
	<b>GUJARAT STATE ENERGY GENERATION LIMITED</b>	SECTION: D4.1
	TITLE <b>350* MW COMBINED CYCLE POWER PLANTAT HAZIRA</b>	SHEET 1 OF 4
	<b>CIVIL WORKS - SCOPE OF WORK</b>	SPEC. NO. TCE.4915A-H-500-001

## GENERAL

1. This specification is to cover the design, preparation of general arrangement, construction as well as Fabrication drawings, supply of all labour as well as materials and construction of all civil, structural as well as architectural work on EPC basis for the proposed 350 MW Combined Cycle Power Project promoted by M/s GSEG Gujarat State Energy Generation Ltd in the state of Gujarat.
2. Description of various items of work under this specification and nature of work in detail are given hereinafter. The complete work under this scope is referred to as CIVIL WORKS. Lists of various civil works are covered under the scope of work given in SECTION – D4.2.
3. The work to be performed under this specification consists of design, engineering, execution, supervision as well as providing all labour, materials, consumables, equipment, temporary works, temporary labour and staff colony, constructional plant, fuel supply, transportation and all incidental items not shown or specified but reasonably implied or necessary for the completion and proper functioning of the plant, all in strict accordance with the specifications, including revisions and amendments thereto as may be required during the execution of the work.
4. All materials including cement, reinforcement steel, structural steel shall be arranged by the BIDDER.
5. The scope shall also include setting up by the BIDDER a complete testing laboratory in the field to carry out all relevant tests required for the civil works for the project.
6. The work shall be carried out according to the design/drawings to be developed by the BIDDER and approved by the OWNER. For all building and structures, foundations, etc., necessary layout and details are to be developed by the BIDDER keeping in view the statutory & functional requirements of the plant and facilities and providing enough space and access for operation, use and maintenance. Certain minimum requirements are indicated in this specification for guidance purpose only. However, the BIDDER's offer shall cover the complete requirements as per the best prevailing practices and to the complete satisfaction of the OWNER.
7. BIDDER shall inspect the site, examine and obtain all information required and satisfy himself regarding matters and things such as

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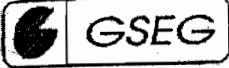
access to site, communications, transport, right of way, the type and number of equipment and facilities required for the work, availability of local labour, materials and their rates, local working conditions, weather, tidal / flood levels, subsoil conditions, natural drainage, etc. Ignorance of the site conditions shall not be accepted by the Owner as basis for any claim for compensation or extension of time. The submission of a bid by the BIDDER will be construed as evidence that such an examination was made and any later claims / disputes in regard to price quoted shall not be entertained or considered by the OWNER on account of ignorance of prevailing site conditions.


## 8.0 GEOTECHNICAL INVESTIGATION


OWNER has not carried out any Geotechnical Investigation in the proposed power plant area. Before construction of 156.1 MW CCPP units (which is next to the proposed units) a brief Geotechnical Investigation was carried out during June 1999 by M/s M K Soil Testing Laboratory. This report is available with Owner. However Bidder shall consider this report and recommendation for reference only.

- 8.1 The site for proposed power plant is observed to consist of top layer of soft to medium stiff silty clay of high plasticity followed by layers of non-plastic dense to very dense silty sand and very stiff highly plastic silty clay. Ground water table was observed at depth 2.75m to 3.00m below GL at the time of Investigation. Ground water is not susceptible to rise in monsoon. Ground Water is not suitable for concrete work.
- 8.2 The topsoil up to around 2.0m below natural ground surface is observed to have high to moderate swelling potential making it not suitable for resting foundations directly on it. Due to alkalinity in soil it should be avoided for back filling or plinth filling purposes, to prevent direct contact with adjacent walls and flooring.
- 8.3 Looking to the site conditions piled foundations are recommended on the site.
- 8.4 Chemical analysis of water shows that water is saline and chlorides and sulphates are of high magnitude rendering it unsuitable to use for concreting purpose.
- 8.5 The conclusion and recommendations drawn by the report are attached and reflect that:

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<p>a) Pile foundation are recommended</p> <p>b) Chemical analysis of soil shows organic contents rendering it corrosive nature and requiring sulphate resistant cement. Provide damp proof and anticorrosive coating on the external faces of concrete substructures.</p> <p>8.6 The soil investigation study report was made a part of the bid document for both non-critical civil works as also for the civil works to be executed under the EPC Contract.</p> <p>8.7 Accordingly, all foundations for non-critical civil works are being carried out through pile foundation, all below ground structures are constructed using sulphate resistant cement and fusion bonded epoxy coated reinforcement steel.</p> <p>8.8 Alternatively BIDDER may make his own assessment for the type of foundations envisaged based on the report available with owner at his own risk. In any case, the Bidder has to carryout detailed geo technical investigation after the award of contract, through some approved/reputed agency and submits geotechnical investigation report with recommendations for Owner's review and approval. The recommendation given in approved final report becomes binding on the contractor. The Bidder is not eligible to increase his cost or demand any extension of time because the final report is in variance from preliminary report furnished by Owner.</p> <p>9. <b><u>SURVEY DATA</u></b></p> <p>The OWNER has not carried out a topographical survey of the proposed power plant area. However the proposed plant site is fairly flat. The bidder shall be required to make the plant layout considering the contour and minimum cutting and filling. Bidder is required to do the grading for entire plant area. Before finalising the plot plan, bidder shall make sure that none of the existing structures / services shall be disturbed the working power plant. If required bidder has to carryout detail survey after award of contract.</p> <p>10. <b><u>STATUTORY REQUIREMENT</u></b></p> <p>BIDDER shall comply with all the applicable statutory rules pertaining to Factory act, Fire safety rule of Tariff Advisory Committee, Water act of</p>		
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<p>Pollution control board, Explosives act, local civil authority including building use permission etc. Provisions of Safety, health and welfare according to Factories act shall also be complied with. Statutory clearances and norms of State Pollution Control Board shall be followed. BIDDER shall obtain approval of Civil / Architectural drawings from concerned authorities before taking up the construction work.</p>			
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## 1.0 SCOPE OF WORK

1.1 The works covered in this section consists of collection of all site related data, conducting site investigations, design, preparation of all construction drawings, supply of all materials, construction, fabrication, erection and testing where necessary, of all structures required for housing all equipment and civil works for all services required for the Power Plant defined in the specification document. The Civil works shall include those required for Installation, Commissioning, testing, operation and maintenance of the Power Plant. The Scope will cover but not limited to the following buildings / structures / systems / facilities.

1.2 Site related investigations, consisting of

- a) Topography Survey
- b) Geotechnical Investigation

1.3 Site development works, consisting of

- a) Fencing.
- b) Roads, drains and culverts
- c) Storm water drainage
- d) Sewage / waste water drainage

1.4 Construction enabling works

- b) Construction water
- e) Construction power

1.5 Temporary buildings

1.6 GTG & STG Building

1.7 Switchgear building

1.8 Heat Recovery Steam Generator

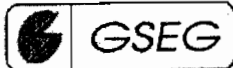
1.9 Foundation inclusive of GTG, STG, BFP etc,

1.10 Steel stack for HRSG

1.11 Transformer yard structures & foundations

1.12 Switch yard structures & trenches

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1.13

DM water storage tank & Condensate storage tank

1.14

Condenser cooling water system

1.15

Cooling water pump house, fore bay & C W pipe line

1.16

C W inlet & outlet conduits

1.17

Clarifiers

1.18

Chlorination room

1.19

Make up water pipe line

1.20

Cooling tower

1.21

Raw water transfer

1.22

Raw water pipe line

1.23

Raw water storage reservoir & pump house

1.24

Pipe, cable rack and pipe sleepers

1.25

Deaerator , BFP building, MCC room

1.26

DG and Air compressor room

1.27

Gas conditioning skid

1.28

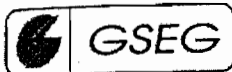
Clarified water storage tank and pump house

1.29

Control room building modifications

It is not the intent to specify herein all the works in the scope of this contract. The scope also includes all other buildings, structures and works necessary which are not specifically mentioned here but required for construction, operation and maintenance of the power plant are deemed to be included in the scope of the Contractor. All works shall conform to the specification. The works shall conform to high standards of design, engineering and workmanship. Design and construction shall conform in every respect to all local and state regulations governing such works and to stipulations of Indian Standards unless stipulated otherwise in detail specification.

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TITLE

**350\* MW COMBINED CYCLE POWER PLANT AT HAZIRA****DOCUMENTS TO BE SUBMITTED BY BIDDER WITH EPC BID  
PERTAINING TO CIVIL WORKS**

SECTION: D4.3

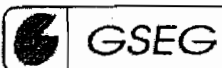
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The following documents are to be submitted by bidder with EPC bid

1. Suggested plot plan locating all buildings, structures, facilities, roads, temporary site office, etc. with their plan dimensions.
2. Write up on proposed storm water drainage system furnishing layout of the drains, types of drains and suggested disposal system.
3. Write up on proposed sewage disposal system for the toilet in various buildings and scheme for usage / disposal of the clear water.
4. Write up on proposed treatment and disposal of effluent / waste water generated in the plant and scheme for usage / disposal of clear water.
5. A detailed write up on Sea water intake system, Condenser cooling water system along with schematic drawing showing preliminary sizing and details of Cooling towers, channels, forebay and pump house, cold and hot water conduits and the method of construction.
6. A detailed write up on make up water system for the cooling tower blowdown, covering, source of water, Intake / withdrawal arrangement, pump houses, conduits along with method of construction.
7. A report on foundation proposed for various structures, buildings and facilities based on the data furnished by OWNER and further data collected by the BIDDER. Allowable safe bearing capacity for open foundation, depth of foundation, need for pile foundations, soil improvement if any required, special precaution against aggressive soil etc shall also be covered in the report.
8. A write up on dewatering system proposed at the time of construction where deep construction such as for C.W. forebay and pump house etc. are to be executed where water table is higher.
9. General arrangements / architectural drawings for all buildings and structures showing dimensions, levels, plans, sections, elevations, materials proposed, types of framing, wall / cladding, floors, roofs, types of finishes etc.
10. Detail design criteria proposed to be adopted for each building, structures, foundations, facilities etc.

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<p>11. A write up on the sizing and constructional details of steel stack with sketch showing detail of foundation along with list of appurtenances.</p> <p>12. List of software proposed to be used in various areas for analysis, design, drafting as well as project monitoring along with their sources and validation report for software.</p> <p>13. List of all sub-contractors that the BIDDER proposed to employ, in case the contract is awarded to him, indicating their addresses with telephone number, experience on similar jobs, name, qualification and experience of persons who shall be employed in the job on behalf of the sub-contractor etc shall be submitted to the OWNER. Only the Sub Contractor, approved by the OWNER shall be engaged by the CONTRACTOR on the job.</p> <p>14. Details of quality control laboratory with a list of testing equipment shall be furnished.</p> <p>15. All deviations from bid document shall be furnished by BIDDER in the format given in the specification document. Deviation furnished elsewhere in the bid other than at the place titled "Deviations" will not be considered as deviations.</p> <p>16. Any exclusions from the scope mentioned and implied in these specifications, shall be clearly mentioned by the BIDDER separately in a section titled "EXCLUSIONS". Only the details mentioned in this section shall be considered as exclusions. All works, other than these, shall be deemed to be in the scope of this contract and shall be executed by the CONTRACTOR at no extra cost to the OWNER.</p>			
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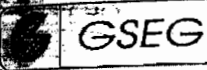
  

1.0 The following documents are to be submitted for the approval of the OWNER, prior to commencement of fabrication & erection / construction. All drawings shall be of standard sizes (Metric system) and shall be made on AUTOCAD latest version. The list is not exhaustive but indicative only:

- (a) General plant layout drawing with co-ordinates of roads, boundary wall, buildings and facilities, piping / cable corridors, pipe and cable trestles, provision of landscaping and green belt development, diversion drains, equipment lay down areas etc.
- (b) Drawing showing underground facilities with co-ordinates of these facilities like buried pipes, buried cables, trenches, ducts, sewer, drains, sumps, pits, culverts, foundations etc.
- (c) Storm water drainage study furnishing levels of various terraces arrangement and details of drains, culverts etc for storm water drainage system.
- (d) Study note on disposal of sewage and other effluent from the plant to satisfy the statutory requirement.
- (e) Design basis memorandum for all buildings, facilities, services and structures.
- (f) Design basis report on raw water intake sump & pump house for water drawl from existing ONGC pipeline.
- (g) Architectural floor plans, elevations, cross sections and perspective view in colour of all buildings. For main plant building BIDDER shall submit two different schemes along with a report elaborating the underlying philosophy of the proposed architectural concepts.
- (h) Design calculations and drawings for foundations / substructure and superstructure of all buildings including pump houses and other structures.
- (i) Design calculations including dynamic analysis and drawings for all foundations subjected to dynamic loads like foundations for GTG, STG etc.

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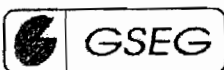
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<div><div>(j)</div><div>Design calculations and drawings for all facilities and services like roads, culverts, bridges, paving, road / rail crossings, drainage pump house (if required), drains, sewers, water supply, water tank, sumps, tunnels, trenches, ducts etc.</div></div> <div><div>(k)</div><div>Drawings of all architectural works including finish schedule, colour scheme (both internal and external), doors and windows, flooring and false ceiling, etc.</div></div> <div><div>(l)</div><div>Design calculations and drawings for plumbing and building drainage.</div></div> <div><div>(m)</div><div>Design calculations and drawings for structures and foundations in switchyard, transformer yard, etc.</div></div> <div><div>(n)</div><div>Design calculations and drawings for structures pertaining to cooling water system.</div></div> <div><div>(o)</div><div>All other designs, details / drawings or any other submissions as indicated else where in this specification and as required by the OWNER.</div></div> <div><div>(p)</div><div>Details of corrosion protection measures for all structures.</div></div> <div><div>(q)</div><div>Total quantity of concrete (grade wise), reinforcement steel (diameter wise) and structural steel (section wise) in all construction drawings.</div></div> <div><div>(r)</div><div>All design and drawings for the Cooling towers.</div></div> <div><div>(s)</div><div>All design and drawings for steel stack.</div></div> <div><div>(t)</div><div>All design calculations and drawings for HRSG Foundations.</div></div> <div><div>(u)</div><div>Design calculations for important joint / connections for structural steel works.</div></div> <div><div>(v)</div><div>Construction and erection procedure for all major structures with specific reference to main plant building, GTG/STG foundation and other machine foundations.</div></div> <div><div>(w)</div><div>Write up on various statutory requirements and their compliance for various buildings and facilities.</div></div> <div><div>(x)</div><div>Copies of all reports on investigation and studies carried out by the CONTRACTOR as per the scope.</div></div>			
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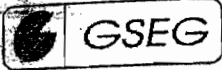
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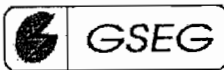
  

1.0	<b><u>DESCRIPTION OF BUILDING, STRUCTURES AND FACILITIES</u></b>
1.1	Following structures / buildings / areas / facilities/services are to be included in the contract. The description against each building / system is indicative only and not exhaustive. Although almost all the systems are covered here but any other system (Civil, Structural and Architectural) required for successful completion of the project shall form a part of this contract and shall deemed to be included in the scope of works.
2.0	<b><u>SITE RELATED INVESTIGATION</u></b>
2.1	<b><u>Topography Surveying</u></b>
2.1.1	All Bench Mark (BM) levels of the survey shall be established with reference to the nearest GTS benchmark available. Precision levelling shall be carried out for establishing the BM at site by carrying levels from GTS BM adopting double circuit levelling. Precision theodolites used shall be of one-second accuracy.
2.1.2	All boundary lines shall be located with their distances, included angle and bearings and boundary pillars constructed. Number of pillars shall be adequate to mark the boundary limits without any dispute. A closed traverse survey shall be carried out with theodolite to form the framework for the detailed survey work.
2.1.3	Two-reference line, North-South line and East-West line at right angles to each other shall be established with grid pillars constructed at 100 metres c/c in both directions in such a way that these pillars will not be disturbed during construction. Coordinates shall be painted on these grid pillars. Pillars shall also be painted using synthetic enamel paint for easy identification. Benchmark pillars shall be provided atleast at 6 locations. These pillars shall be properly protected to prevent their disturbance during construction activities. BM shall be distinguished from grid pillars with different type of painting.
2.1.4	Spot levels shall be taken in a grid of five meters (5 m) and contours shall be established at an interval of 500 mm. All Contour levels shall be with respect to MSL.

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2.1.5	Contractor shall furnish one soft copy in a floppy along with six (6) copies of all survey drawings to the Owner for his reference.		
2.1.6	The topographical survey shall also be carried out for the entire length of pipe raw water pipe line as explained above.		
2.2	<b><u>Geotechnical Investigations</u></b>		
2.2.1	Detailed geotechnical investigation shall be carried out by the Contractor on award of work. Based on the plot plan developed, the Contractor shall prepare field and laboratory testing scheme and obtain the approval of Owner prior to commencing the investigation. In the power block boreholes shall be provided and spread judiciously to cover all major structures as well as equipment foundations. Generally, a grid of 50 metres c/c both ways is recommended from Stack to end of Switchyard. In the other areas it shall be ensured that the boreholes are provided near all major structures. If the final geotechnical investigation report found variance with the results of the preliminary investigation, the contractor is not eligible for any extra claim or time.		
2.2.2	Geotechnical investigation shall also be carried out for entire length of raw water pipe line from ONGC pipe line to raw water storage reservoir within the plant boundary.		
2.2.3	Following field tests shall be conducted: <ul style="list-style-type: none"> <li>▪ Bore Holes and standard penetration tests.</li> <li>▪ Static Plate load tests</li> <li>▪ Cyclic Plate load test</li> <li>▪ Permeability tests</li> <li>▪ Density and moisture content tests</li> <li>▪ Vane Shear tests</li> <li>▪ Static Cone and dynamic cone Penetration tests</li> <li>▪ Soil resistivity tests.</li> <li>▪ Pressure meter tests.</li> <li>▪ Percolation test</li> </ul>		
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	<p>2.2.4 Boreholes shall be located to cover the entire area. All boreholes shall be sunk up to a depth of 25.0 m or 5.0 m continuous into hard rock whichever is earlier.</p> <p>2.2.5 Standard penetration tests (SPT) and collection of undisturbed soil samples (UDS) shall be carried out alternatively at 1.0 m intervals and at significant change of strata. The interval shall be increased to 1.5 m below 5 m depth of boring. UDS shall be replaced by SPT in cohesion less strata. Even in highly weathered / disintegrated rock, where core recovery is poor, SPT shall be conducted. The first SPT in any borehole shall be conducted at 1m depth.</p> <p>2.2.6 In rock strata, core recovery and Rock Quality Designation (RQD) shall be noted carefully for each run, immediately after cores are taken out of barrel.</p> <p>2.2.7 During boring, the level at which ground water is struck shall be carefully noted. Ground water samples shall be collected for chemical analysis. Water samples shall be collected before the addition of water or drilling mud to the hole.</p> <p>2.2.8 Following laboratory tests shall be conducted: (Preferably on Undisturbed soil samples and if UDS is not possible, on remoulded soil samples.)</p> <ul style="list-style-type: none"> <li>(a) Grain size analysis             <ul style="list-style-type: none"> <li>(i) Hydrometer analysis</li> <li>(ii) Sieve analysis</li> </ul> </li> <li>(b) Specific Gravity</li> <li>(c) Chemical Analysis of soil and ground water including Sulphates, Chlorides, pH value, etc.</li> <li>(d) Chemical Analysis of 2:1, Water:Soil extract of the samples giving SO<sub>3</sub> content.</li> <li>(e) Consistency Index : Liquid Limit, Plastic Limit, Plasticity Index, Shrinkage Limit and Shrinkage ratio.</li> </ul>		
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(f)

Consolidation test giving all relevant parameters.

(g)

Swelling pressure and free swell index for expansive soils.

(h)

Unconfined Compressive Strength on soil samples

(i)

Direct Shear Test

(j)

Triaxial Compressive Strength Tests:

(i)

Unconsolidated Undrained Test

(ii)

Consolidated Undrained Test

(iii)

Consolidated Drained Test

(k)

Moisture-density relations for Standard Proctor and Modified Proctor tests.

(l)

Crushing Strength, specific gravity, unit weight, water absorption test on Nx size rock specimens.

(m)

Permeability test

2.2.9

The Geotechnical investigation report shall necessarily include, but not be limited to the following information.

(a)

Recommended types of foundation.

(b)

Allowable safe bearing capacities and settlement values in different strata for shallow foundations indicating relevant design criteria adopted, method of analysis adopted etc.

(c)


If pile foundations is envisaged, type of pile recommended with reasons for the same, length, diameter, allowable capacity (vertical, lateral and pullout) of individual and groups of piles, negative skin friction if any and magnitude of estimated negative skin friction.

(d)

Recommendations for values for modulus of subgrade reaction for foundation design.

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(e) Type of cement to be used for concrete substructures and in stone / brick masonry foundations with reference to the chemical nature of subsoil and ground water.

(f) Recommendations regarding excavations (shallow & deep), embankment, safe side slopes for excavation and embankment, dewatering, site drainage, etc.

(g) Recommended soil properties such as density, specific gravity, cohesion, angle of internal friction etc. for design.

(h) Precautions to be taken for design of lightly loaded structures when expansive soil is encountered with respect to swelling pressure and free swell index values obtained.

(i) Recommendation for soil improvement if required, to be indicated in the report.

2.3 **Site Development Work & Site Grading**

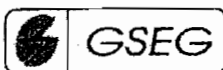
2.3.1 The required grade level of the plant area shall be graded by the Contractor considering the contours, minimum cutting and filling.

3.0 **Fencing**

3.1 **Fencing**

Minimum 3 m high fencing above the toe wall shall be provided around the entire switch yard, transformer yard, auxiliary transformer yard, stores etc wherever fencing is necessary due to security / safety / statutory requirements. Fencing shall comprise of 2.4 m high PVC coated galvanised chain link fence of minimum 8 guage (including PVC coating) with mesh size 75 mm and galvanised barbed wire on inclined member to a height of 600 mm above the chain link fencing. 3 Lines of 12-gauge high tensile spring steel wire shall be provided for the entire length of fencing. Also 50 mm X 6 mm galvanised MS flats shall be provided at every fifth post sandwiching the fencing with post using GI nuts and bolts. Top of toe wall shall be 200 mm above formation level. Toe wall shall be generally of RCC construction and

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shall extend 150 mm below the formation level and the fencing mesh shall be embedded inside toe wall by minimum 75 mm. Fencing post shall be fabricated out of galvanised MS angle section of minimum 75x75x6 mm size and shall be spaced at a maximum spacing of 2.5 m with struts made up of galvanised MS angle at every fifth fencing post in addition to those at bends. Expansion joint shall be provided at every 60 m. Steel entry gates shall be provided for all fenced areas. Gates shall be formed out of tubular section conforming to IS:1161. Removable type of fencing shall be provided at suitable location to permit entry and exit of equipment.

4.0 **ROADS, DRAINS AND CULVERTS:**

4.1 Access roads and vehicular parking areas shall be of flexible pavement type with water bound macadam base and bituminous topping on prepared surface.

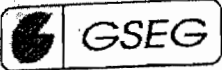
4.2 The main access road from the existing asphalt road to the plant boundary shall be four lanes with a refuge of about 2 m wide in between double lane 'up' and 'down' roads. The road shall be designed to cater to the load and needs of construction and maintenance of heavy trucks carrying machinery and heavy cranes.

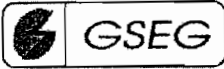
4.3 All other plant internal roads providing access to buildings / structures / systems for vehicular movement shall be 7.5 m wide. All other minor roads shall be 4 m wide. 1500 mm / 750 mm wide (1500mm for 7.5 M wide Road / 750mm for 4 M wide Road) road shoulder shall be provided on both side of all two lane roads paved with interlocking concrete paving blocks of approved shape/design and colour.

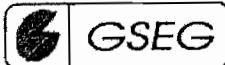
4.4 Road construction shall be as per IRC standards. However the minimum requirement for the roads shall be; 200 mm thick (consolidated thickness) sub base course laid in two layers of 100 mm each and 150 mm thick (consolidated thickness) water bound macadam base course laid in two layers of 75 mm each and topped with 50 mm thick semi-dense bituminous carpet. The minimum thickness of black topping shall be 50 mm. Bituminous topping of all plant roads shall be taken up after all the major construction activities are completed.

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4.5	On either side of the roads open drains shall be provided. Minimum clear width of the drain shall be 600 mm. The drains shall be designed and built using RCC. Drainage lines and other under ground services shall be located at least 1 m clear from the edge of the road. All service and utility lines crossing the roads shall be taken up through NP3 class RCC pipe designed for impact loading. All culverts carrying storm water shall be cast-in-place RCC box culverts.		
5.0	<b><u>STORM WATER DRAINAGE:</u></b>		
5.1	Run off coefficient for paved and unpaved areas shall be taken as 0.9 and 0.6 respectively.		
5.2	Storm water drainage system shall be designed in two parts. (a) Main drains  (b) Auxiliary drains  Main drains shall be designed as a network covering total plant area and shall ultimately be led to nearest water body. Auxiliary / branch drains shall cover individual graded terraces to collect discharge from plant buildings and shall connect to main drain at suitable locations.		
5.3	Drainage for plant effluent and storm water shall be carried by gravity. The drains shall generally be open type and constructed of RCC. RCC box culverts shall carry drainage under roads.		
5.4	At places where covered drainage system is required, channels with removable cover shall be preferred to piping system, as piped system tends to get blocked. Underground storm water piping shall be restricted strictly to areas where surface drains are not desirable or practicable from functional point of view.		
5.5	Drainage shall be provided where necessary to prevent ponding and ground erosion and to carry surface water away from building, structures and other works including roads, building or equipment foundations.		
5.6	The storm water drainage for the contaminated area such as fuel oil areas and oil skids etc. shall be designed separately and the		
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<p>CONTRACTOR shall identify sufficient area outside the property boundary to locate his staff and labour colony no area inside the plant boundary shall be used to house the labour colony. Construction and maintenance of the staff and labour colony to satisfy all statutory requirements is the sole responsibility of CONTRACTOR.</p> <p><b>9.0      <u>Gas Turbine And Steam Turbine Generator Building</u></b></p> <p><b>9.1</b>      GT and ST shall be housed in one single Building. Generator part of GTG portion of building alone can be without crane approach. However layout of GT shall be such that the part of GT to be handled by crane shall also be approachable from STG building crane.</p> <p><b>9.2</b>      Turbine building framing shall be of structural steel with moment connected framing in the transverse direction and bracing in the longitudinal direction.</p> <p><b>9.3</b>      Service and maintenance bays shall not have any intermediate floors, however a 1500 mm wide observation gallery with handrails shall be given at the operating floor level to observe the TG erection operation.</p> <p><b>9.4</b>      Crane capacity and crane rail level shall be fixed based on the equipment to be lifted and the method of lifting various heavy parts. At crane girder top flange level a crane walkway shall be provided in line with Factory rules. Access shall be provided to crane walkway through a cage ladder from operating floor at two ends. Bottom level of roof framing shall be decided by the crane clearance requirement duly taking into account clearance required for mounting lighting fixtures. All other requirements of the crane shall be as outlined in the Mechanical section of this document.</p> <p><b>9.5</b>      Side cladding shall be of brick wall / solid concrete block wall up to a height of 3000mm above FFL.</p> <p><b>9.6</b>      Windows shall be sliding windows in anodised aluminium framework using 6 mm thick glass in general. However in areas where cladding is of sheeting, fixed glazing in anodised aluminium framework and in accessible areas sliding windows in anodised aluminium framework using 6 mm thick glass shall be provided.</p> <div data-bbox="1289 1933 1398 2000" style="text-align: right; border: 1px solid black; padding: 2px;"> ISSUE R0 </div>		

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regulation etc., which are covered under mechanical section of this specification.

**13.0 Transformer Yard Structures and Foundations**

**13.1** Generator transformer, Station transformer unit auxiliary transformer and service transformer are located as per requirement close to the respective building. Transformers shall be founded on RCC foundations with rails on the top and oil soak pits filled with hard stone aggregate. Burnt oil pits are provided to collect leaked oil from the soak pit through RCC, pipes laid to slope. RCC blast wall / RCC frame with brick wall of adequate thickness and height to satisfy TAC regulations shall be provided in between transformers and between main transformer and turbine building as Fire barrier wall.

**13.2** RCC foundations shall be provided with rail to transport transformers out of transformer yard during maintenance. Entire area shall be surrounded with 3 m high chain link fencing with gates. Where rails cross the fencing, fencing shall be made of removable type to facilitate transport of transformer. Floors shall be paved with plain cement concrete and shall be sloped towards peripheral drains, which shall lead to a sump from which the drainage is led through an oil water separator. The clear water shall be led to plant drainage / guard pond.

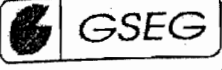
**14.0 Switchyard structures and Trenches**

**14.1** Extent of the Switchyard will depend on the layout of the switchyard, which has been outlined in the Electrical section of this document.

**14.2** All steel structure for the Switch yard shall be hot double dip galvanised structure with welded / bolted connections at shop and bolted connection at site. All bolts and nuts shall also be galvanised. Minimum zinc consumption shall be 200 gms per square meters of exposed surface. Design criteria of Switchyard structure are furnished else where in the specification.

**14.3** Major steel structures are towers, beams, lighting masts etc. They are all of latticed construction using angle sections. In addition supporting structure for equipment, such as isolator, lightning arrestors, etc shall also be provided. These structures may be of tubular section or latticed

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as the case may be. Towers, beams etc shall be trial assembled at shop, keeping in view the actual site condition, prior to dispatch to erection site so that they can be conveniently pre-assembled before erection or conveniently assembled during erection.

14.4 Lighting masts shall be provided with cage ladder. Where platforms are provided on lighting masts for mounting of lighting fixtures, they shall have protection handrails formed of galvanised section. Grating used for platforms shall be galvanised.

14.5 Foundations may be open foundation or on piles based on soil / conditions.

14.5 Trenches shall all be of RCC construction. Trench walls shall be designed to withstand a surcharge load of 1500 kg / sq.m. Trench wall shall project 150 mm above the paved / graded level to prevent ingress of storm / rain water. All trench, floors shall be given a slope of minimum 1 in 750 and the slope shall lead to a sump, where pump can be installed for drainage. Cover for cable trenches shall be a per specification.

14.6 The complete area within the fencing for switch yard/transformer yard shall be provided with a mild slope towards peripheral RCC drains, which in turn will be connected to the plant drainage system. Entire switchyard area shall be provided with 75 mm thick paving using 20 to 40 mm size stone aggregate on top and 75 mm paving of 20 mm stone aggregate below. Before laying the paving, the ground surface shall be treated with anti weed chemicals as per manufacturer recommendations.

14.7 Fencing around switch yard area shall comprise of PVC coated G-1 chain link fencing of minimum 8G (including PVC coating) of mesh size 75 mm and of height 2400 mm above toe wall with 600 mm high galvanised anti-climbing device with barbed wire (8 rows) such that total fence height of 3 m above toe wall is achieved. Other details of fencing such as anti-climbing device, fencing, toe wall etc shall be as explained earlier.

15.0 **DM STORAGE TANKS**

15.1 DM water storage tank shall be placed outside the existing DM plant, condensate storage tank near HRSG shall be supported on sand pad with RCC ring wall footing.

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