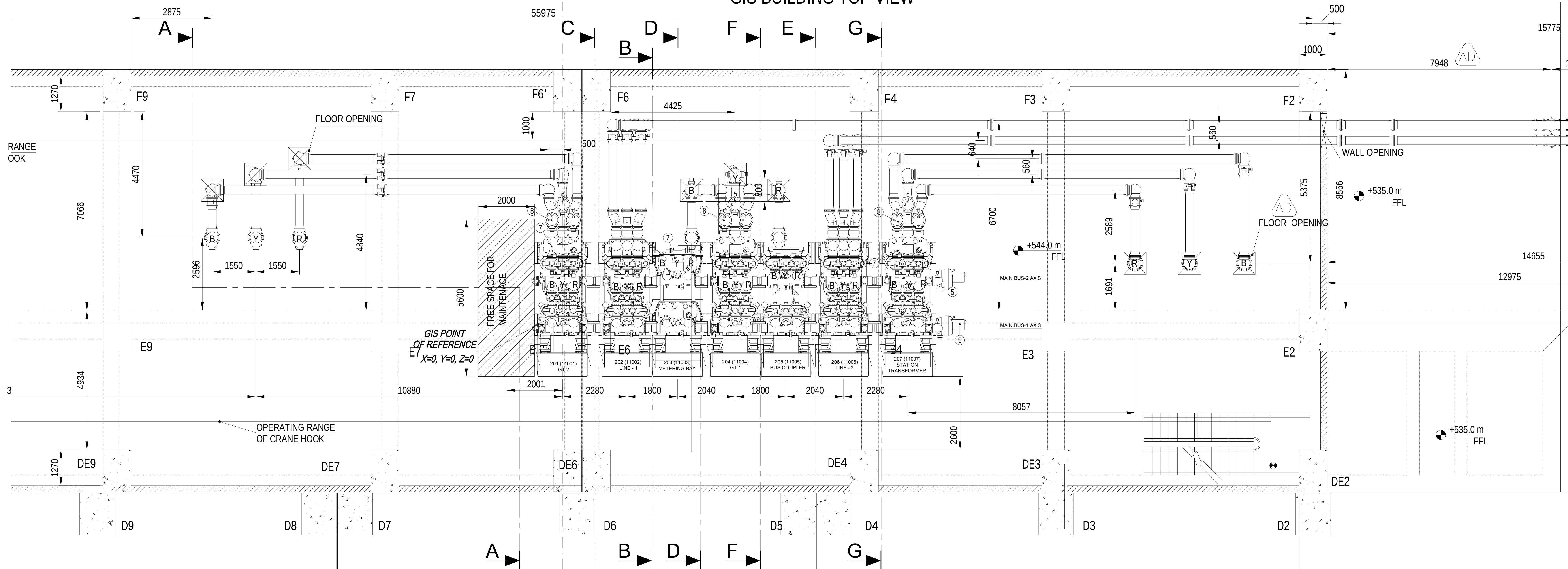
REFERENCE DOCUMENTS		
DOCUMENT TITLE	ABB DOCUMENT NO.	CLIENT DOCUMENT NO.
PROJECT SPECIFIC GIS PARAMETERS	1HYG900036-6	-
SINGLE LINE GAS DIAGRAM	1HYG900036-1	-
CIVIL WORK REQUIREMENTS	1HYG900036-3	-
CIVIL GUIDELINES PLAN AT EL 535.	-	12000019676_Rev07
CROSS-SECTION OF POWER HOUSE	-	12000019651_Rev12
GT BLOCK DIAGRAM	-	24580050501_Rev00
ST OUT LINE GENERAL ARRGT.	-	14580050322_Rev00

AD	2019-07-06	DHRUVI S	LINE-1 AND LINE-2 BUS DUCT ROUTING MODIFIED
AC	2019-05-14	BHAVIN S	ST PHASE SEQUENCE, GT AND BUSHING TERMINATION MODIFIED
AB	2019-04-02	BHAVIN S	BUSDUCT ROUTING & BAY SEQUENCE MODIFIED
AA	2018-10-26	BHAVIN S	FIRST ISSUE
REV	DATE	NAME	MODIFICATION

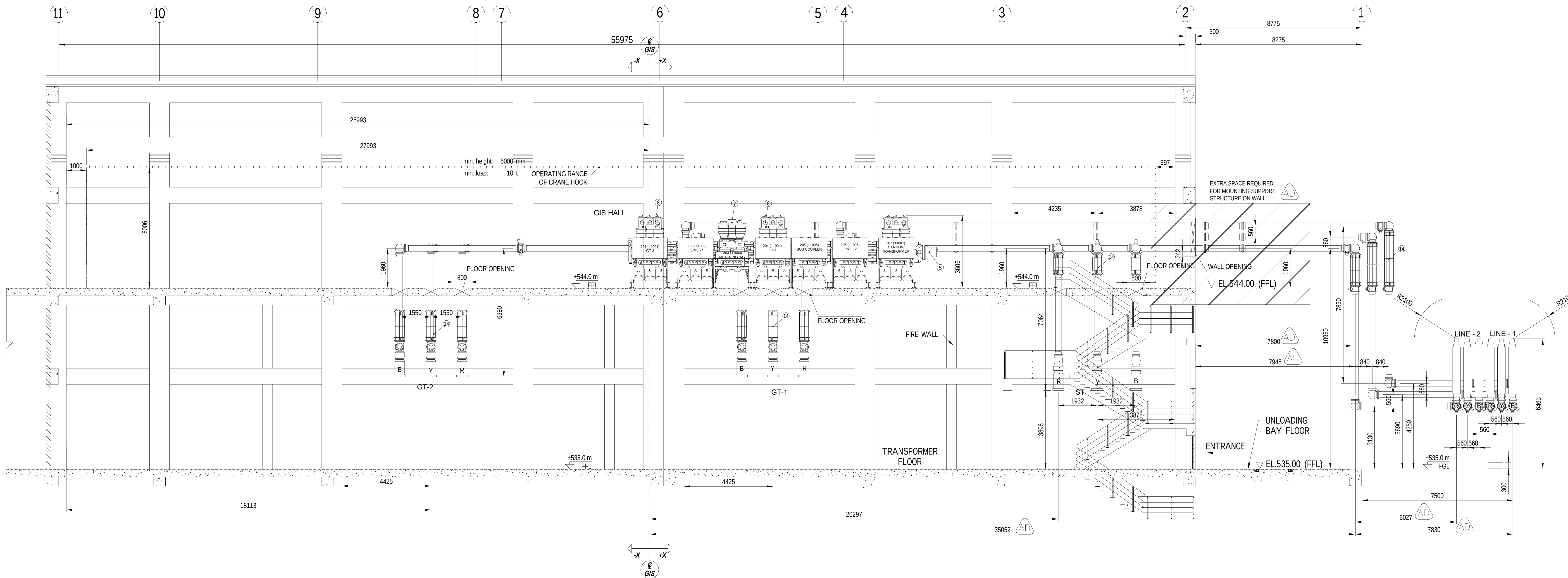
CLIENT:	M/S BHARAT HEAVY ELECTRICAL LIMITED
END CUSTOMER:	UTTARAKHAND JAL VIDHYUT NIGAM LIMITED (UJVNL)
PROJECT:	220 kV GIS for 2 x 60 MW VYASI HEP AT VYASI, DIST DEHRADHUN, UK
NOA No:	136/E & M DESIGN-IVvy-EPC(6) (FOR SUPPLY) dt 15.04.2014 & 137/E & M DESIGN-IVvy-EPC(6) (FOR SERVICES) dt 15.04.2014
BHEL Doc No:	TB-3-398-316-102

Draft:	06.07.2019	DHRUVI S	Derived from:	Separate BOM:	Scale:	1:85	Doc type:	DW1	Format:	A0	
Approved:	06.07.2019	DEBASISH M	Replaces:	SF6 SWITCHGEAR ELK-14-245C						Language:	EN
Released:	06.07.2019	DHRUVI S	Responsible department:	220 kV GIS for 2 x 60 MW VYASI HEP.						No. Sheets:	006
Order number:	3100094055		Revision:	TOPVIEW - GIS LAYOUT						Sheet no.:	001
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ABB			ABB India Ltd under license of ABB Technology Ltd		Document number:						Sheet
					1HYG900036-2						no.

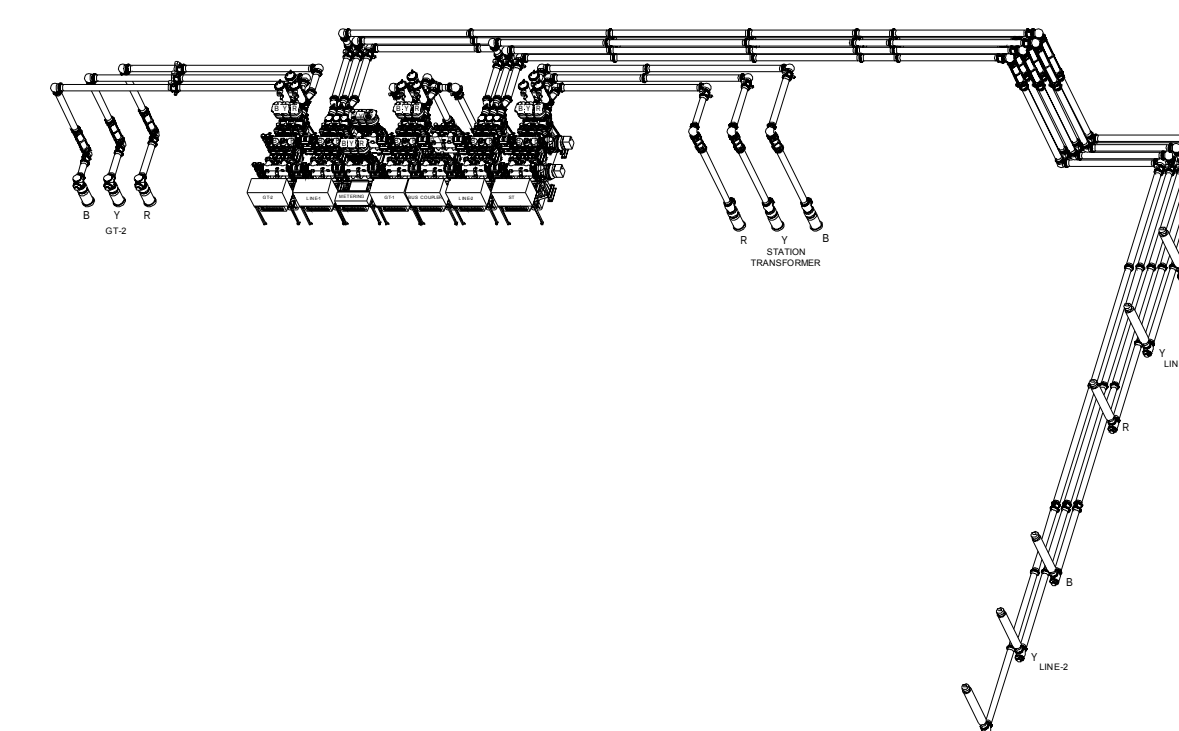
GIS BUILDING TOP VIEW



SECTION X-X



KEY PLAN



EOT Crane Specification (minimum) - Inside GIS Hall	
Capacity	Min 10.0T
Type	RADIO Controlled with remote
HOIST Lifting Speed	0.315 to 3.15MPM step less speed through VVVF AC Drive
C.T Speed	1.6 to 16 MPM step less speed through VVVF AC Drive
L.T Speed	2 to 20 MPM step less speed through VVVF AC Drive

TRANSFORMER CONNECTION
INTERFACE ACCORDING IEC 62271-306, 1HC0036270 REV A

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. CIVIL DETAILS (DOORS / STAIRS /) AND STEEL STRUCTURE ON THIS DRAWING ARE FOR INFORMATION ONLY. FOR DETAILS REFER TO RELEVANT DRAWINGS.
3. CIVIL CONTRACTOR SHOULD INFORM AG ABOUT ANY OTHER INSTALLATION SUCH AS AIR CONDITIONING, LIGHTING, PUMP AND GAS INSTALL, IN ORDER TO AVOID COLLISION WITH G/S / CIVIL CONTRACTOR STRUCTURES.
4. ALL CIRCUIT BREAKERS ARE EQUIPPED WITH 3 DRIVES FOR 3 PHASES.
5. ALL DISCONNECTOR & EARTHING SWITCHES ARE EQUIPPED WITH 1 DRIVE FOR 3 PHASES UNLESS OTHERWISE STATED.
6. EACH GAS COMPARTMENT IS EQUIPPED WITH A GAS VALVE, A DENSITY MONITOR AND A PRESSURE RELIEF DEVICE.
7. ALL THE CIVIL INPUTS PERTAINING TO G/S WILL BE NOTICATED IN SEPARATE DRAWING NAMED "CIVIL WORK REQUIREMENTS".
8. ALL THE DETAILS OF THE SUPPORT STRUCTURE & ASSOCIATED FOOTING PERTAINING TO G/S WILL BE NOTICATED IN SEPARATE DRAWING NAMED "SUPPORT LAYOUT". HOWEVER FREE SPACE FOR THE SUPPORT STRUCTURE & FOOTING IS NOTICATED IN THE DRAWING AND IT SHOULD BE ENSURED THAT THIS SPACE IS NOT UTILIZED FOR ANY OTHER INSTALLATION.
9. ALL THE DETAILS OF G/S EARTHING & ITS ASSOCIATED STRUCTURE EARTHING WILL BE NOTICATED IN SEPARATE DRAWING NAMED "EARTHING LAYOUT".

LEGEND

- | |
|------------------------------------|
| 1 - CIRCUIT BREAKER |
| 2 - DISCONNECTOR |
| 3 - DISCONNECTOR & EARTHING SWITCH |
| 4 - MAINTENANCE EARTHING SWITCH |
| 5 - HIGH SPEED EARTHING SWITCH |
| 6 - CURRENT TRANSFORMER |
| 7 - VOLTAGE TRANSFORMER |
| 8 - SURGE ARRESTER |
| 9 - SF6 TO AIR BUSHING |
| 10 - CABLE END BOX |
| 11 - TRANSFORMER CONNECTION |
| 12 - LOCAL CONTROL CUBICLE (LCC) |
| 13 - LATERAL DISMANTLING UNIT |
| 14 - COMPENSATOR |

REFERENCE DOCUMENTS

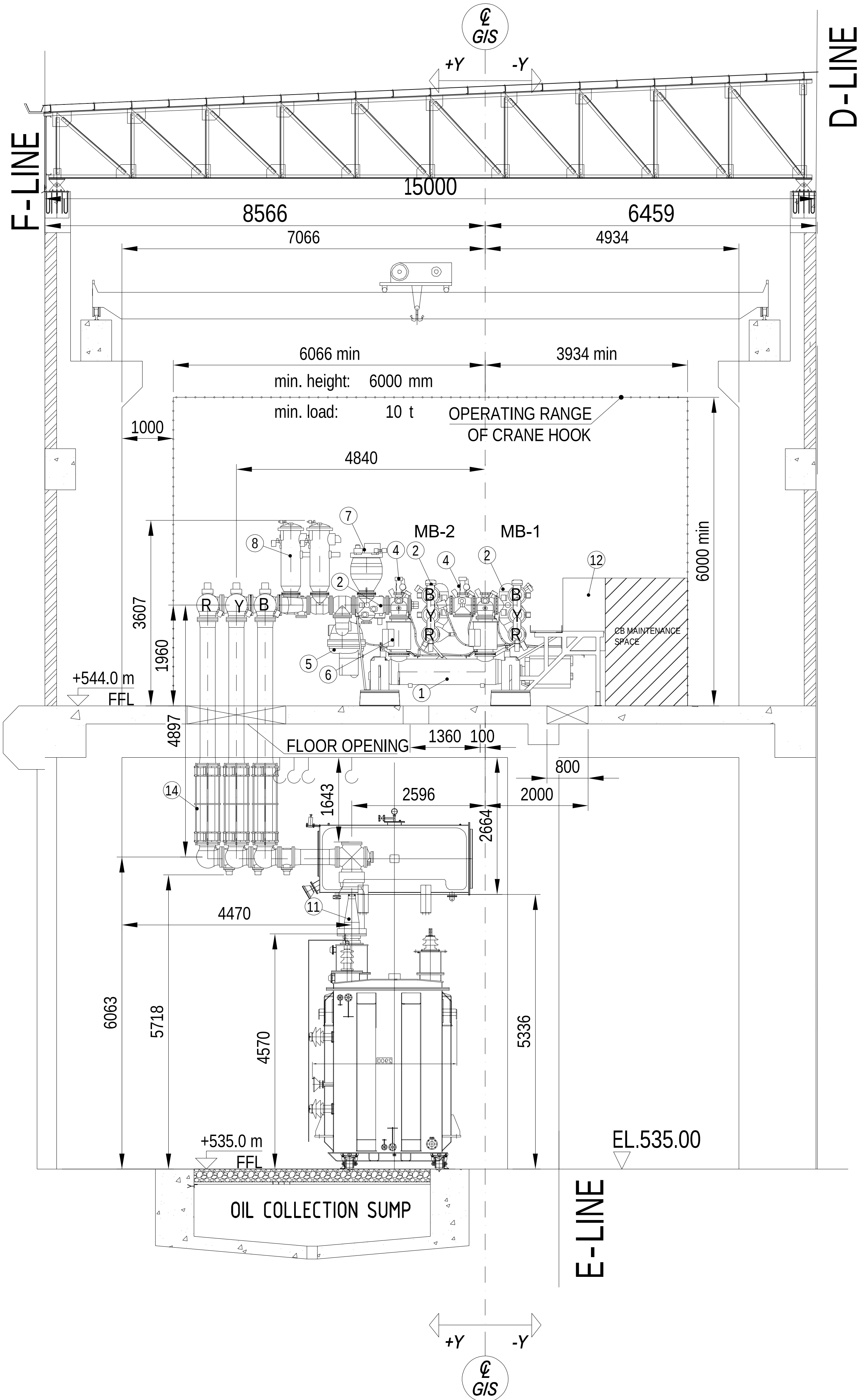
DOCUMENT TITLE	ABB DOCUMENT NO.	CLIENT DOCUMENT NO.
PROJECT SPECIFIC GIS PARAMETERS	1HYG900036-6	-
SINGLE LINE GAS DIAGRAM	1HYG900036-1	-
CIVIL WORK REQUIREMENTS	1HYG900036-3	-
CIVIL GUIDELINES PLAN AT EL 535.	-	12000019676_Rev07
CROSS-SECTION OF POWER HOUSE	-	12000019651_Rev12
GT BOLD DIAGRAM	-	24580050501_Rev00
ST OUT LINE GENERAL ARRGT.	-	14580050332_Rev00

AD	2019-07-06	DHRUV S	LINE-1 AND LINE-2 BUS DUCT ROUTING MODIFIED
AC	2019-05-14	BHAVIN S	ST PHASE SEQUENCE, GT AND BUSHING TERMINATION MODIFIED
AB	2019-04-02	BHAVIN S	BUSDUCT ROUTING & BAY SEQUENCE MODIFIED
AA	2018-10-26	BHAVIN S	FIRST ISSUE
REV	DATE	NAME	MODIFICATION

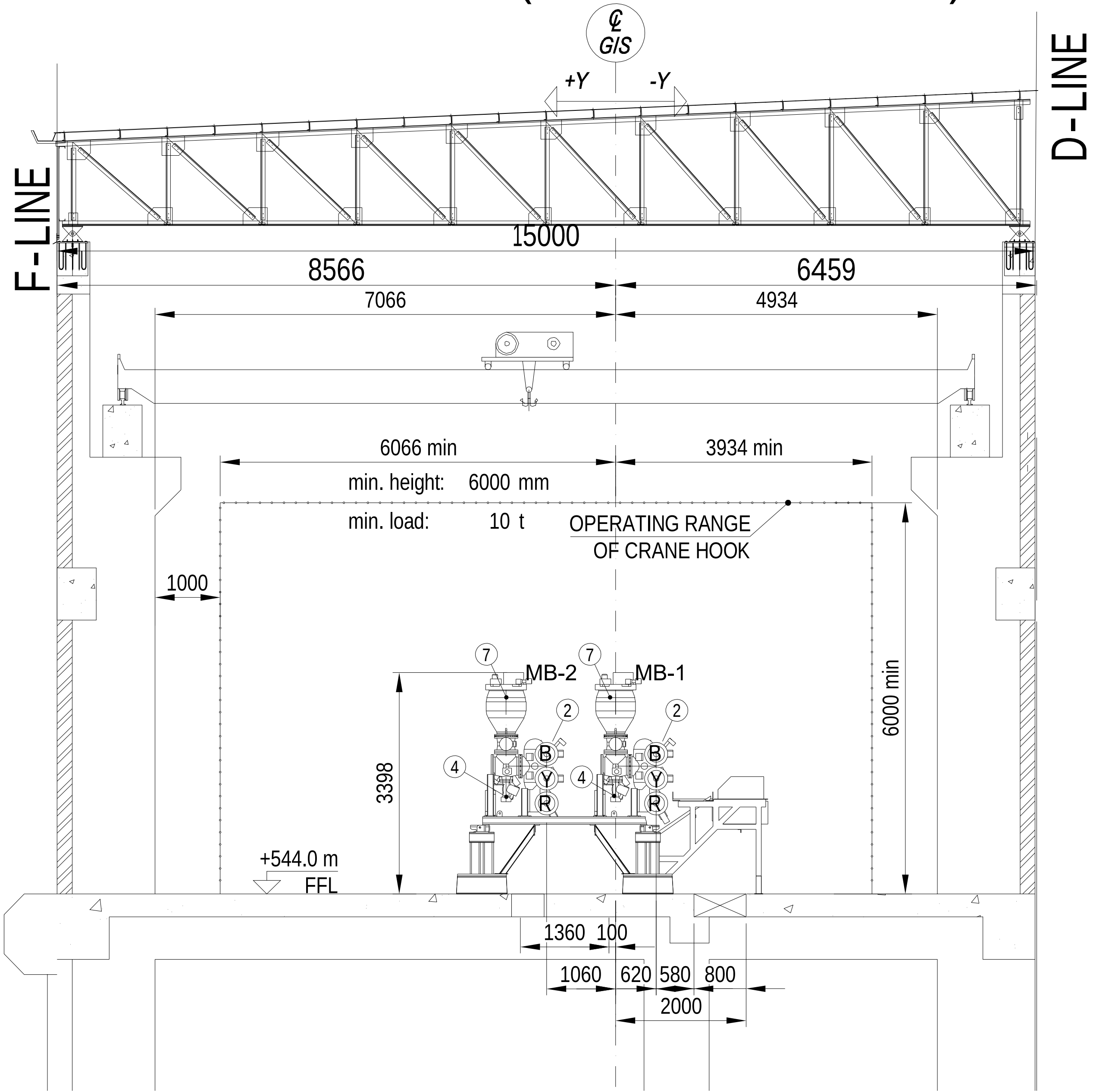
CLIENT:	M/S BHARAT HEAVY ELECTRICAL LIMITED
END CUSTOMER:	UTTARAKHAND JAL VIDHYUT NIGAM LIMITED (UJVNL)
PROJECT:	220 kV GIS for 2 x 60 MW VYASI HEP AT VYASI, DIST DEHRADHUN, UK
NOA No:	138E & M DESIGN-INVY-EPCC (FOR SUPPLY) dt 15.04.2013 137E & M DESIGN-INVY-EPCC(E) (FOR SERVICES) dt15.04.2013
BHEL Doc No:	TB-3-398-316-102

Date:	06.07.2019	DHRUVI S	Dated from:	-	Separate BOM:	-	Scale:	1:85	Doc type:	DW1
Approved:	06.07.2019	DEBASISH M	Replaces:	-	SF6 SWITCHGEAR ELK-14 245C 220 kV GIS for 2 x 60 MW VYASI HEP.					
Released:	06.07.2019	DHRUVI S	Responsible department:	PGHV-GIS PASS						
Order number:	3100094055		Revision:	AD						
 ABB India Ltd under license of ABB Technology Ltd				Document number: 1HYG900036-2						

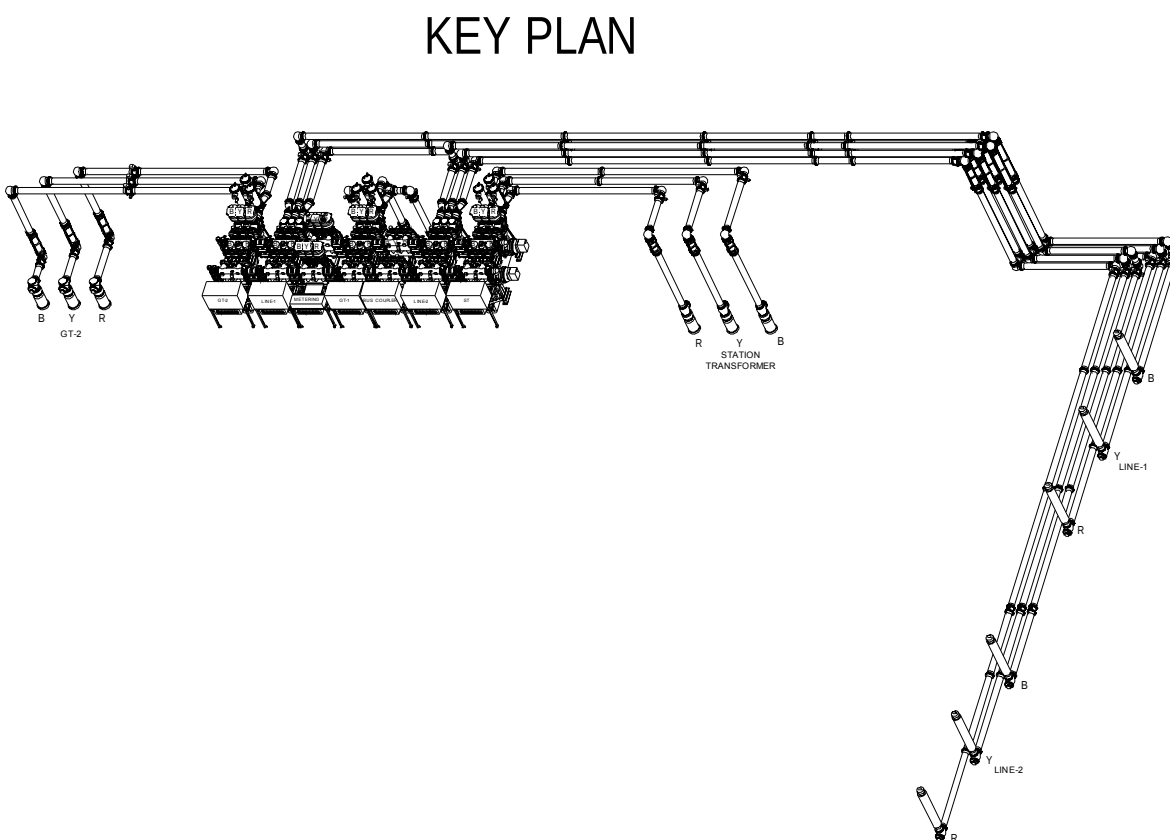
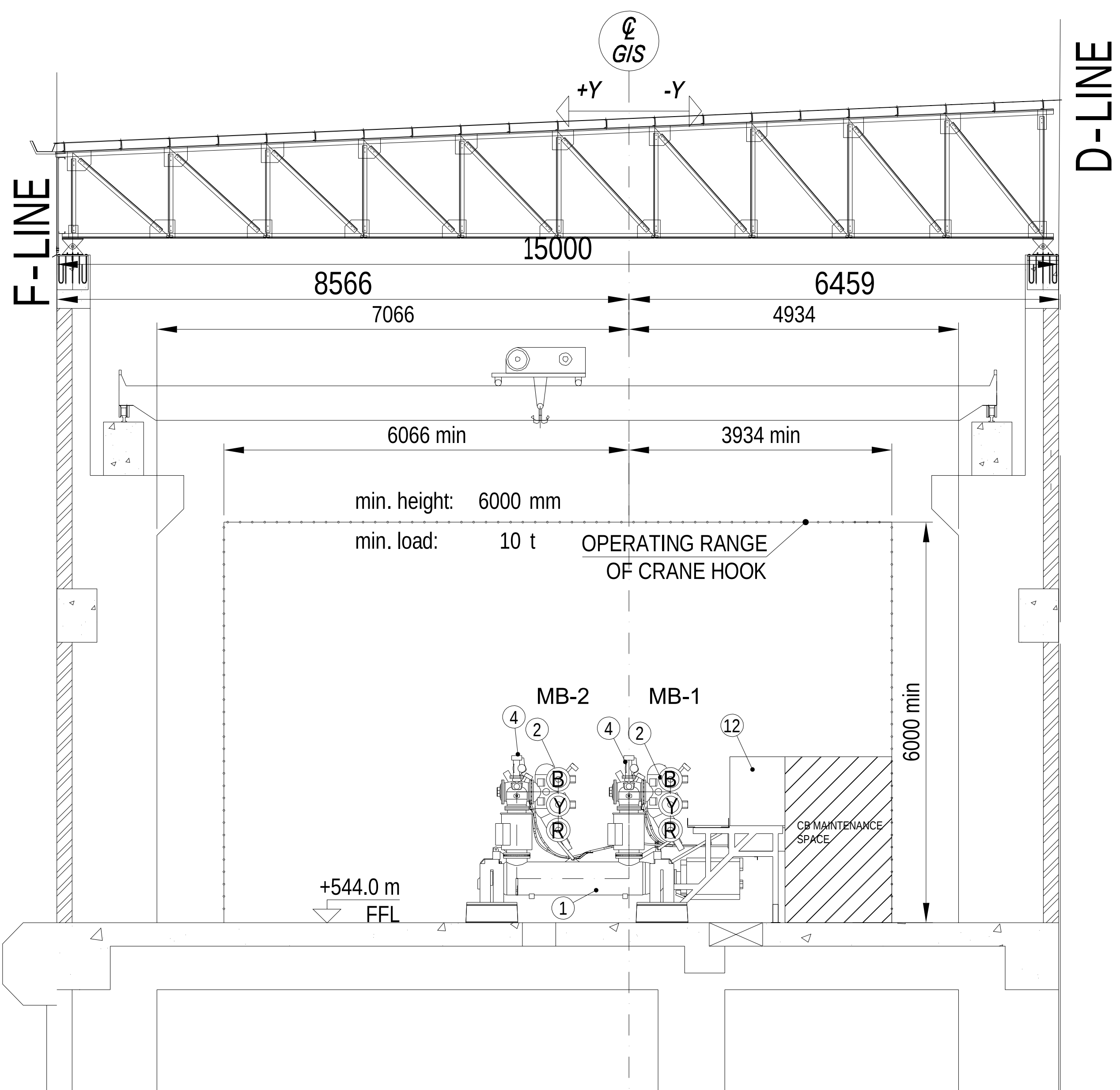
SECTION A-A (GT-2 BAY)



SECTION B-B (METERING BAY)



SECTION F-F (BUS COUPLER BAY)



EOT Crane Specification (minimum) - Inside GIS Hall	
Capacity	Min 10.0T
Type	RADIO Controlled with remote
HOISIT Lifting Speed	0.315 to 3.15MPM step less speed through VVVF AC Drive
C.T Speed	1.6 to 16 MPM step less speed through VVVF AC Drive
L.T Speed	2 to 20 MPM step less speed through VVVF AC Drive

TRANSFORMER CONNECTION
INTERFACE ACCORDING IEC 62271-306, 14C0303270 REV AF

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LEGEND	
1	CIRCUIT BREAKER
2	DISCONNECTOR
3	DISCONNECTOR & EARTHING SWITCH
4	MAINTENANCE EARTHING SWITCH
5	HIGH SPEED EARTHING SWITCH
6	CURRENT TRANSFORMER
7	VOLTAGE TRANSFORMER
8	SURGE ARRESTER
9	SF6 TO AIR BUSHING
10	CABLE END BOX
11	TRANSFORMER CONNECTION
12	LOCAL CONTROL CUBICLE (LCC)
13	LATERAL DISMANTLING UNIT
14	COMPENSATOR

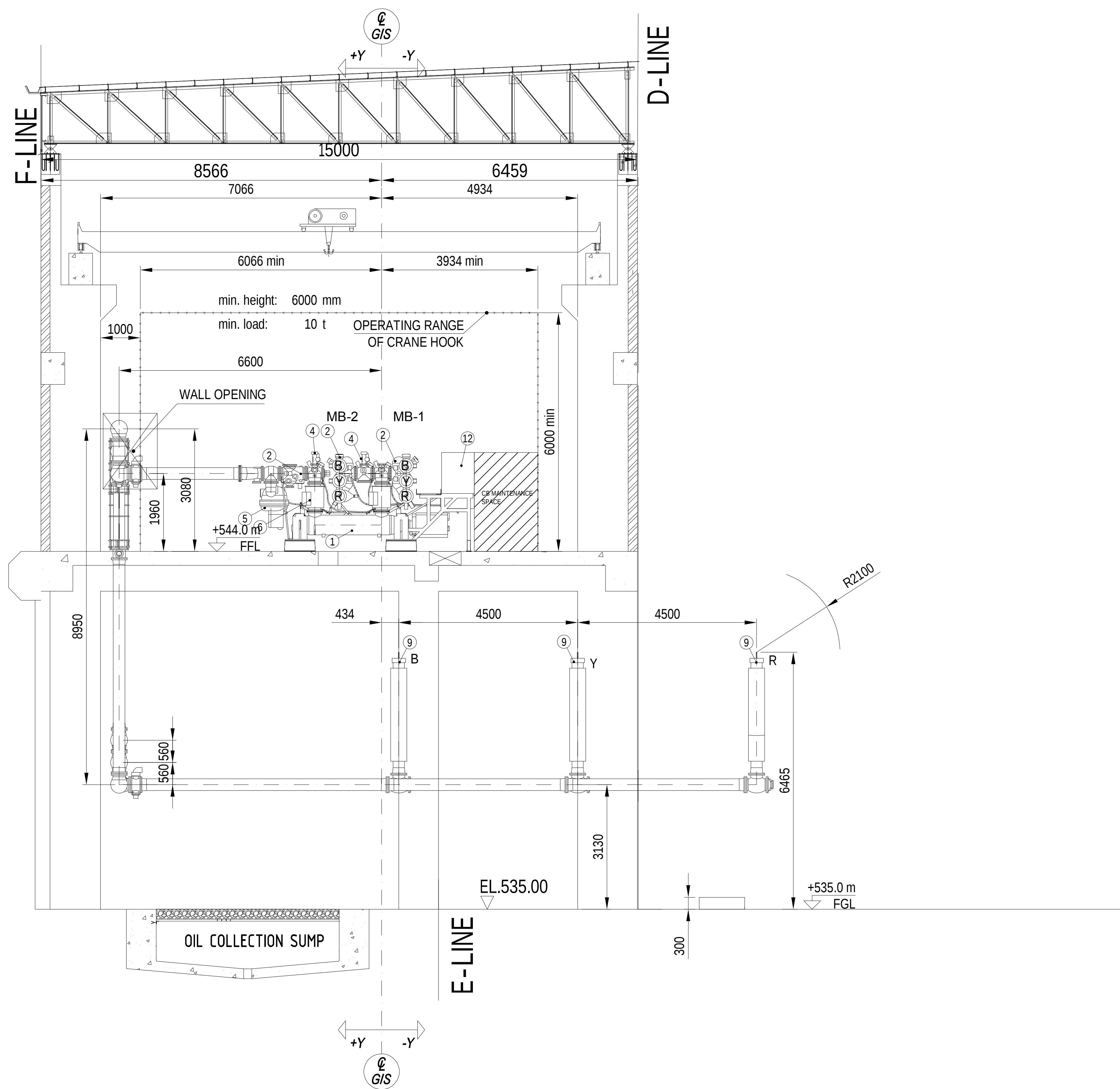
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DOCUMENT TITLE	ABB DOCUMENT NO.	CLIENT DOCUMENT NO.
PROJECT SPECIFIC GIS PARAMETERS	1HYG900036-6	-
SINGLE LINE GAS DIAGRAM	1HYG900036-1	-
CIVIL WORK REQUIREMENTS	1HYG900036-3	-
CIVIL GUIDELINES PLAN AT EL. 535.	-	12000019676_Rev07
CROSS-SECTION OF POWER HOUSE	-	12000019651_Rev12
GT BLOCK DIAGRAM	-	24580050501_Rev00
ST OUT LINE GENERAL ARRGT.	-	14580050322_Rev00

AD	2019-07-06	DHRUVI S	LINE-1 AND LINE-2 BUS DUCT ROUTING MODIFIED
AC	2019-06-14	BHAVIN S	ST PHASE SEQUENCE, GT AND BUSHING TERMINATION MODIFIED
AB	2019-04-02	BHAVIN S	BUSDUCT ROUTING & BAY SEQUENCE MODIFIED
AA	2018-10-26	BHAVIN S	FIRST ISSUE
REV	DATE	NAME	MODIFICATION

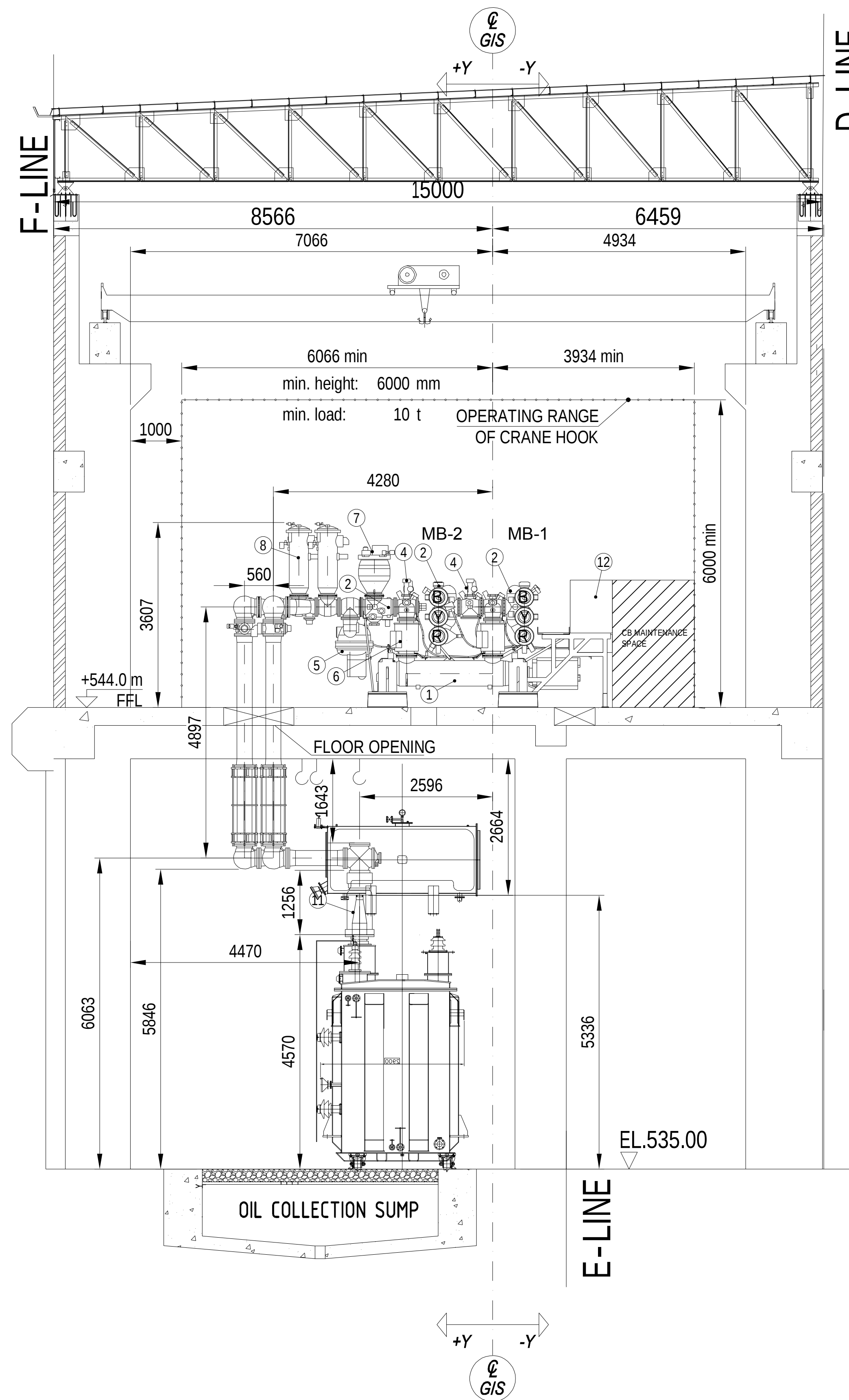
CLIENT:	M/S BHARAT HEAVY ELECTRICAL LIMITED
END CUSTOMER:	UTTARAKHAND JAL VIDHYUT NIGAM LIMITED (UJVNL)
PROJECT:	220 kV GIS for 2 x 60 MW VYASI HEP AT VYASI, DIST DEHRADHUN, UK
NOA No:	136/E & M DESIGN-INVY-EPC(6) (FOR SUPPLY) dt 15.04.2014 & 137/E & M DESIGN-INVY-EPC(6) (FOR SERVICES) dt 15.04.2014
BHEL Doc No:	TB-3-398-316-102

Draft:	06.07.2019	DHRUVI S	Derived from:	Separate BCM:	1:50	Doc type:	DW1	Format:	A0
Approved:	06.07.2019	DEBASISH M	Replaces:	SF6 SWITCHGEAR ELK-14 245C					
Released:	06.07.2019	DHRUVI S	Responsible department:	220 kV GIS for 2 x 60 MW VYASI HEP					
Order number:	3100094055		Revision:	SECTIONS					
			AD	GIS LAYOUT & REQUIREMENTS					
				Document number:	1HYG900036-2				

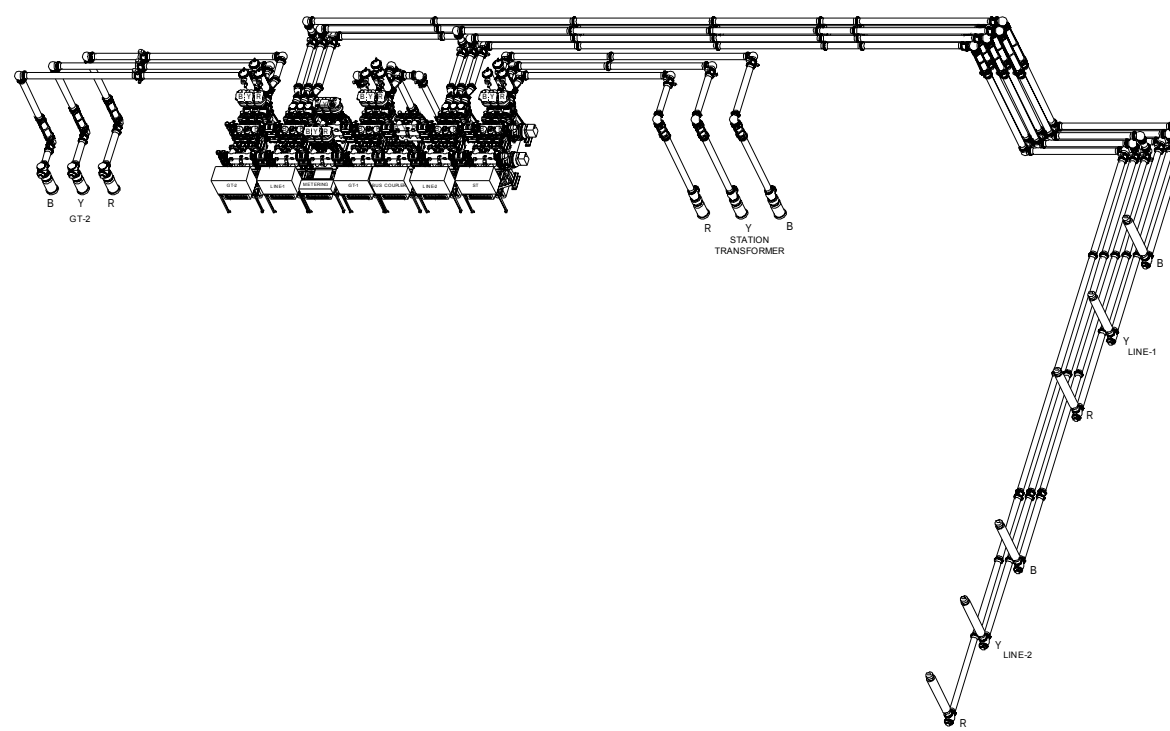
SECTION C-C (LINE-1 BAY)



SECTION D-D(GT-1 BAY)



KEY PLAN



EOT Crane Specification (minimum) - Inside GIS Hall

Capacity	Min 10.0T
Type	RADIO Controlled with remote
HOISIT Lifting Speed	0.315 to 3.15MPM step less speed through VVVF AC Drive
C.T Speed	1.6 to 16 MPM step less speed through VVVF AC Drive
L.T Speed	2 to 20 MPM step less speed through VVVF AC Drive

TRANSFORMER CONNECTION
INTERFACE ACCORDING IEC 62271-306, 1HC0308270 REV AF

NOTES

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LEGEND

1 - CIRCUIT BREAKER
2 - DISCONNECTOR
3 - DISCONNECTOR & EARTHING SWITCH
4 - MAINTENANCE EARTHING SWITCH
5 - HIGH SPEED EARTHING SWITCH
6 - CURRENT TRANSFORMER
7 - VOLTAGE TRANSFORMER
8 - SURGE ARRESTER
9 - SF6 TO AIR BUSHING
10 - CABLE END BOX
11 - TRANSFORMER CONNECTION
12 - LOCAL CONTROL CUBICLE (LCC)
13 - LATERAL DISMANTLING UNIT
14 - COMPENSATOR

REFERENCE DOCUMENTS

DOCUMENT TITLE	ABB DOCUMENT NO.	CLIENT DOCUMENT NO.
PROJECT SPECIFIC GIS PARAMETERS	1HYG900036-6	-
SINGLE LINE GAS DIAGRAM	1HYG900036-1	-
CIVIL WORK REQUIREMENTS	1HYG900036-3	-
CIVIL GUIDELINES PLAN AT EL 535.	-	12000019676_Rev07
CROSS-SECTION OF POWER HOUSE	-	12000019651_Rev12
GT BLOCK DIAGRAM	-	2450050501_Rev00
ST OUT LINE GENERAL ARRGT.	-	14580050322_Rev00

AD	2019-07-06	DHRUVI S	LINE-1 AND LINE-2 BUS DUCT ROUTING MODIFIED
AC	2019-06-14	BHAVIN S	ST PHASE SEQUENCE, GT AND BUSHING TERMINATION MODIFIED
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AA	2018-10-26	BHAVIN S	FIRST ISSUE
REV	DATE	NAME	MODIFICATION

CLIENT:	M/S BHARAT HEAVY ELECTRICAL LIMITED
END CUSTOMER:	UTTARAKHAND JAL VIDHYUT NIGAM LIMITED (UJVNL)
PROJECT:	220 kV GIS for 2 x 60 MW VYASI HEP AT VYASI, DIST DEHRADHUN, UK
NOA No:	136/E & M DESIGN-INVY-EPC(6) (FOR SUPPLY) dt 15.04.2014 & 137/E & M DESIGN-INVY-EPC(6) (FOR SERVICES) dt 15.04.2014
BHEL Doc No:	TB-3-398-316-102

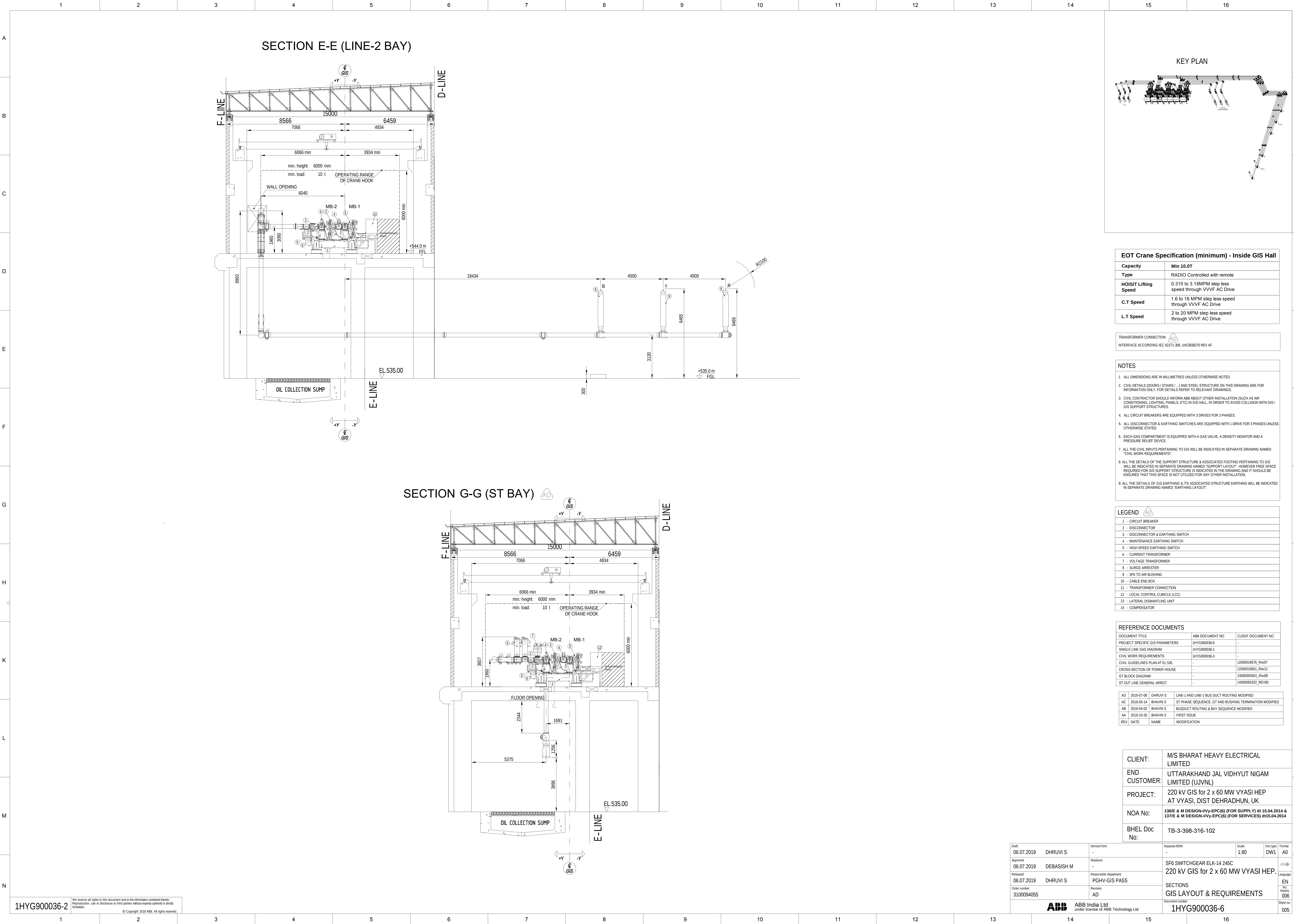
Draft:	06.07.2019	DHRUVI S	Derived from:	-	Scale:	1:50	Doc.type:	DW1	Format:	A0
Approved:	06.07.2019	DEBASISH M	Replaces:	-	SF6 SWITCHGEAR ELK-14 245C					
Released:	06.07.2019	DHRUVI S	Responsible department:	PGHV-GIS PASS	220 kV GIS for 2 x 60 MW VYASI HEP.					
Order number:	3100094055		Revision:	AD	SECTIONS					
					GIS LAYOUT & REQUIREMENTS					
					Document Number:	1HYG900036-2				



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1HYG900036-2

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EOT Crane Specification (minimum) - Inside GIS Hall	
Capacity	Min 10.0T
Type	RADIO Controlled with remote
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C.T Speed	1.6 to 16 MPM step less speed through VVVF AC Drive
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TRANSFORMER CONNECTION 
INTERFACE ACCORDING IEC 62271-306, 1HC038270 REV AF

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LEGEND 	
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2	DISCONNECTOR
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4	MAINTENANCE EARTHING SWITCH
5	HIGH SPEED EARTHING SWITCH
6	CURRENT TRANSFORMER
7	VOLTAGE TRANSFORMER
8	SURGE ARRESTER
9	SP8 TO AIR BLUSHING
10	CABLE END BOX
11	TRANSFORMER CONNECTION
12	LOCAL CONTROL CUBICLE (LCC)
13	LATERAL DISMANTLING UNIT
14	COMPENSATOR

REFERENCE DOCUMENTS		
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CIVIL WORK REQUIREMENTS	1HYG900036-3	-
CIVIL GUIDELINES PLAN AT EL 535.	-	12000019676_Rev07
CROSS-SECTION OF POWER HOUSE	-	12000019651_Rev12
GT BLOCK DIAGRAM	-	24580050501_Rev00
ST OUT LINE GENERAL ARRGT.	-	14580050322_Rev00

REV	DATE	NAME	MODIFICATION
AD	2019-07-06	DHRUVI S	LINE-1 AND LINE-2 BUS DUCT ROUTING MODIFIED
AC	2019-06-14	BHAVIN S	ST PHASE SEQUENCE, GT AND BLUSHING TERMINATION MODIFIED
AB	2019-04-02	BHAVIN S	BUSDUCT ROUTING & BAY SEQUENCE MODIFIED
AA	2018-10-26	BHAVIN S	FIRST ISSUE

CLIENT:	M/S BHARAT HEAVY ELECTRICAL LIMITED
END CUSTOMER:	UTTARAKHAND JAL VIDHYUT NIGAM LIMITED (UJVNL)
PROJECT:	220 kV GIS for 2 x 60 MW VYASI HEP AT VYASI, DIST DEHRADHUN, UK
NOA No:	136/E & M DESIGN-INVY-EPC(6) (FOR SUPPLY) dt 15.04.2014 & 137/E & M DESIGN-INVY-EPC(6) (FOR SERVICES) dt 15.04.2014
BHEL Doc No:	TB-3-398-316-102

Draft: 06.07.2019	DHRUVI S	Derived from: -	Separate BCM: -	Scale: 1:80	DocType: DW1
Approved: 06.07.2019	DEBASISH M	Replaces: -	SF6 SWITCHGEAR ELK-14 245C 220 kV GIS for 2 x 60 MW VYASI HEP.		
Released: 06.07.2019	DHRUVI S	Responsible department: PGHV-GIS PASS	SECTIONS GIS LAYOUT & REQUIREMENTS		
Order number: 3100094055		Revision: AD	Document number: 1HYG900036-6		
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COMPUTER DRG. PATH NAME :

REF. DRG. No.

SIGN. & DATE

INVENTORY No.

DRAWING No. TB-3-398-316-002

11

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TB-3-398-316-002

8

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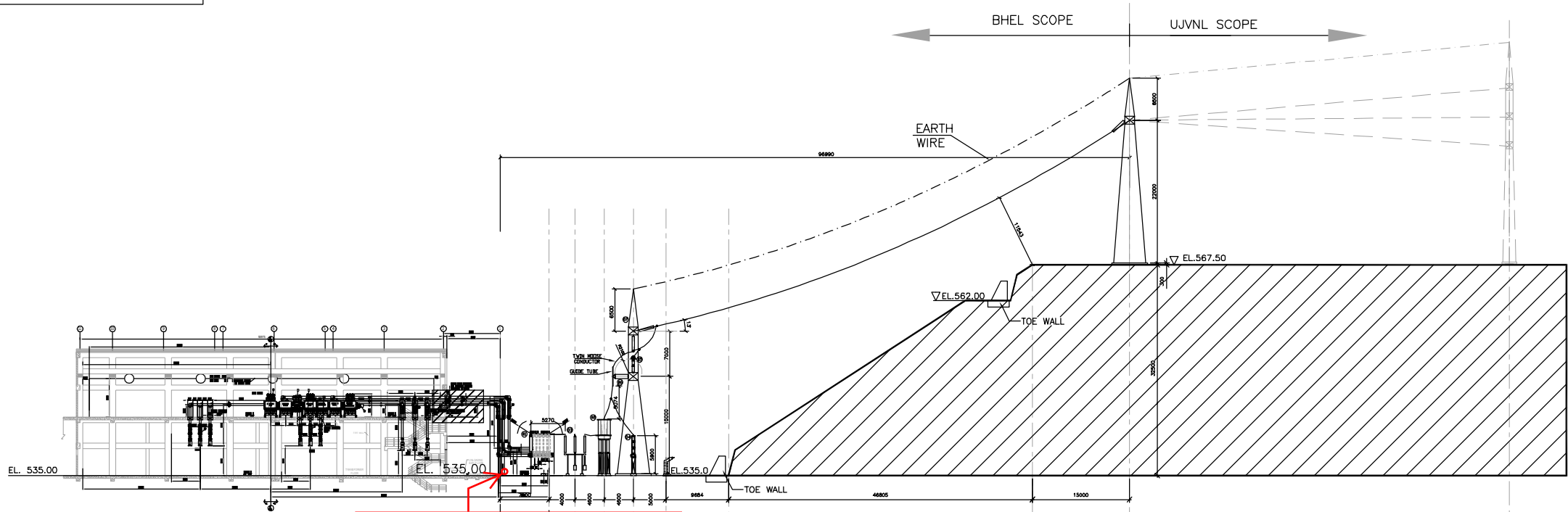
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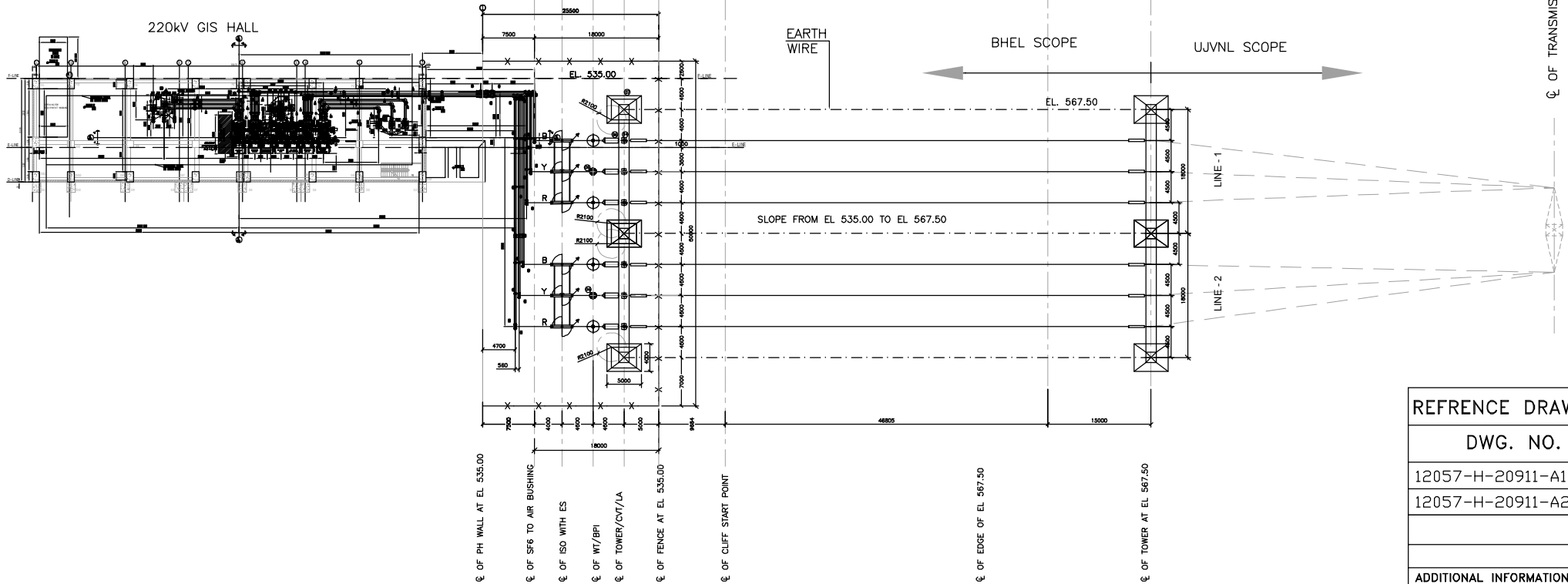
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Tap point 2 Location required
at EL. 535 for Pot Head yard

SECTION VIEW



PLAN VIEW

S.NO.	DESCRIPTION	UNIT
1.	PHASE TO PHASE	mm 2100
2.	PHASE TO EARTH	mm 2100
3.	MIN. DISTANCE OF THE LOWEST EARTH PART OF INSULATOR SUPPORTING LIVE CONDUCTORS FROM GND	mm 2550
4.	SECTION CLEARANCE	mm 5000
5.	HEIGHT OF CENTER LINE OF FIRST LEVEL FROM PLINTH LEVEL	mm 5900
6.	PLINTH HEIGHT	mm 300
7.	SUB CONDUCTOR SPACING	mm 250

SYSTEM PARAMETERS INCLUDING ALTITUDE CORRECTION FACTOR	220kV
LIGHTNING IMPULSE WITHSTAND VOLTAGE (kVp)	1050
P.F. WITHSTAND VOLTAGE (kVrms)	460
HIGHER SYSTEM VOLTAGE (kV)	245
CREEPAGE DISTANCE (mm/kV)	25
SHORT CIRCUIT CAPABILITY (kA FOR 1SEC)	50

BILL OF QUANTITY:-

S.NO.	LEGEND	DESCRIPTION	QTY.
01.		220 kV SF6 TO AIR BUSHING	06
02.		220 kV, 1-PH WAVE TRAP.	04
03.		220 kV, 3-PH HDB ISOLATOR WITH E/SWITCH	02
04.		220 kV, 1-PH CVT	06
05.		198 kV, 1-PH LA	06
06.		220 kV BUS POST INSULATORS.	02
07.		TOWER WITH PEAK	06
08.		STRING INSULATOR	18

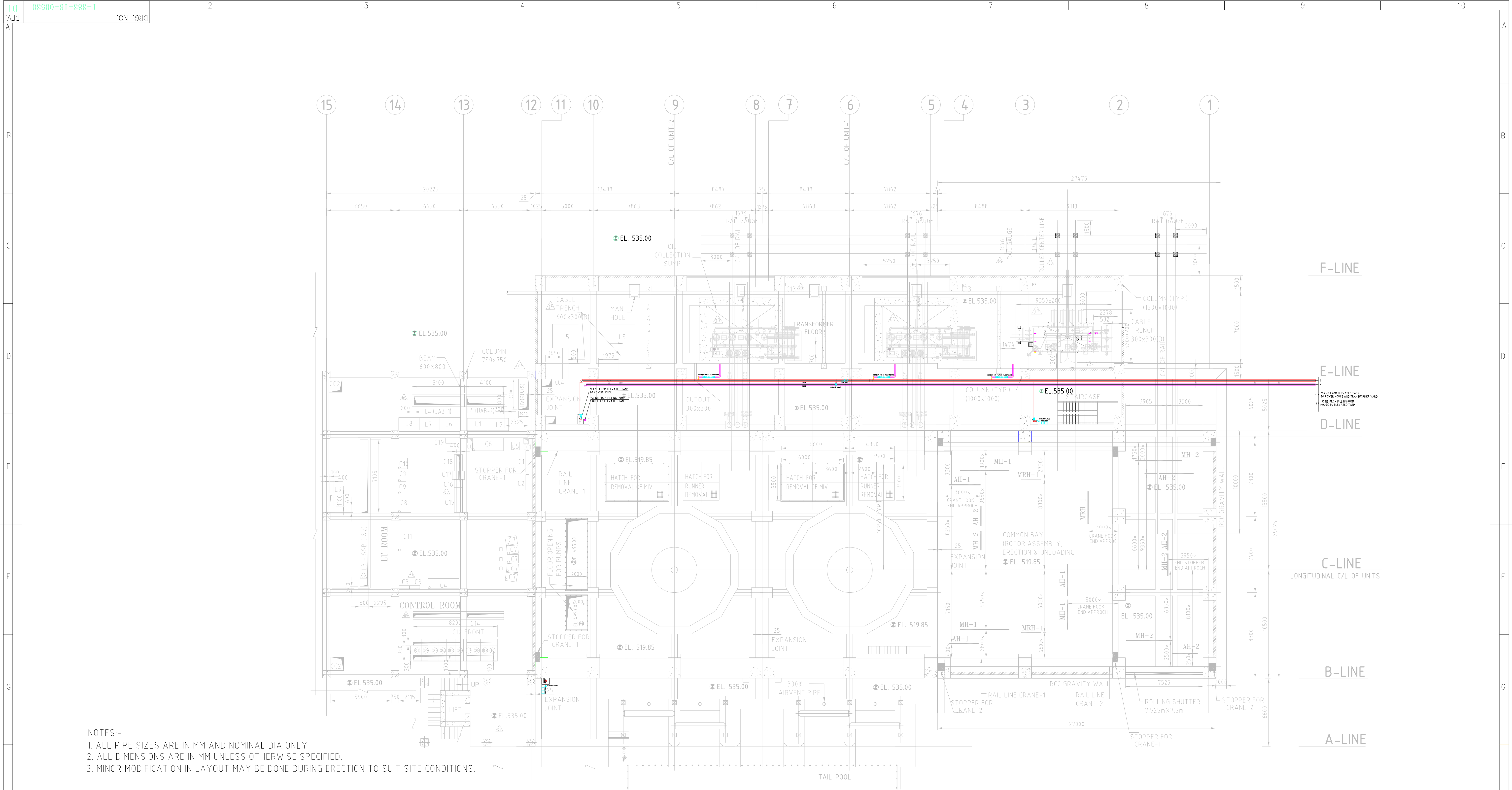
--- EARTH WIRE
--- PRESENT SCOPE
--- UJVNL SCOPE
X FENCE OF POTHEAD YARD

- NOTE:-
- ALL DIMENSIONS ARE IN MM, UNLESS OTHERWISE SPECIFIED.
 - 220KV POTHEAD YARD SHALL BE LOCATED AT EL. 535M.
 - UJVNL TO CHECK THE LOCATION OF FIRST TRANSMISSION LINE TOWER.
 - UJVNL TO ENSURE TO PROVIDE ACCESS TO 220KV POTHEAD YARD AT EL. 535M.
 - NO. OF SURGE ARRESTERS, RATING AND THEIR LOCATIONS ARE FINALISED BASED ON INSULATION CO-ORDINATION STUDIES.
 - LOCATION OF GIS AND DUCT ROUTING IS SHOWN IN GIS HALL LAYOUT.
 - WAVE TRAP IS CONSIDERED IN R AND B PHASES OF BOTH LINES. HOWEVER, FOUNDATION OF WAVE TRAP WILL BE PROVIDED IN ALL THREE PHASES.
 - GIS HALL LAYOUT SUBMITTED IN SEPARATE DRAWING (REFER DDC NO. TB-3-398-316-102, REV AD)
 - UJVNL TO CONFIRM THE LOCATION OF POTHEAD YARD PLOT (50X15M) WRT GIS HALL.

REFERENCE DRAWING

DWG. NO.	TITLE
12057-H-20911-A18,REV D	POWER HOUSE GIS TRANSFORMER HALL GA-PLAN
12057-H-20911-A20,REV D	POWER HOUSE GIS TRANSFORMER HALL GA-L SECTION
	EXC PLAN AT EL. 535M
	SECTION THROUGH C-LINE - AS ON 5TH JAN 2016
ADDITIONAL INFORMATION	PROJECT 220kV GIS for 2x60 MW VYASI HEP
STATUS OF DRAWING	CUSTOMER UJVNL LTD.
DISTRIBUTION OF PRINTS	
DRN NAME SIGN DATE NO. OF VAR	
GV	
MM	
VK	
APPD	
SUB-SUPPLIER/VENDOR	
ISSUED BY DEPT. TBEM	UNTOLO.DIMS. GR.
DEPT. CODE 316	ANGLE
TITLE	SCALE NTS
OVERALL LAYOUT (PLAN & SECTION) FOR 220KV POTHEAD YARD	WEIGHT (KG)
	REF. TO ASSY. DRG.
	ITEM NO.
	NO. OF ITEM
	DRAWING NO. TB-1-398-316-002
	REV. 02
	SHT. No. 01
	NO. OF SHT. 01

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NOTES:-

- 1. ALL PIPE SIZES ARE IN MM AND NOMINAL DIA ONLY
- 2. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
- 3. MINOR MODIFICATION IN LAYOUT MAY BE DONE DURING ERECTION TO SUIT SITE CONDITIONS.

REFERENCE DRAWINGS:

BHEL BHOPAL DRAWING: 1 200 00 196 76

LEGEND			
SL.NO	SYMBOL	TAG	DESCRIPTION
01.		NB	MS PIPE
02.			GATE VALVE
03.			Y STRAINER
04.			HOSE BOX
05.			DELUGE VALVE
06.			REDUCER

PLAN AT EL 535.00M

PROJECT	2X60MW - VYASI HYDROELECTRIC PROJECT, UTTARAKHAND									
COSTUMER	UJVN LIMITED									
CONSULTANT	-									
भारत हेवी इलेक्ट्रिकल्स लिमिटेड, भोपाल Bharat Heavy Electricals Limited, Bhopal				NAME	SIGN	DATE	NO. OF VAR.			
				DRWN/ HARISH	-sd-	16.05.19				
				CHKD/ VASUKUMAR	-sd-	16.05.19				
				APPD/ PCS	-sd-	16.05.19				
ADDITIONAL INFORMATION				DEPT	UNTL. DIMS. GR.	ANGLE	SCALE	WEIGHT(kg)	REF. TO ASSY.DRG.	ITEM NO.
STATUS OF DRAWING				CODE						NO. OF ITEMS
DISTRIBUTION OF PRINTS				TITLE						
				Piping Layout of Hydrant System in Power House (All Floors)						
				DRAWING NO. 1-383-16-00530						REV. 01
				SHEET NO. 02						NO. OF SHEETS. 07