PRASAR BHARATI
BROADCASTING CORPORATION OF INDIA
DIRECTORATE GENERAL:ALL INDIA RADIO
(PLANNING & DEVELOPMENT UNIT)
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FNo. 27/12/Spec/CEs Comm.-II /2005-D(TD/FM) &
F.No.10th Plan(Tower)/9/4/ Specification/2005-D(TD/FM)

Specification No. : 10th Plan /100 M FM Tower/ Spec. /1(Revised)/2005-D(TD/FM)

Specification for Supply, design , erection , testing and commissioning of latticed steel self supporting 100 M tower including provisions for mounting for installation of VHF FM antenna etc. for FM Stations of All India Radio.

[Total number of pages - 24 Nos.]

Date of approval by Committee of Chief Engineers : 28.11.2005/30.11.2005

Chief Engineers Committee Approval reference. : FNo. 27/12/Spec/CEs Comm. - II /2005-D(TD/FM)

The Committee of Chief Engineers has approved the above Specification after discussions held in the meeting on 28.11.2005/30.11.2005 under the chairmanship of CE(D).

1. SCOPE:

1.1 Supply, design , erection , testing and commissioning of latticed steel self supporting 100 M tower including provisions for mounting for installation of VHF FM antenna , Microwave Dish antennae, Yagi antennae and their feeder cables etc., as indicated in Annexure 'A'.

Schedule of requirement/ material (Un priced)for supply at site and design , erection , testing and commissioning of latticed steel self supporting tower of 100 M high FM towers at site shall be submitted in the format enclosed as Annexure-C by the tenderer.

Item wise compliance statement must be enclosed with the tender.

Following provisions are to be made on the tower :

SNO.	Technical Requirement	Details	Remarks
1.	Aperture for Band II FM antenna (6/8/10 bay)	Yes	**-**
2.	Provision for mounting similar antenna on top of the tower for second channel in future	Yes	As per schematic of tower Annexure-A

3.	Provision for mounting MW dish antenna of 2.1 M dia	Yes	As per schematic of tower Annexure-A
4.	Other requirements like cable tray ladder, Solid State Aviation Obstruction Light, platforms guard all device etc	Yes	-
5.	TV antenna (Band III) aperture	Required	-

Schematic of towers indicating the facilities to be provided is enclosed as Annexure 'A'.

1.2 The specifications cover the design, fabrication, supply and erection of self supporting steel lattice tower and accessories complete with foundation work, earthing devices, pipe of suitable size and length for mounting of 6/8/10/bay VHF FM pole type antenna, Solid State Aviation Obstruction Lights with cabling, ladders for climbing, Cable Racks for supporting cables and platforms .

1.3 The supplier of the tower is required to install the following items on the tower :

1.3.1 The Solid State Aviation Obstruction Lights, power supply cables along with suitable clamps will be supplied and installed by the tenderer.

1.3.2 The details of various antennae and accessories with mounting details are enclosed as Annexure 'B' for MW Dish antenna and drawing no. TM- 15499 for mounting arrangement of FM antenna. These details are tentative and likely to be slightly different depending upon their supplier.

1.3.4 The cables for Solid State Aviation Obstruction Lights Power supply between the transmitter building and the tower base shall be routed underground. The power supply cables from transmitter building /diesel generator room shall be laid under ground up to tower base as per standard practice and from tower base these cables shall be taken on tower on the vertical cable rack.

2. GENERAL:

Note : Please refer tender documents for general term and conditions of contract for SITC works including all the commercial aspects like ;
Packing and Packing List, Insurance and Marine Risk etc., Guarantee, Payment terms, Penalty/Compensation for Delay, Damages and Liabilities, Time Period and Extension for Delay , Foreclosure of Contract due to Abandonment or Reduction in Scope of Work, Cancellation of Contract in Full or Part, Recovery of Security Deposit, Performance Guarantee, Unsatisfactory Workmanship, Damages Incurred During Installation , Indian Electricity Rules, Tenderer Liable for Damages, Defects, Recovery of Compensation, Ensuring Payment and Amenities, Labour Laws to be Complied by Tenderer, Minimum Wages Act Compliance, Tenderer to Indemnify Government against

Patent Rights, Return of Surplus Material, Employment of Technical Staff and Employees, Release of Security Deposit, Safety Code etc.) i.e. in totality .

2.1 The specifications indicated here in are only to guide the tenderer about the requirements of the users. Detailed design of the tower from all aspects shall be got worked out by the tenderer, keeping in view the effects of local meterological conditions like wind velocity, sisesmalogical conditions, temperature etc. to ensure the safety of the tower.

2.2 The design of the tower shall be based on recognized principles of structural design conforming to standard practices followed in the field. Full responsibility regarding soundness of design and the execution of work rests with the tenderer.

2.3 The tender shall be complete and include all minor items of apparatus and accessories which may not have been enumerated in this specification and schedule but which are useful and necessary for the due and perfect assembly and operation of the work. No extra - charges will be paid for providing and installing such minor items.

2.4 The performance specifications and design basis are detailed in Para 3. The tender shall be deemed to comply with the specifications in those aspects which do not figure specifically in the departure from specifications.

2.5 The tenderer shall furnish complete information with his tender so that its full merit may be judged with respect to the requirements of the specifications. For this purpose the tenderer shall submit alongwith his tender, the following documents.

2.5.1 Outline drawings to scale showing the assembly of the structures. These drawings should show the main dimensions including the sizes of main structural members, mounting centres, methods of attachment to concrete foundations and any special features of design or form. Weight of full tower is to be given.

2.5.2 Stress diagrams of the complete structures under maximum wind load conditions and with all information necessary for the design of footings.

2.5.3 The design calculations indicating the various formula used for design, the bearing and sheer stresses used for the design of bolted sections, and the factors of safety adopted for the various structural components and materials. Overall safety factor of the tower on worst atmospheric conditions will be better than 2 (two)

2.5.4 The Design of foundations:

2.5.5 Details of solid state aviation obstruction lights, antenna fixtures, P.S. cables, earthing etc.

2.5.6 Wind zone and design wind velocity for design to be given.

2.6 The location of the towers at the site vis-à-vis the transmitters, building will be marked out by indentor.

2.7 The tenderer shall make his own arrangements for power supply, water and the storage of materials and their safe custody at installation site.

2.8 The tenderer shall make his own arrangements for providing accommodation for his workmen at site.

2.9 The tenderer shall make his own arrangements for procuring the necessary labour, skilled and unskilled. He should conform to all local State laws and regulations concerning labour and their employment.

2.10.1 The tenderer shall make good all damage to the purchaser's buildings, property, equipment , article and departmental personnel arising from the erection of the tower in the course of such erection and through out the period during which the stability of tower is guaranteed.

2.10.2 The tenderer shall indemnify and hold harmless the purchaser against all claims in respect of damages to buildings, property, articles, situated nearby not belonging to the purchaser, and public personnel arising from the erection of the tower in the course of such erection and through out the period during which the stability of the tower is guaranteed.

2.10.3 The tenderer shall indemnify and hold harmless the purchaser against claims in respect of injury to any person howsoever arising out of the erection and through out the period during which the stability of the tower is guaranteed.

2.10.4 The tenderer shall be responsible for the safe erection of the tower and other accessories etc. The tenderer shall fully discharge all obligations under the Indian Workmen's Compensation Act in so far as it effects the workmen in his employment.

2.11 Prior approval of the indentor in writing, shall be obtained, if the tenderer desires to sublet or assign any section of the work associated with the design, fabrication, supply and erection of the tower. Such permission of consent shall not, however, discharge the tenderer form his liabilities in this contract or any part thereof.

2.12 The successful tender shall supply within one month from the date of acceptance of the tender;

2.12.1 General arrangement of tower including solid state obstruction lights, plate forms, suitable size and length of pipe for mounting provision of VHF FM antenna along with mounting provision of microwave dish antenna, yagi antenna etc.

2.12.2 Two sets of complete outline, assembly, foundation and erection drawings. He shall forward all technical information necessary to illustrate that the design meets fully

the requirements of this specifications. He shall submit a certificate testifying the soundness of design at his own cost from "Indian Institute of Technology" / Structural Engineering Research Centre, Ghaziabad

After Certification of the design, the successful tenderer should get the detailed working drawings and Drawn Out Details list approved by the indentor.

While sending the detailed working structural drawings of tower including foundation etc. and Details of Design document, list etc to the indentor for the approval , the tenderer shall ensure the following .

2.12.1 Tender shall indicate the weight of the each tower members on the structural drawing it self so as to assess the total weight of the tower as per following table.

Sr.No.	Tower member size Length(mm)xWidth(mm)x Thickness(mm)	Ref. to Structural drawing.	Weight (Kg)	Remarks

2.12.2 Tender shall mention <u>on the all the working tower foundation and structural drawing it self</u>;

2.12.2.1 Directorate AT No.,

2.12.2.2 Specification No.

2.12.2.3 Certificate for approval for soundness of tower as per AIR specification along with signature , stamp of competent authority of Structural Engineering Research Centre, Ghaziabad/ Indian Institute of Technology .

After the approval/acceptance of all tower working drawings from Directorate the tenderer shall send duly approved tower working drawings to Installation Officer, Station Engineer, Zonal Chief Engineer and Directorate by giving all the references . In any case the duly approved tower working drawings (as per 2.12.2) must be available with all concerned offices before the start of tower work at site.

2.13 <u>EXPERIENCE AND RESOURCES:</u>

The tenderer is required to submit details of his previous experience in similar type of work, the capacity of their plant, and their organizational set up for undertaking such work in the last 5 years.

2.14 <u>PATENTS AND COPYRIGHTS:</u>

The tenderer shall hold the purchaser and his employees safe, harmless and immune from any liability that may arise out of infringements of patents and copy rights associated with the design, fabrication, erection and use of the tower and its accessories.

2.15 <u>DATE OF COMPLETION :</u>

The tower erection shall be completed within one year from the date of placing the order.

3. TECHNICAL SPECIFICATIONS :

3.1 FABRICATION AND DESIGN :

3.1.1 Tower members shall be of structural steel conforming to IS:8500, IS 226, IS 2062 and IS:7215 or latest IS as applicable with latest amendments.

3.1.2 All steel used shall be galvanized, conforming to relevant IS specification i.e. IS 2629 for tower members IS 5358 for fasteners and IS 1573 for washers with latest amendments. Spray galvanizing may be permitted whenever hot dip galvanization is not possible.

3.1.3 Assembly of tower members and other structures on tower shall be by means of nuts and bolts with locking nuts. Rivetting and welding may be done if the design demands and it shall conform to relevant IS specifications with latest amendments. Minimum thickness of the members should not be less than 6 mm.

3.1.4 The quality of steel used for nuts, bolts, washers etc. should conform to IS No. 6639/72 and mechanical properties as per IS 1367 with latest amendments. Dimensionally, it shall conform to IS 1363 with latest amendments. The heads being forged out of solid, truly concentric with the shank and shall be perfectly straight. All bolts shall have hexagonal heads and nuts. The bolts shall be treated with standard threads to take the full depth of the nut. All nuts shall fit hand tight to the bolts. No appreciable fillet shall exist at the point where shank of the bolt connects to the head. Lock nuts and washers shall be provided to all bolts and nuts. The tender shall include sufficient spare bolts and nuts to compensate for loss in the field during erection. The cost of bolts and nuts shall be included in the cost of tower.

3.1.5 The overall force co-efficient for wind load on tower shall be taken from IS:875/1987 (with latest amendments) Indian Standard for Self-Supporting Steel Towers For calculating the solidity ratio actual obstruction area of tower shall be considered. Separate Wind obstructing areas shall be taken for ladder, cable rack and platforms etc.

3.1.6 The basic dynamic wind pressure at different heights for different zones shall be taken from the Indian Standard Code with latest amendments mentioned above.

3.1.7 The basic wind velocity for the site is to be taken from the revised BIS Code No. IS 875/1987 with latest amendments.

3.1.8 The permissible stresses in the various structural members of tower shall be adopted from the relevant clauses of IS 800 amended up to date.

3.1.9 Loading effect due to antenna and various accessories as indicated at Clause No.

5 will be taken into consideration.

3.1.10 Loading effect of seismic forces as per IS 1893(with latest amendments)and cyclonic winds and conditions of frost etc. if any, may also be taken into consideration.

3.1.11 Weight of the tower should not be less than 68 MT.

3.2 FOUNDATIONS :

3.2.1 Tenderer is advised to inspect the tower site and acquaint himself with the local terrain & site conditions soil conditions, nature of sub soil, water table and its seasonal variations etc. and make such local enquiries, as may be necessary for any data required by him, before quoting his rates. No extra charges for leveling and retaining walls etc., shall be payable by the indenter in addition to the cost quoted in the tender.

3.2.2 The successful tenderer shall carry out soil tests through a reputed firm of experts, to the satisfaction of the indentor. Soil samples should be got tested in a recognized laboratory. In case the tenderer carriers out the tests himself, authorized representative of the indentor has to be associated with such borings. Samplings and testing. When a test boring is conducted complete test observations will have to be recorded and furnished to be indentor.

However, for the purpose of this bid, the tenderer shall quote the rates (in the commercial bid)on the basis of 8.2 M tones per Sq.m safe bearing capacity of the soil at 2 m depth.

He shall also quote his rate(in the commercial bid) for any variation in the above value of bearing capacity of the soil for arriving at the rate as applicable to the actual bearing capacity as obtained by soil exploration tests as under .

i) Extra for reduced bearing capacity of soil below 8.2 Mt./Sq.M up to minimum of 5.45 Mt/Sq.M for every 0.55 Mt./Sq.M decrease.

ii) Reduction in the event of higher bearing capacity of soil above 8.2 Mt./Sq.M for every 0.55 Mt./Sq.M increase.

3.2.3 The cement, sand and concrete used shall be best grade and the concrete shall preferably be mixed in a mechanical mixer in the standard ratio 1:2:4. The foundation shall be watered and cured for at least 14 days and the erection of the tower shall be commenced only after the foundations are thoroughly cured.

3.3 VERTICALITY, DEFLECTION & TWIST

3.3.1 UNDER STILL AIR CONDITIONS :

3.3.1.1 The tower shall be vertical after erection and no straining shall be permitted to

achieve this. This erection tolerance of verticality shall be within 25 mm every 9100 mm. Deflection in any particular section beyond the above limit is not permissible.

3.3.1.2The angular twist shall not exceed +/- 0.5 degree from the normal plans of tower face.

3.3.2 UNDER MAXIMUM WIND LOAD CONDITIONS :

3.3.2.1 The average slope of the axis of the antenna support column shall not depart from the vertical by more than 1 deg. Under maximum wind load conditions. The successful tenderer will have to satisfy that verticality is maintained at not more than 1 deg. at the maximum wind load conditions.

3.3.2.2 The angular twist shall not exceed +/- 1 degree from the normal plane of the tower face.

3.4 PROTECTION AGAINST LIGHTNING:

The tower shall be provided with a suitable designed complete system of lightening protection in accordance with the provision of IS-2309-1969 with latest amendments including necessary earthing based on the specific resistivity of the soil and sub-soil water level. The lightening protective system shall be got approved, before execution.

3.5 PAINTING:

3.5.1 The tower shall be given two or more coats of paint in additional to primer coats after erection. The tower shall be painted to have equal alternate bands of international orange and white colours with top and bottom bands painted in orange as per civil aviation regulations.

3.5.2 The paints used in painting shall be in accordance with I:S-2074/62,2932 & 2933/75 or latest IS with latest amendments. Before applying coats of primer, the surface shall be given a coat of Pickling agent so as to avoid the flaking of painting. The tenderer should furnish the details about the pickling intended to be applied.

3.6 EARTHING :

All the tower legs shall be grounded properly, following the standard practice of earthing of such structures in level ground and mountaineous regions. The earth resistance of the tower shall be within 1 ohms.

4. FACILITIES ON TOWER :

4.1 PLATFORM :

4.1.1 Provision of platform for access to the transmitter antenna & microwave dish antennae and cable at different levels be made as indicated in the sketch at Annexure 'A'. 1.5 meter high handrails would be provided at each level with expanded metal net for additional safety. Platform flooring will consist of chequered plate conforming to IS 3502 with latest amendments and shall be designed as to take stationary and moving load of 4 persons plus equipment weighing about 100 Kg. At each platform "Toe-plates" has a form of protection against accidental dislodging of small tools, are to be provided.

4.2 LADDERS:

4.2.1 An internal ladder of width not less than 300 mm starting from about 4 M level of the tower from the ground and going up to the top with openings at all the platforms shall be provided. The ladder shall be hoped type for safety of the climbing personnel guardall. The ladder portion from 10 M onward shall be provided with free fall prevention (Guard all) safety system for ensuring safety against free fall of climbing personnel. The Ladder starting from ground upto 4 m level shall be a portable type Aluminium Ladder for climbing the personnel. The face on which the ladder is to be provided shall be intimated before the commencement of erection of tower.

4.2.2. Rungs of the ladder shall be clear of any obstructions to the climber, equally spaced by a distance of not less than 250 mm.

4.3 SOLID STATE AVIATION, OBSTRUCTION LIGHTS & POWER CABLES :

4.3.1 Solid state aviation obstruction lights fittings equipped with appropriate colour prismatic globes shall be provided as per latest Civil Aviation Regulations with latest amendments for marking and lighting of obstacles. The globes and their housings shall be strong, weather proof and of approved manufacture. Each globe shall house a solid state lighting arrangements to yield specified illumination. The tower lighting drawing shall be got approved from the indentor.

Power supply cable for the Solid state aviation obstruction lights and power sockets shall conform to latest IS with latest amendment. These cables shall be terminated in TP&N MCB of suitable rating in a suitable metal box at the tower base including the earthing etc..

4.3.2 One more number of similar Power supply cable as above in 4.3.1 shall be supplied and laid for feeding weather proof power sockets with switches on each platform. This cable will also be terminated at tower base in TP&N MCB of suitable rating in a suitable metal box at the tower base including the earthing etc.

4.3.3 Distribution of supply to Solid state aviation obstruction lights shall be through 4 way weather proof junction boxes. The power sockets with switches shall be of suitable rating. All these shall be suitably mounted.

4.3.4 The tenderer shall provide temporary solid state aviation obstruction lights during erection of tower as soon as the tower reaches height of 40 meters or the minimum heights to be lighted as prescribed in Civil Aviation regulations with latest amendments.

4.3.5 One no. of 4 core, 6.0 sq.m Aluminum conductor(Stranded) , PVC Insulated ,PVC sheathed weather proof armoured cable shall be provided and laid with weather proof service outlets at each platforms terminated in a 15 ampere socket and switch for power supply for miscellenous purpose . This cable shall be terminated in Control Room/Transmitter Hall - 20 m from the tower.

The power supply cable as above shall also be provided from diesel generator room .

The change over switch between the two supply shall also be provided at the tower base with suitable weather proof metal box with 2 nos incoming 32 ampere SP&N MCBs , change over switch and out going 32 ampere SP&N MCB.

The cables shall be laid under ground up to tower base as per standard practice and from tower base these cables shall be taken on tower on the vertical cable rack.

4.3.6 Prices of cables and their lengths must be quoted separately. The location of control room may be assumed to be 20 m from tower.

4.4. CABLE RUN-WAY AND ANTENNA SUPPORTING LADDERS

4.4.1 The vertical cable rack for support of RF feeder cables starting from the base of the tower and going up to the tower top shall be provided.

This cable rack shall be routed along the tower face or leg and should be just behind the climbing ladder or be a part of this for easy accessibility. The cable rack shall carry all the RF feeder cables as well as Solid State aviation obstruction lights, service cable etc. It should be provided with necessary holes for fixing the cable clamps.

4.4.2 FM Antenna Fixtures :

Provision for fixing the supporting pipe (As per annexure-A) of suitable size [as per loadings of 6/8/10 bay VHF FM pole type antenna NB , dia - to be decided by the tenderer as per structural requirement including the factor of safety and duly got approved from IIT with the tower design , for mounting the 6/8/10 bay VHF FM pole type antenna] shall be made on three faces of the tower. This supporting pole will be supplied by the tendetrer and will also be fixed in VHF FM band -II aperture.The fixtures of the antenna shall not foul with the cable routing from the power divider to the antenna. Above pipe shall be supplied by the tenderer as part of tower.

4.4.3 Microwave Dish Antenna Fixtures :

Two (2) Nos. of fixtures for mounting 2 microwave dishes are to be provided.

Provision for mounting these fixtures at other platforms is also to be made.

4.4.5 Top mounted Antenna Fixtures :

Provision is to be made for mounting a FM or LPT antenna in future.

5. LOADING DUE TO FM ANTENNA, MICROWAVE DISH & RF CABLES

5.1 The following Net weight and Wind loading figures may be taken into consideration in respect of antennae, cables etc. These are in addition to self loadings of tower.

LOADING DUE TO FM ANTENNA, MICROWAVE DISH & RF FM CABLES ETC.

5.1 The following minimum wind loading figures may be taken for guidance of the tenderer. Ice loading shall also to be taken into design as per site requirement, if required .

Sr. No.	Descreption	Height of center of aperture from ground	Net weight (Kg)	Wind load (Kg)	Remarks
1.	Band II pole Type VHF FM 6/8/10 bay Antenna for F.M.	As per schematic drawing- Annexure- A			
1.1	Main Channel	-do-	800	1200 at 198 Km/hr without ice.	Weight& wind loading due to support column not included.
1.2	2nd Channel(FM or LPTV transmitter)	-do-	250	400 -do-	-do
2.0	Microwave dish at various levels - 4Nos.(Dia 2.1 M solidity factor 0.25)	-do-	45	To be calculated by tenderer	
3.0	Yagi antenna 2Nos.	-do-	30	-do-	
4.0	Band-III Panel antenna for TV	-do-	3000	3000	Weight& wind loading due to support column not included.*

The above weights do not include weight of the antenna supporting interface on which the antenna will be mounted.

5.2 As indicated elsewhere the following cables are to be installed on tower. Wind loading due to these may also be taken into consideration.

5.2.1 3-1/8" RF cable : 2 Nos.
5.2.2 Power supply cable* : 2 Nos.
5.2.3 7/8" Co-axial cable for M/W Dish : 2 Nos.
5.2.4 Solid State Aviation Obstruction Light cable* : 1 No.
5.2.5 Co-axial cable for Yagi : 2 Nos.

(* items at Sr. No. 5.2.2/4.3.5 and 5.2.4/4.3.1 and 4.3.2 are to be supplied by tenderer including lugs , connectors etc.)

6. ITEMS OF WORKS

6.1 Feeder Cables : Laying/fixing of Power supply and Solid State Aviation Obstruction Light cables (* items at Sr. No. 5.2.2/4.3.5 and 5.2.4 / 4.3.1 and 4.3.2 are to be supplied by tenderer) including connections , testing and commissioning complete as required . Rates for supply and laying/fixing of above cables should be quoted separately.

6.1.2 For the sake of completeness of works, the tenderer may have to undertake minor items of works that may become necessary in mounting of antenna system.

7. SCHEDULE OF REQUIREMENTS:

7.1 Design, Supply and Erection of FM tower (100 M) as specified above and complete with :-

i) Foundation
ii) Earthing
iii) Platforms
iv) Internal, external ladders and free fall prevention system
v) Cable rack on tower
vii) Solid State Aviation obstruction light
viii) Supply and installation of service connection cables etc

7.2 INSPECTION: The successful tenderer shall prepare in consultation with the indentor, the schedule of events with target dates which shall be adhered to. The tenderer shall state in his tender the place of manufacture, testing and inspection of various materials included in the specifications, to enable AIR representative or such other inspecting authority that may be designated to carry out inspection and test as he may desire. The tenderer shall provide all the necessary facilities for the purpose. Such of the stores as are to be inspected during manufacture have to be certified by an AIR representative before the finished materials are packed and forwarded to the destination. All the above works will be inspected by the representative of the indentor. The tower inspection shall be done as per mutually accepted test procedure which shall be submitted and got approved form the indentor before the supply of tower. However for guidance purpose Acceptance Test Procedure/Protocol is enclosed in "D".

7.3 A detailed completion report of tower (after completion of all the works) together with complete set of drawings will be submitted by the contractor to the Installation Officer, Station Engineer, Zonal Chief Engineer and Directorate.

8. GUARANTEE

8.1 The Tenderer shall guarantee to replace free of charge any material or part thereof that may develop defects within one year of handing over of the tower.

8.2 The tenderer shall guarantee the stability, safety durability and satisfactory mechanical behaviour of the structure under the conditions of specified loading. The guarantee shall hold good for a period of one year from the date of handing over the tower.

9. List of Annexure/Drawings:

9.1 Tower profile (100 M) . Annexure 'A'

9.2 Drawing no. TM-15499 giving mounting arrangement of 6-dipoles FM antenna system, pipe etc. (These details are for reference only).

9.3 Site outlay plan-.

9.4 Mounting detail of microwave dish antenna (3 drgs.)- Annexure 'B'.

9.5 Annexure 'C' Schedule of requirement/ material (Unpriced)

9.6 Annexure ‘D’ Acceptance Test Procedure/Protocol(ATP)

ANNEXURE - "C"

SCHEDULE OF REQUIREMENT/MATERIAL (UNPRICED) FOR 100 M HIGH LATTICED STEEL SELF SUPPORTING TOWER
(FOR EACH TOWER)

I) SUPPLY AT SITE:

S.No.	DESCRIPTION	Qty (WEIGHT / VOLUME)	UNIT
1.	**100 M tower structure Weight**		
i	Tower fabricated members including Stub		MT
ii	Bolts , nuts and Washers		MT
iii	Total Weight		MT
2.	Foundation material : Volume of Concrete, Excavation and Weight of steel reinforcement per foundation on the basis of 8.2 M tones per Sq.m safe bearing capacity of the soil at 2 m depth		
i	Excavation Volume		Cub. Mtr
ii	Concrete Volume		Cub. Mtr
iii	Weight of Steel Reinforcement		MT
3.0	Foundation material :Please quote for any variation in the above value of bearing capacity of the soil for arriving at the rate as applicable to the actual bearing capacity as obtained by soil exploration tests as under :		
(a)	Extra for reduced bearing capacity of soil below 8.2 Mt./Sq.M up to minimum of 5.45 Mt/Sq.M for every 0.55 Mt./Sq.M decrease.		
i)	Excavation Volume		Cub.Mtr
ii)	Concrete Volume		Cub.Mtr
iii)	Weight of Steel Reinforcement		MT
(b)	Foundation material :Reduction in the event of higher bearing capacity of soil above 8.2 Mt./Sq.M for every 0.55 Mt./Sq.M increase		
i)	Excavation Volume		Cub.Mtr
ii)	Concrete Volume		Cub.Mtr
iii)	Weight of Steel Reinforcement		MT
4.0	Accessories ;		
i)	Solid State Aviation Light as per civil aviation regulation with latest amendments for 100 M tower height Complete with lugs etc. as required.		1 Set Complete

S.No.	DESCRIPTION	Qty (WEIGHT / VOLUME)	UNIT
ii)	Lightening Arrester arrangements Complete as per IS including earthing material at ground (two nos.) with earthing conductor/ strip from tower top to ground complete material with lug etc.as required.		1 Set Complete
iii)	Tower earthing system material as per IS for all four legs of 100 M tower along with earthing strip of suitable size complete material with lug etc.as required.		1 Set Complete
iv)	Solid State Aviation Light Cables, switch, socket of suitable size complete material with lug etc. for 100 M tower as required.		1 Set Complete
v)	Paint material complete with all items . for 100 M tower as per AIR Specification complete as required.		1 Lot
v)	a)Power supply cable 4 core x 6 sq. mm , Aluminum conductor(Stranded), PVC Insulated, PVC Sheathed , armoured , Weather proof cable complete material with lug etc. as required.		120 M
	b) earth wire 8 SWG 2 nos. x 100 M complete material with lug etc. as required.		200 M
	c) clamps for mounting/fixing of cable in vertical cable tray on 100 M high tower.		1 Lot
	d) 32 ampere TP&N MCB incoming and out going (2 +1) nos. complete material with lug etc.as required.		3nos.
	e)32 ampere change over switch - 1no complete material with lug etc. as required..		1nos
	f) weather proof metal box for (c) and (d)		1no.
	g) weather proof industrial sockets and switches 15 ampere including weather proof metal boxes at various plate forms complete material with lug etc. as required.		4 Sets

S.No.	DESCRIPTION	Qty (WEIGHT / VOLUME)	UNIT
vi)	100 mm dia pipe of length 25.0M for mounting of VHF FM antenna along with clamps for fixing / mounting of VHF FM antenna as per tower profile general arrangements.		1no.
vii)	clamps etc. for fixing / mounting of microwave antenna as per tower profile general arrangements.		1 Lot
viii)	clamps etc. for fixing / mounting of microwave antenna as per tower profile general arrangements.		1 Lot
ix)	Vertical cable tray material complete for 100 M tower.		1 Lot
x)	Vertical ladder material with Free Fall Prevention system and guard all system etc. complete.		1 Lot
xi)	Aluminum ladder as per specification.		1 no.
5.0	Any other hardware and accessories for the completeness of 100 M tower set up at site . (item wise details to be given by the tenderer).		1 Lot
6.0	Soil testing detailed report with document as per AIR Specification complete as required.		1 Job
7.0	Design of 100 M as per AIR Specification complete as required.		1 Job
8.0	Submission of SREC Ghaziabad/IIT approved Design documents of tower (For foundation and tower structure) and all working structural drawings of tower including tower foundation drawings as per AIR Specification.(to be submitted to Directorate)		2 Set Complete
9.0	After approval / acceptance of Directorate , submission of SREC Ghaziabad/IIT approved (For foundation and tower structure) all working structural drawings of tower including tower foundation		4 sets Complete

	drawings as per AIR Specification to ; a) Installation Officer - 1 Set . b) Station - 1 Set c) Zonal Office - 1 Set d) Directorate - 1 Set.		
10.0	Inspection of tower material		1 no.
11.0	Completion Report and submission of final tower drawings after erection at site to ; a) Installation Officer - 1 Set . b) Station - 1 Set c) Zonal Office - 1 Set d) Directorate - 1 Set.		4 sets Complete
	as per AIR Specification [Specification No. : 10th Plan /100 M FM Tower/ Spec. /1(Revised) / 2005-D(TD/FM)] complete as required.		
	TOTAL		

SCHEDULE OF REQUIREMENT/MATERIAL (UNPRICED) FOR 100 M HIGH LATTICED STEEL SELF SUPPORTING TOWER

(FOR EACH TOWER)

II) ERECTION ,INSPECTION, TESTING AND COMMISSIONING AT SITE:

S.No.	DESCRIPTION	Qty	Unit
1.0	Erection , testing and commissioning of 100 M tower at site as per AIR Specification	1 no. complete	No.
2.0	Inspection at site as per AIR Specification	No.	No.
3.0	Foundation work at site : Volume of Concrete, Excavation and Weight of steel reinforcement per foundation on the basis of 8.2 M tones per Sq.m safe bearing capacity of the soil at 2 m depth complete as required as per AIR Specification.		
	Excavation Volume		Cub. Mtr
	Concrete Volume		Cub. Mtr
	Weight of Steel Reinforcement		MT
4.0	Foundation work at site : Please quote for any variation in the above value of bearing capacity of the soil for arriving at the rate as applicable to the actual bearing capacity as obtained by soil exploration tests as under complete as required as per AIR Specification :		
4.1	Foundation work at site : Extra for reduced bearing capacity of soil below 8.2 Mt./Sq.M up to minimum of 5.45 Mt/Sq.M for every 0.55 Mt./Sq.M decrease complete as required as per AIR Specification.		In percentage
	Excavation Volume		Cub.Mtr
	Concrete Volume		Cub.Mtr
	Weight of Steel Reinforcement		MT
4.2	Foundation work at site : Reduction in the event of higher bearing capacity of soil above 8.2 Mt./Sq.M for every 0.55 Mt./Sq.M increase complete as required as per AIR Specification		In percentage
	Excavation Volume		Cub.Mtr
	Concrete Volume		Cub.Mtr
	Weight of Steel Reinforcement		MT
5.0	mounting provisions for VHF FM antenna complete as required as per AIR Specification	1 Job	Job
6.0	mounting provisions for microwave dish antenna complete as required as per AIR Specification	1 Job	Job

S.No.	DESCRIPTION	Qty (WEIGHT / VOLUME)	UNIT
7.0	mounting provisions for yagi antenna complete as required as per AIR Specification	1 Job	Job
8.0	mounting provisions for RF cables for feeding VHF FM antenna , microwave dish antenna and yagi antenna complete as required as per AIR Specification	1 Job	Job
9.0	fixing of Solid State Aviation Obstruction lights as per Civil Aviation Regulations with latest amendments for 100 M height tower including connection , earthing etc complete as required as per AIR Specification	1 Job	Job
10.0	painting of tower complete as per Civil Aviation Regulations with latest amendments complete as required as per AIR Specification.	1 Job	Job
11.0	fixing of Lightening Arrester arrangements Complete as per IS including earthing at ground (two nos.) with earthing conductor/ strip from tower top to ground complete as required as per AIR Specification.	1 Job	Job
12.0	Tower earthing system complete as per IS for all four legs along with earthing strip of suitable size complete as required as per AIR Specification.	1 Job	Job
13.0	Fixing of pipe with clamps etc. including fabrication for mounting of VHF FM antenna as per tower profile general arrangements. complete as required as per AIR Specification	1 Job	Job
14.0	fixing of clamps etc. for mounting provision of microwave antenna as per tower profile general arrangements complete as required as per AIR Specification.	1 Job	Job
15.0	fixing for clamps etc. for mounting of yagi antenna as per tower profile general arrangements complete as required as per AIR Specification.	1 Job	Job
16.0	Fabrication and fixing of Vertical cable tray with Fall Prevention System for Vertical ladder complete as required as per AIR Specification.	1 Job	Job
17.0	Fabrication and fixing of Vertical ladder complete as required as per AIR Specification	1 Job	Job
18.0	Laying of power supply cable 4 core x 6 sq. mm , Aluminum conductor(Stranded), PVC Insulated,	20 M	M

	PVC Sheathed , armoured , Weather proof cable in ground as per IS/CPWD Electrical Specifications complete including connections , etc. complete as required as per AIR Specification		
19.0	Laying and fixing of power supply cable including fabrication of suitable clamps for 4 core x 6 sq. mm , Aluminum conductor(Stranded), PVC Insulated, PVC Sheathed , armoured , Weather proof cable on the vertical cable on the tower including connections , earthing etc. complete as required as per AIR Specification .	100 M	M
20.0	Installation , testing and commissioning including connections , earthing etc. of 32 ampere TP&N MCB incoming and out going (2 incoming +1 outgoing =3 nos.) , 32 ampere change over switch ,- 1no ,including weather proof metal box and weather proof industrial socket and switch 15 ampere at plate various forms - 4nos complete as required as per AIR Specification.	1 Job	Job
	as per AIR Specification [Specification No. : 10th Plan /100 M FM Tower/ Spec. /1(Revised) / 2005-D(TD/FM)] complete as required.		
	TOTAL		

Annexure 'D'

PRASAR BHARATI
BROADCASTING CORPORATION OF INDIA
DIRECTORATE GENERAL:ALL INDIA RADIO
(PLANNING & DEVELOPMENT UNIT)
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Acceptances Test Procedure/Protocol for 100 M (Proposed)

AIR Specification [Specification No. : 10th Plan /100 M FM Tower/ Spec. /1(Revised) / 2005-D(TD/FM)] for Supply, design , erection , testing and commissioning of latticed steel self supporting 100 M tower including provisions for mounting for installation of VHF FM antenna , Microwave Dish antennae, Yagi antennae and their feeder cables etc.

I. DESIGN VERFICATION AND APPROVAL / ACCEPTANCE OF DIRECTORATE : In respect of Tower foundation, soil testing report and Tower structural design and drawings (after IIT certificate of approval for soundness of tower design)

S.No.	Description	Specification	Procedure of Verification
1.	Tower foundation design document and working drawings	As per AIR Specification	Foundation design as per guidelines of IS amended up to date duly verified & certified by IIT for the soundness of tower design including overall safety factor on worst atmospheric conditions and loading effect of seismic forces and cyclonic winds etc. (to be submitted by Tenderer for approval / acceptance of Directorate)
2	Tower Structural drawings and design document	As per AIR Specification	Verification of tower structural design document and drawings duly verified & certified by IIT as per AIR Specification for the soundness of tower design including overall safety factor on worst atmospheric conditions and loading effect of seismic forces and cyclonic winds etc. (to be submitted by Tenderer for approval / acceptance of Directorate)

II.PRE –DISPATCH TEST/ INSPECTION PROCEDURE :
(After approval / acceptance of Directorate as per Para I of ATP)
A. Raw Material

S.No.	Description	Specification	Procedure of Verification
1	Steel pipes / Tubes	As per IS amended up to date	Verification of Quality Control (Q.C.) reports of supplier / Manufactures test certificates
2.	M.S. Angles	As per IS amended up to date	Verification of Quality Control (Q.C.) reports of supplier / Manufactures test certificates
3	M.S. Plates	As per IS amended up to date	Verification of Quality Control (Q.C.) reports of supplier / Manufactures test certificates
4.	M.S. Flats	As per IS amended up to date	Verification of Quality Control (Q.C.) reports of supplier / Manufactures test certificates
5	M.S. Rods	As per IS amended up to date	Verification of Quality Control (Q.C.) reports of supplier / Manufactures test certificates
6.	Chequred Plates	As per IS amended up to date	Verification of Quality Control (Q.C.) reports of supplier / Manufactures test certificates

II.PRE –DISPATCH TEST/ INSPECTION PROCEDURE :
(After approval / acceptance of Directorate as per Para I of ATP)
B. Manufactured component / sub-assemblies

S.No.	Description	Specification	Procedure of Verification
1	Components	As per IIT approval & acceptance of Directorate	Verification of Quality Control (Q.C.) reports and random checks may be made on any chosen items for conformity with Quality Control reports
2.	Base shoe	As per IIT approval & acceptance of Directorate	Verification of Quality Control (Q.C.) reports and random checks may be made on any chosen items for conformity with Quality Control reports
3.	Typical Bay proof assembly	As per IIT approval &	Verification of Quality Control (Q.C.) reports and random checks may be

		acceptance of Directorate	made on any chosen items for conformity with Quality Control reports
4.	Welded Components	As per IIT approval & acceptance of Directorate	Verification of Quality Control (Q.C.) reports and random checks may be made on any chosen items for conformity with Quality Control reports
5	Galvanizing	As per IIT approval & acceptance of Directorate	Verification of Quality Control (Q.C.) reports and random checks may be made on any chosen items for conformity with Quality Control reports

II.PRE –DISPATCH TEST/ INSPECTION PROCEDURE :
(After approval / acceptance of Directorate as per Para I of ATP)
C. Brought out items

S.No.	Description	Specification	Procedure of Verification
1.	Cables (A)Telephone Cables (B)Feeder Cables (C) AOL Light	As per AIR Specification	Verification of Quality Control (Q.C.) reports / Manufactures test certificates
2.	Lighting Arrestors	As per AIR Specification	Verification of Quality Control (Q.C.) reports / Manufactures test certificates
3.	Fasteners bolts & nuts	As per IS amended up to date	Verification of Quality Control (Q.C.) reports / Manufactures test certificates
4.	AOL & accessories	As per AIR Specification	Verification of Quality Control (Q.C.) reports
5.	Copper earthing material	As per AIR Specification & IS amended up to date	Verification of Quality Control (Q.C.) reports

III. On site Tests after Erection of Tower

S.No.	Description	Specification	Procedure of Verification
1.	Verticality of Tower	Verticality of Tower shall be as per AIR specification	Calculations using the data taken from Theodolite's observations on Tower at site

2.	Providing & tightening of Bolts	AS per standard torque	Check for the specified torque using torque wrench at random
3	Painting	Colour pattern as per AIR & civil aviations specification amended	Visual check
4.	Twist in the Tower	Twist of Tower shall be as per AIR Specification	Calculations using the data taken from Theodolite and observations on Tower at site

IV : Test results and inspection report in respect of part II A,B,C shall be submitted by the tenderer after inspection of inspecting officer as per Directorate's order.