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BHUTAN TELECOM LIMITED

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TENDER NAME: "Supply, Installation and Commissioning of Power, Tower & Shelter on Turnkey Project"

Bhutan Telecom invites your firm for submitting ebid through eprocurement systems for **"Supply, Installation and Commissioning of Power, Tower & Shelter on Turnkey Project"** Subject to below conditions:

1. **Instruction to Bidders**
   1.1 Bidders are requested to read RFP before creating Quotation for the tender
   1.2 Bidders are requested to read the Manual for Bidding before bidding in the eprocurement Systems.
   1.3 Bidders are requested to update the documents (Trade License & Trade License) if expired before creating the Quotation for the tender.
   1.4 Bidders are requested to submit ***eBid*** in the systems first and then also submit EMD **a day before actual submission date** of the systems date (**i,e by 14th January 2021**) to avoid disqualifying of bid submission.
   1.5. ebid & EMD to be submitted by 14th January 2021 failing which shall it shall not be accepted. The bid shall be opened on 15th January (14:00 hours)

2. **Bid Security**

2.1 EMD (2%) of the total bid value in a sealed envelope to be submitted to Finance & Accounts Section.

2.2 The bid security shall be in the form of unconditional bank guarantee/Banker's Cheque/ Cash Warrant/ Demand Draft or as specified in the bidding documents and shall be enforceable in any Bank in Bhutan.

2.3 The Bid Security shall be in the name of Chief Executive Officer, Bhutan Telecom Ltd.Thimphu Bhutan. Bid Security must be issued by any scheduled Bank and acceptable to Bhutanese Bank and shall have to be valid for three months from the

2.4 Bid Security of bidders whose bids have been declared "Non-Responsive" shall be returned after such declaration.

2.5 Bid Security of "Responsive" but unsuccessful bidders will be returned after receiving Performance Security from the "successful bidder".

2.6.1 Bid Security of "successful bidder" will be returned after receiving Performance Security.

3. **Forfeiture of Bid Security**

   3.1 If a Bidder withdraws its bid during the period of bid validity his Bid Security shall be forfeited.

3.2 If the "Successful Bidder", to whom the Notification of Award for the supply is presented, refuses or neglects or fails to furnish the required Performance Security, his Bid Security shall be forfeited.

4. **Taxes and Duties**

4.1 The bidder shall be entirely responsible for all the taxes, duties and other such levies imposed outside Bhutan. 3% FCT shall be deducted at source on the total order value for Equipment & Services order. Taxes inside Bhutan shall be borne by BT.

Performance Security

4.1 Upon receipt of notification of award, the successful Bidder shall furnish a "Performance Security" to the purchaser within two weeks from the date of issuance of Purchase Order (PO). "Performance Security to be submitted to nearest BTL, Office.

4.2 The amount of such "Performance Security" shall be not less than 10% (ten percent) of the total "Evaluated Price" of bidder's offer.

4.3 The "Performance Security" shall be denominated in the currencies of the contract and shall be in the form of Cash Warrant/Demand Draft/ an irrevocable Bank Guarantee to be given by any branch of scheduled banks in Bhutan.

4.4 The proceeds of this "Performance Security" shall be payable to the purchaser as compensation for any failure of the Bidder to complete his obligations stipulated in the contract.

4.5 If supplier fails to deposit "performance Security" within one week from the date of issuance of PO, the order shall be treated as cancelled and it shall be placed to the 2nd Lowest Bidder.

4.6 The "Performance Security" shall be discharged with or without deductions (as applicable) to the supplier upon his completion of performance obligations as described in the contract terms.

5. Prices

5.1 Equipment Price quoted by the bidder shall be **CIF, Phuentsholing Stores**

5.2 The bidder should quote as per the specification provided in Bid Form and delivery schedule

5.3 All prices quoted shall be on a per unit basis and valid till **for 12 months from the date of bid opening**. The selected bidders shall be contacted for additional supply of any enlisted item in future on repeat order basis for the entire contract period.

5.4 Prices should be inclusive loading charges. If the vendor wish to use BT's forklift, the charges to be paid separately during unloading of equipment.

6. Purchaser's Right

6.1 Bhutan Telecom reserves the right to reject all or in part, the item supplied by the successful bidders during physical verification/technical testing if it believes that the goods supplied are non standard/non specific and unreliable in terms of quality.

6.2 Bhutan Telecom reserves the right to accept or reject any bid and to annul the bidding process and reject all bids at any time prior to award of contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidders of the grounds for the purchaser's action.

6.3 Bhutan Telecom reserves the right at the time of the contract to increase or decrease the quantity of item tendered, without any change in price or other terms and conditions.

6.4 Bhutan Telecom also reserves the right to call quotations and receive the same in the form of email or fax, directly from the manufacturers in India and other countries and compare the rates with those offered by the local suppliers.

6.5 If need be, Bhutan Telecom also reserve the right to purchase the items directly without assigning any reasons thereof.

6.6 If the selected bidder fails to supply the full quantity of the bid, Bhutan Telecom shall cancel the order for the quantity not supplied and place the order to the next bidder in succession. However, Bhutan Telecom shall recover as liquidated damages, the difference between the contracted rates and the actual price paid to the next bidder for the quantity not supplied.

7. Mandatory Documents to be submitted with the bid.

7.1 Bidders shall download Integrity Pact and resubmit/ upload duly filled and signed and completed form in original scan to be submitted. Failing to upload, tender shall be considered non-responsive.

7.2 Bidders are requested to submit your own drawings for Tower, Monopole & Shelters which should be as per our Drawings.

8. Scope of Work

The scope of work includes supply and erection of towers at various sites. The supply component will involve the supply of Power , Tower ,Shelter and its accessories (TO BE QUOTED CIF PHUENTSHOLING, BHUTAN), whereas the service component will include transportation of materials up to individual sites and erection of towers. You are ***required to quote separately*** for supply and services.

9. Period of Execution of Work / Delivery

The contractor shall supply, install and commission the work specified within 2 (two) months from date of placing purchase order. Supply within 2 (two) months from the issue of purchase order and installation within 2 (two) months from the date of site is ready failing which the contractor shall be liable for liquidated damages as detailed in clause 15 for both the supply and installation accordingly.

10. Contractors Responsibility

The contractor shall perform the work stipulated in clause 2 above.

The contractor shall take full responsibility of performance, stability, reliability and durability of the facilities installed

The contractor shall complete the supply and service component within 4(four) months as stipulated in Clause 9.

A fortnightly progress report shall be submitted giving the details on the progress of supply, installation and commissioning of the system.
Any part of the work found not to the satisfaction of Bhutan Telecom shall be remedied at the expense of the contractor

Packaging and delivery of the materials should be done site wise and PO wise

Bidder or their representative should visit the site before submission of bids and full covid-19 protocols put in Place by Royal Government of Bhutan must be followed diligently. BT shall provide preliminary data as reference.

The contractor shall be fully responsible for the deviation of work scope for not adhering as specified above

Head loading of materials should be CIF site identified by BT

Bidder should submit exclusive services cost breakup for tower, shelter and power (services includes transportation, head loading, installation & commissioning etc.) The service cost pertaining to tower, shelter and power can be broken up and allotted to different vendors.

The contractor shall deploy minimum of one team per region for execution of tower, shelter and power.

Bidder shall submit exclusive cost breakup for hardware and services

The contractor shall handover balance materials to respective region/local BT offices or CHQ project section with proper signed handing taking document.

The contractor shall clean station and its surrounding and dispose wastes at the safe place post installation in accordance to the National Environment Commission policy

The contractor shall be fully responsible for any damages caused except force majeure prior to Acceptance test /handing taking

A fortnightly progress report shall be submitted giving the details on the progress of supply, installation and commissioning of the system.

The selected bidder/contractor shall submit the implementation schedule on the supply, civil works, installation and commissioning of tower, shelter and power based on the work plan shared by BT.

Any part of the work found not to the satisfaction of BT shall be remedied at the expense of the contractor.

The contractor shall supply any additional orders at the unit price within the Contract period. The Employer shall decide the location of supply.

The contractor shall ensure availability of spares within warranty period.

The contractor shall follow guidelines of COVID-19 Protocol issued by Royal Government of Bhutan and any expenses pertaining to COVID-19 shall be borne by contractor. The expenses include the logistic and medical expenses for the employees of contractor/supplier.

The contractor shall be fully responsible for transportation of materials on transship while BT will facilitate approval from agencies.

The contractor shall develop and level the sites which includes tree felling while BT shall support and facilitate in obtaining approval from agencies.

11. **Bhutan Telecom's Responsibility**

Bhutan Telecom shall take necessary measures to accord personnel of contractor such facilities as issuance of visas, permits and other authorizations necessary for the entry into Bhutan and travel to the sites.

Bhutan Telecom shall be responsible for all the taxes and levies in Bhutan except the 3% Foreign Contract Tax (FCT) on the turn key (goods along with services), which shall be borne by the contractor.

BT shall acquire land and hand over to contractor

BT also reserves right to change in implementation schedule based on the priority which will be informed in advance to the contractors.

12. Inspection and Testing

The contractor shall conduct standard tests in presence of Bhutan Telecom representatives to conform to general technical standards.
Should any tested/ inspected goods/ materials fail to conform to the specifications Bhutan Telecom may reject them and the contractor shall replace the rejected goods/material or make alteration necessary to meet the specifications without any cost to Bhutan Telecom.

13. Warranty

The contractor shall warrant that the equipment and materials supplied shall be new and free of defects and that the contractor shall be responsible for any defects that may develop within the warranty period of 12 months from the date of commissioning/erection/UAT.

14. **Payment Terms**

For Supply of goods:

CIF price of goods shall be paid as under: Progressive Payment: Fifty percent (50%) of the CIF price component for all the equipment and materials shall be paid on proof of dispatch. Supplier to furnish all the documents for payment purpose.

The balance fifty percent (50%) of the CIF price for the materials component shall be paid after reaching to the designated place.

For Services:

Expatriate supervision & Local service charge i.e., transportation and erection/commissioning charges shall be paid as follows:

Eighty percent (80%) of the charges shall be paid on pro-rata basis after installation at site and on certification by the Engineer.
Twenty percent (20%) of the charges shall be paid within 30 days of operational acceptance and taking over of the component

15. Liquidated Damages

If the contractor fails to supply, install and commission the work within the stipulated time detailed in Clause 9, Bhutan Telecom shall be entitled to recover 0.1% of the value of the delayed quantity of goods and services for every day's delay till a maximum of 10%.

16. Force Majeure

Either party shall be excused from the performance or punctual performance of any of its obligations under this contract, and such obligations shall be extended for a period reasonable under circumstances, if the performance of this contract is prevented or delayed by any cause beyond the effected parties' reasonable control which, without in any way limiting the generality of the foregoing, shall include acts of God, riots, wars, earth quakes, storms, cyclone landfall, lightning, landslides, accidents, pandemic, embargo or requisition (acts of government), including non-availability of visas and permits for contractors' personnel, or delays in the performance of its subcontractors caused by any such circumstances.

Non-availability or withdrawal of any export/import licenses for the goods or any part thereof in this contract cannot be considered as force Majeure events. And accidents due to wild animals cannot be considered as force Majeure events.

In case of Force Majeure, the contractor shall promptly notify the employer in writing and furnish the employer with all relevant information thereto. Should a cause of force majeure continue for more than one (1) month, either party shall then have the right to terminate this contract.

1. Technical Support and Queries

2. For further details and queries, please contact @cpsmobilepms@bt.bt /manager.procurement@bt.bt

Annexure-I (Specifications of Power)

1. General

The Power Supply Facilities shall supply stable and uninterrupted power to maintain normal performance of the GSM Base- stations/Repeaters, Back-haul radio system and associated equipment. The Power supply facilities to be provided shall be composed of Storage Batteries, Rectifiers, air-conditioners, ventilations and others.

Power supply equipment block schematic, wiring diagram including the type, the size and the number of wires must be provided

2. Storage Batteries

General Requirements

1) The storage Batteries shall be so designed as to hold at least twelve (12) years life when operated on full-floating basis.

2) The storage batteries shall be provided with suitable detector to be used for detection of the condition of extant capacity, and each battery shall be so designed as to be equipped with such detector to be used with supervisory and control for O&M purposes.

Type

1) The storage batteries shall be maintenance free Vent Regulated Lead Acid (VRLA) type.

2) The container shall be strong enough to withstand rough handling.

3) Explosion-proof vent plug shall be provided at the upper part of the container.

4) The batteries shall be designed for operation in ambient temperature of –20 to +45 deg. Celsius

Composition

1) The storage batteries proposed shall be divided into at least two (2) banks for the all GSM base stations

2) The steel rack finished with acid-resistant paint shall be supplied.

3) The numbering seal for battery cells and each battery bank shall be provided.

Capacity

1) The capacity of each storage battery shall be calculated at the temperature from -15º C to 40ºC (The altitude of the selected sites for the Project ranges from 160m in the south to 4000m in the north)

2) For full-floating power supply system, the capacity of storage batteries shall be sufficient to supply ten (10) hours load for the telecommunications equipment in case of Power supply failure. (Approximately, load of 20KW should be taken into account)

Special Requirement for Batteries

1) The batteries shall be low maintenance type such that routine battery maintenance is not required.

2) The batteries shall be of solid construction, suitable for transportation over rugged terrain.

3) The batteries shall have a low self-discharge rate. Prospective bidders shall state the self-discharge rate of –15, 25 and 45 deg. Celsius.

4) It shall be possible for the batteries to be charged with an external backup system.

Information

The following information shall be included in the proposal:

1) Type of storage batteries proposed and name of manufacturer.

2) Calculation basis of storage battery capacity.

3) Discharge characteristics for ten (10) hours, twenty (20) hours and two hundred (200) hours rate.

4) Number of cells used in one bank.

5) Operation life.

6) Full weight, empty weight, electrolyte volume and dimensions of each cell.

7) General description concerning installation, operation and maintenance works.

3. Room Air Conditioner

The proposed inverter air condition shall be of both Window and Split type (ranging from 2 TON), to ensure that the internal ambient temperature remains within the range of 25 degree Celsius. The Air conditioner should meet the following system

Characteristics:

1. Operating Voltage: 220V (+5 and/- 10%)
2. Duty: Continuous.
3. Power consumption: Less then 1000 Watts for window type and 2000 W for Split type.
4. Condenser Fan: Axial flow
5. Evaporator Fan: Centrifugal
6. AC refrigerant should be 410A

Controls: Microprocessor control.

4. Earthing and Bonding

To ensure maximum safety and system reliability, a high grade earthing shall be provided with an earth resistance less then 2 Ohms for each site.

Technical Details

1) Earthing system shall consist of earthing materials, earthing terminal box to be installed in an applicable room, etc.
2) All the equipment including fuel tanks, panels and all other non-current carrying metallic parts of the equipment shall be earthed.
3) The earthing materials shall be installed not less than 800 mm deep from the ground level.
4) If earth rods are used, they shall be driven into the ground until the top of each rod is approximately at the same depth as the earthing wire.
5) The earth resistance shall be so designed to maintain the safety operation of the system.
6) The measured soil resistivity and calculation data of earthing system shall be submitted to the Employer.
7) Earthing wire shall have enough capacity to carry fault current of the system to the ground.

8) Where the designed earth resistance cannot meet with the actual earth resistance value at site, additional earth rods, or other applicable procedures shall be provided to meet the design requirements.

9) All earthing wires penetrating the building shall be installed in a rigid plastic conduit, and shall be sealed by non-flammable materials to prevent the ingress of the dust, water and fire.

10) The earth resistance shall be less than 2 ohms for safe operation of telecom equipment.

5. Rectifier units

The bidder should submit the type of rectifier and the manuals. The rectifier shall have the house keeping alarms extension facilities to the NOC. Name plate of the installation date and site name should be pasted on the Rectifier)

6. Ventilation system

All shelter shall have DC (-48VDC) with power consumption less than 2 Amps.The ventilation shall be one inlet with four Fans and one outlet with four fan exhaust fan.The inlet shall have good dust proof system and easy to carry out the maintenance. The vendor should provide manual system for installation and maintenance.

7. Warranty

The Supplier/Contractor shall provide with all manufacturers' warranties. The supplier warrants that all goods supplied in relation to the contract meets specification, is defect free and is fit for the purpose of the intended use. If, during the warranty period, the goods are found to be defective or faulty, the contractor shall promptly rectify the defect. If the defect is permanent then the contractor should replace the item at his own cost.

8. Inspection and Test:

The Supplier/contractor must inspect the goods prior to dispatch to ensure conformance to specification and/or any other provisions of the contract. BT reserves the right to inspect the goods for compliance with specifications and provisions of the contract at the factory before dispatching of the equipment at BT site. If, in the BT's opinion, the goods and/or services do not comply with the specification, the BT will inform the Supplier/contractor in writing. In such a case the Supplier/contractor shall take the necessary action to ensure compliance, liability for any additional cost incurred for rectifying.

Annexure-II Specifications of Towers

1. Structural Design

General

1. Unless otherwise specified, the antenna supporting structure shall be self-supporting type and foundation shall be of reinforced concrete.

2. Any stress of component of facilities, of steel, bolt, reinforcing bar and concrete shall not exceed allowable stress of material specified in the standard.

3. The design for steel structure shall be based on the following concept and assumption in case if the tower structure to be constructed:

i) Steel structure shall be regarded as an elastic body.

ii) Steel structure shall be analyzed as a space frame work. However, in common trussed structures, the stress may be calculated as a plane, truss of which the members are frame din one plane, substituting the space framework, and furthermore, where the common truss has inclination, the truss may be the followings' all be taken into consideration:

- Where the inclination of the truss is not uniform, interaction between two inclinations.

- Other influence caused by construction of the plane trusses as a space framework.

iii) Neither the stress caused by dead load including ice coating load, nor the stress resulting from the combined load of dead load or seismic load shall exceed allowable stress of the materials specified in the Standard.

The stress analysis may be carried out by the means of electronic computer subject to applying the proven stress analysis program.

iv) The bidder shall submit the tower line diagram with length and the foundation drawing signed by competent design team.BT reserved the right to ask the details of foundation information from the design team.
v) The bidder shall submit the weight of tower.

2. Loads on Facility's Structure

a) Dead Load

Dead load means the dead weight of the antenna supporting structure and all other facility's structure, all appurtenances and other such items as antennas, which are to

be mounted on the main supporting structure. Where required, dead weight of the ice, which is expected to coat on all members of the antenna supporting structure and all other facility's structure, the appurtenances, antenna, etc, shall be included in the dead load. At sites over 2,500 meters above sea level, antenna supporting structures antennas and all other facilities shall be considered for ice coating load. Unless otherwise specified, radius thickness of the ice coating and density of the ice may be assumed as 10 mm and 0.6 g / cu.cm respectively.

b) Wind Load

i) Full calculation shall be taken in the wind load acting on the antenna supporting structure and all other facilities, the appurtenance and antenna, etc to be attached on the main supporting structure. The ice coating, if required, shall be included as a part of the projected area for locations over 2,500 meters above sea level.

ii) The combined effects of dead load and wind load shall be taken into calculation in the stress analysis so that the worst stress in all component part can be determined. Where height, direction, size and/or type of the antennas are not specified and they cannot be determined at the stage of structural calculation, these shall be so assumed that they cause the worst effects on the structure when wind load is calculated.

iii) Unless otherwise specified, any formulas, coefficients and factors required for calculation of the wind load shall be in accordance with the standard, or the results of tunnel test as an alternative of the standard.

iv) For the purpose of design and calculations, the wind speed shall be taken at 180 km / hour.

c) Seismic load.

i) Where required to considered, the combined effect of dead load and seismic load shall be taken into the calculation.

ii) Combined effects of seismic load and wind load may not be taken into the calculation.

iii) The lateral seismic factor may be assumed as k = 0.1 from the 100 years probability value of 100 gal given in the maximum expected seismicity distribution map of the world published by the Building Research Institute (Ministry of Construction, Japan) or an equally renowned institute, for the calculation.

d) Soil Bearing Capacity

Soil bearing capacity at all the sites is assumed as at least 10 tons/sq.m.

e) Transmission Loss of Telecommunication Network.

Radio transmission loss shall be as follows:

i)Wind speed 90 km/h (25m/sec) = Radio transmission loss <3Db.

ii) Wind speed 150 km/h (42m/sec) = Radio transmission loss<20Db.

f) Distribution of load asper the height of the towers.

4.1 General

a) The concrete work specified in this chapter consists of formwork, reinforcement, concreting, anchoring for concrete and other works necessary for the facilities to provide.

b) Application

3. Twist, Sway and Displacement

a) Twists means horizontal angular displacement of the main supporting structure at each antenna mounting elevation from no wind load position to worst wind load position.

Sway means vertical angular displacement of the central vertical axis at each antenna mounting elevation from its no wind position to the worst wind load position, divided by each corresponding elevation.

b) Unless otherwise specified, twist, sway and displacement shall not exceed the following values:

i)Twist :1 deg.

ii)Sway :1 deg.

iii)Displacement :1/100

b) Earth works

1. General

a) Extent

The earthwork specified in this chapter consists of excavation, grading filling, backfilling and related earthwork necessary to complete the facilities to be provided.

b) Planning

Prior to commencement of the earthwork, the bidders shall submit to the Employer two (2) copies of planning drawings in which all the dimensions, procedures and methods for excavation, cutting, filling and backfilling, are clarified.

2. Excavation

a) Excavation for all the foundations shall be executed either by mechanical facilities or by hand. However, the portion of a depth of at least 30 cm above the level of bottom of excavation shall carefully be executed by hand in order not to disturb or destroy the surface of the layer.

b) In the case where any part of the surface of excavation is disturbed or destroyed, tamping or substitution, such as cast-in- site plain concrete shall be carried out so as to make the part stronger than the natural condition.

c) To ensure safety at work, the contractor shall provide shoring, sheet piling or waling, if necessary. Shoring shall be removed as back filling progresses but only after confirming that banks are safe against collapse or carving on slopes.

d) The bidders shall completely remove all existing obstructions against the construction of the facilities.

e) All debris has to be cleared from the sites to the designated site identified by the local authority

3. Drainage

The bidders shall control the grading around the facilities to be provided so as to prevent water from running into the excavated areas and damaging the facilities. The bidders shall also maintain all pits and trenches where footings are to be placed, free of water at all times. Water pumps, wherever required, shall to be provided to keep the excavated spaces clear of water during the construction.

4. **Backfilling for Structures**

Before placing backfill, the bidders shall remove all debris subject to termite attack, rot, or corrosion, and all other deleterious materials from areas to be backfilled. The bidders shall deposit backfills in layers of not more than 30cm thick and compact each layer.

5. Site Grading

Rough grading of the site in the excavated and filled sections as well as the adjacent transition areas shall be reasonably smoothed and compacted and shall be free from irregular surface changes. The sub- grade shall be evenly sloped to provide drainage away from the facilities and in suitable directions at a grade of not less than 1%.

4. Concrete Works

and mixed at site.

c) Standards

Unless otherwise specially specified. JIS, ASTM and BS standards shall be applied. Application of any other equivalent standard shall be notified to the employer for approval

4.2 Materials of forms

a) The forms shall be able to withstand loads that may be forced by concrete weight and pressure, vibration and shock during concreting works and shall not distort or warp to the poured concrete

b) The forms shall include all spacers, chairs, bolsters, ties and other devices necessary for properly placing, spacing, and fastening reinforcement in place

c) The formworks shall remain in position until the concrete gains adequate compressive strength as per the internationally accepted norms and practices.

4.3 Materials of Reinforcement

a) Reinforcing Bars.

All the reinforcing bars shall to be hot rolled deformed bars in accordance with BS 4449, JIS G 3112, ASTM A 615 or equivalent. The tensile requirements for deformed bars are as follows:

Yield Point	: 3,000 kg/sq.cm or more
Tensile Strength	: 4,900 – 6,300 kg/sq.cm
Elongation	: 14 % or more.

b) Welded wire Meshes.

Welded wire meshes shall be 3.2 mm in diameter, spaced at 100mm by 100mm on centers.

4.4 Inspection of Reinforcement

The reinforcement bars shall be inspected by the Employer after the reinforcement bars has been placed prior to placing of concreting, whenever and wherever required.

4.5 Materials of Concrete

a) Cement

Ordinary Portland cement to be used shall be declared to and approved by the Employer.

Mechanical and physical tests for the cement shall be carried out by the bidders at his own expenses when required by the Employer.

b) Aggregates.

Samples of aggregates to be used shall be submitted to the Employer for approval. The bidders shall ensure that only aggregates of approved quality are used for all concrete works.

c) Water.

The water for mixing and curing shall be clean and free from earth, vegetation's, organic and inorganic impurities.

4.6 Quality of Concrete

a) Adequate mix ratios of cement, sand and aggregates shall be used to achieve the strength requirements specified.

The mix ratios of these materials shall be approved by the Employer.

The general requirements and types of Concrete are as follows:

	Type A	Type B
i) Cement, kg / cu.m of Concrete	270 or more	250 or more
ii)Design strength at 28 days	150	135
iii) Method of compacting concrete when placed	vibrate	vibrate

b) Type of Concrete

The types of concrete to be used for the purposes are stated in the table below:

Type of Concrete	Purpose
A	All the structural members
B	Leveling concrete under foundations and other non-structural components.

4.7 Depositing Concrete

The concrete shall be placed with the aid of mechanical vibrations applied directly to the concrete. No concreting works will be allowed without the use of vibrators.

The bidders shall ensure proper and complete curing of concrete irrespective of the availability of water at site to prevent rapid evaporation of moisture and to maintain concrete in a moist condition.

5. Structural Works

5.1 Materials

5.1.1 Structural Steel

a) Standards

The structural steel shall be standardized products confirming to well known and internationally accepted standards. The steel to be used shall not have any structural defects and shall not be obtrusively corroded.

b) Shapes and Dimensions.

Set of high strength bolts, nuts, washers and plates, confirming to renowned standards shall be used.

The shapes and dimensions of the bolts and nuts shall be finishing grade "medium" precision grade "3rd class" of internationally accepted standards.

The shape and dimension of steel plates, stainless steel plates and other related items shall also confirm to internationally accepted standards.

5.1.2 Welding Materials

The electrode to be used for welding shall be standard products. Appropriate electrodes shall be selected for the type of steel to be welded.

Welding materials other than those stipulated above shall be selected according to the method of welding to be employed.

5.2 Bolts Holes

The diameter of bolt holes shall be larger 0.5 mm than the diameter of the bolt itself.

Anchor bolts shall be secured by using two (2) nuts.

For bolts, other than those mentioned above, and for those embedded in concrete proper precaution shall be taken to prevent nut loosening by using either double nuts or spring washers or any other acceptable methods.

5.3 Welding

5.3.1 General

This clause applies to the arc welding of structural steel elements.

a) In-site welding shall be carried out after inspection of the steel fabrication an election.

b) The welding shall be done only by qualified and experienced welders.

5.4 Product Inspection

a) In- shop inspection report of finished products shall be submitted to the Employer for approval.

b) The products shall be inspected by the employer after the in- shop inspection by the manufacturer.

c) Faulty portions shall be promptly rectified.

5.5 Painting of Structural Steel

a) All structural steel shall receive two full coats of anti-corrosive paints conforming to internationally accepted standards. Even galvanized structural members shall be painted, if so required by the Employer. The brand and color of the paint shall be approved the Employer. Painting cost needs to be mentioned separately.

b) Surfaces to be embedded in or to come in the contact with the concrete shall not be painted.

6 Antenna Support Structure

6.1 General

a) The Antenna Supporting Structure to be constructed shall consist of foundation, main structure and appurtenances.

b) All steel materials including bolts and nuts shall confirm to international standards. All materials of antenna supporting structure including other steel materials used in the structure shall be coated by hot-dip galvanizing after all fabrication works have been completed.

c) The antenna supporting structures shall be inspected by the Employer during the construction as well as after the completion of construction works.

d) A copy of final drawings and instructions shall be submitted to the Employer promptly after the completion of the antenna supporting structures for the Employer's record.

6.2 Tower Shape

a) Each tower shall have a triangular or square cross section. The top section of each tower shall be parallel sided for not less than 5 meters with a triangular or square cross section of not less than 2.0 per side.

6.3 Antenna Mounting

I. Consistent with tower height, towers shall be arranged to support antennas at a number of different levels.

II. This distance may be altered slightly to fit in with the geometry of the tower bracing.

III. Each antenna mounting position shall be capable of being served by an access platform located approximately 1 meter below the center line of the Mounting platforms shall be provided for all antenna positions, which are to be utilized by the Bidder in meeting the radio system requirements. Mounting platforms are not required for unequipped antenna positions.

IV. Antennas shall be mounted on mounting bars to be attached at each mounting level, at set specified vertical distance apart. This distance shall be specified by the Bidders, but should be typically of the order of 1.5 meters.

V. Three sectored GSM antennas shall be mounted on bars/pipes of 50mm-400mm in diameter and 3000mm in length. In addition, two similar bars/pipes shall be provided below the GSM antenna for mounting the radio antenna.

VI. Appropriately sized holes shall be provided in the tower legs at each mounting level for mounting bars to be added as required for future radio systems.

VII. Bidders shall allow for two pairs of holes per leg on each face at each mounting level.

6.4 Antenna Feeder Runway

a) Each tower shall be equipped with a straight, vertical antenna feeder runway extending from the ground to the top of each tower for the provision of coaxial cable and wave guide feeders as necessary. This runway shall have provision for future radio expansion of:

   a. 10 cables -16mm Dia.

   b. 10 cables/wave guides -28mm Dia.

b) For towers with a central runway, the lower end of the runway shall be set in a concrete foundation laid on a solid base. Typically this would consist of a concrete foundation block approximately 1.0m x 0.4m deep.

c) The Bidders shall include design details for a suitable sized antenna feeder gantry extending from the tower structure to the equipment building. This gantry shall be of sturdy construction utilizing galvanized steel members and offer some protection to the feeder cables in the event of flying debris in high winds. Feeder cables should preferably be laid on the outside of the gantry.

6.5 Platforms

I. Working platforms shall be provided to allow access to each antenna equipped for the initial installation specified in these bidding documents.

II. In addition rest platforms shall be provided on all towers where the vertical spacing between working platforms, or the lowest working platform and ground level, exceeds 15 meters. Rest platforms, where practicable, shall be provided at levels, which coincide with the levels of the working platform for antenna mounting positions.

III. Platform checking shall be of expended metal mesh, or similar construction, and shall be adequately supported on steel members of appropriate size.

6.6 Guard Rails

a) Platforms shall be provided with handrails at a height of approximately 1 meter above the decking, intermediate rails at approximately 0.5 meters above the decking and kick rails at the decking level
b) All rails shall consist of suitably sized rolled steel angle section.
c) Guardrails shall be provided on all platforms and shall be continuous around the outside perimeter and the runway opening of each platform and shall encompass the ladder and ladder guard so that free access to the ladder may be gained from the platforms.
d) Handrails on platforms shall not be structural members and shall be removable to facilitate the mounting of antennas.

7. Ladders

a) Steel ladders with ladder guards shall be provided from ground level to the highest working platform on each tower.
b) The ladder guard shall be so arranged that, at each antenna mounting level, a section may be removed to provide access to the future platform without having to cut the vertical strips.
c) Ladders shall, where practicable, continue for a distance of at least 1 meter above the upper surface of the platform that is served. The stiles shall not, however, project above the top of a tower.
d) Ladders, ladder guards and ladder support shall not infringe on the space reserved for antenna feeders.
e) Ladders shall be adequately supported to resist lateral movement.

8. **Lightning Protection**

a) Two lightning discharge rods of height approximately 2.4 meters shall be securely fixed to the top of each tower on diagonally opposite corner s.
b) Each rod shall consist of a steel tube with four 13mm diameter rods of length 0.5 meter (approximately) welded to the top of the tube, disposed equally around the tube and splayed upwards at 45 degrees.

c) No separate earth conductor need be provided from the discharge rods to ground and it is necessary, therefore, that all bolted connections in the tower should be free from paint and reasonably clean at the time of assembly. This applies particularly to the point of the attachment of the discharge rods to the top of the tower.

9. Earthing

a) An earthing system, generally to the provisions of internationally accepted standard shall be provided at each tower. This shall consist of at least one radial earth strap extending from each tower leg, one loop encircling the tower and a separate loop encircling the equipment building.

b) Particular attention shall be paid to the bonding of the earthlings strap to tower, runway, and gantry and building steelwork.

c) Earthing strap shall consist of pure copper of nominal dimensions 25mm x 3 mm.

d) The completed earth system shall have a resistance of less than 2 ohms, when measured with specific earth resistance-measuring instrument. Test result of the earth test should be shared during the handing taking of the site and duly verified by BT Engineer at Site.

10. Inspections on Site

a) The Employer shall undertake an inspection on site as of the excavations for the tower foundations immediately before pouring of the concrete.
b) The Employer shall undertake an inspection on site as of samples of concrete in the foundations. The supplier shall supply sufficient quantity of testing cylinders for this purpose and shall bear the cost of such testing at and approved testing laboratory.
c) The Employer shall undertake an inspection on site of the steel work on delivery to site for damage, which may have occurred during transportation. Any damaged steelwork, particularly to galvanizing, shall be repaired by the supplier, to the satisfaction of the Employer, prior to erection of the steelwork.
d) The Employer shall undertake an inspection, on-site, of the completed installation for condition of the galvanizing, size of members, tightness of bolts and general workmanship.
e) The Supplier/contractor must inspect the goods prior to dispatch to ensure conformance to specification and/or any other provisions of the contract. BT reserves the right to inspect the goods for compliance with specifications and provisions of the contract at the factory before dispatching of the equipment at BT site. If, in the BT's opinion, the goods and/or services do not comply with the specification, the BT will inform the Supplier/contractor in writing. In such a case the Supplier/contractor shall take the necessary action to ensure compliance, liability for any additional cost incurred for rectifying

Annexure-III (Specifications of Shelters)

1. The bidder shall propose weatherproof prefabricated shelters for housing the Back Haul Radio and BTS equipment including power supply facilities.

2. The enclosures shall be mounted on concrete footings at least 3 feet above ground level. Proper steps shall be constructed below the entrance door of the prefabricated shelter for easy access.

3. The enclosures shall be, preferably, fabricated from high-grade plastic/PVC/other similar lightweight materials with metal sandwich. The materials used for the prefabricated enclosure shall be fire resistant and shall not corrode with age in outdoor installations.

4. The enclosure/helter shall be designed to provide ventilation to the equipment while preventing moisture build-up inside.

5. It shall be extremely robust, corrosion resistant, high seismic resistance, wind & dust proof with thermal insulation.

6. It shall offer extruded aluminum alloy C-rails for a multipurpose user-friendly mounting arrangement for equipment racks and cable trays etc.

7. It shall have three way espagnolette-locking system in tandem with a cam profiled wedge (Which pulls the door leaf inside for proper closer) and EPDM gasket to make the door air and water tight to achieve an IP 54 level protection.

8. For sites above 2500m the roofing of the prefabricated shelters shall be so designed that accumulation of snow is kept at minimum.

9. The bidder shall submit the foundation with six pillars.

10. The Supplier/contractor must inspect the goods prior to dispatch to ensure conformance to specification and/or any other provisions of the contract. BT reserves the right to inspect the goods for compliance with specifications and provisions of the contract at the factory before dispatching of the equipment at BT site. If, in the BT's opinion, the goods and/or services do not comply with the specification, the BT will inform the Supplier/contractor in writing. In such a case the Supplier/contractor shall take the

necessary action to ensure compliance, liability for any additional cost incurred for rectifying

11. Shelter Dimensions:

BTS sites shelter

Ext.: 3600x2600x2500 (LxWxH in mm),
Panel with Foam – 60 mm,
Material of Skins – 0.6mm x 0.6mm Precoated Steel,
Floor – Ply 18mm and PVC 2mm

Annexures attached:

Drawings of Towers & Monopoles attached.