

**PRASAR BHARATI
(BROADCASTING CORPORATION OF INDIA)
DIRECTORATE GENERAL; ALL INDIA RADIO
(PLANNING & DEVELOPMENT UNIT)**

FNo. 27/12/Spec/CEs Comm.-I/2005-D(TD/FM)&F. No: 27/12/1(13)(Mumbai)/2005-D(TD/FM)

Specification for Supply, erection, testing and commissioning (SETC) {of 16 Panel VHF FM Antenna, RF Cable, Antenna Switch Frame / Panel, Combiner ,filter RF Rigid Lines & Accessories including the Interim Set up as per AIR specification for VHF FM Transmitters set up }.
(SITE - Mumbai)

{Specification no: SETC 16 P Antenna/ RF Cable/Patch Panel/Combiner /13 /**Mumbai** / November-March
(Revision -2) /2006- D(TD/FM)}

[Total number of pages - 49 Nos.]

Date of approval by
Committee of Chief
Engineers : 16.11.2005, 21.11.2005, 27.02.2006 & 02.03.2006

Chief Engineers Committee : FNo. 27/12/Spec/CEs Comm.-I/2005-D(TD/FM)&
Approval reference. F. No: 27/12/1(Ranchi-1)/2003-D(TD/FM)
F. No: 27/12/1(13)(Mumbai)/2005-D(TD/FM)

The Committee of Chief Engineers has approved the above Specification after discussions held in the meetings on 16.11.2005, 21.11.2005, 27.2.2006 & 2.3.2006 under the chairmanship of CE(D).

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SECTION 6.1 Schedule of erection, testing & commissioning { of 16 panel VHF FM
Antenna, RF Cable, Antenna switch panel/frame & Combiner, RF Rigid Lines &
Accessories *including the interim set up* }
at Mumbai

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N.B. :

- 1. The Tenderer shall submit schedule of material /requirement of SETC without price as above in Section 4.0 to Section 6.0 of AIR Specification (two bid system i.e. technical bid and commercial bid).**
- 2.Each statement of this specification has to be complied with & supported by printed literature/data sheets from the manufacturer of the equipment by the tenderer, without which tender will be considered incomplete & is liable to be rejected. The tenderer should make a detailed offer.**
- 3.All the technical details , Schematic drawings and schedule of requirement/material must be submitted and enclosed with the tender by the tenderer and failing which the tender is liable to be rejected.**
- 4. The tenderer shall submit the tender offer to AIR in the format given below .**

| Sr No. of AIR Spec. Section wise & Clause wise | Details of AIR Spec. | Performance figures of equipment, schematic drawing Nos. and Model No. | Compliance Yes/NO | Ref to tender page No. | Remarks |
|---|-----------------------------|---|--------------------------|-------------------------------|----------------|
| Section 1.0 | | | | | |
| Section 2.0 | | | | | |
| Section 3.0 | | | | | |
| Section 4.0 | | | | | |
| Section 5.0 | | | | | |
| Section 6.0 | | | | | |

5. Tenderer shall quote the rate / cost of individual items in the tender offer while submitting the offer for spares.

6. The tenderers shall fill up their name in CAPITAL LETTERS, full address with pin code , phone number, fax number, e-mail address and with their full signatures , failing which the tender shall be liable to be rejected.

SECTION 1.0 TECHNICAL REQUIREMENTS
(SITE - Mumbai)

| S.No | Project | Interim arrangement required | 16 Panel Antenna | RF Co-axial cable & Dehydrator. Length (M) & Size | Antenna Switch Frame / Panel | Combiner | Filter (Band Pass Filter) | RF rigid lines & accessories required | Reference to SECTION of AIR Specification |
|------|---------|------------------------------|------------------|---|------------------------------|--|---|---------------------------------------|---|
| 1. | Mumbai | Pl. see Note No.I | 1 NO. | 2x330M (4-1/8") Pl. see Note No.III | 1No. | 1No. Pl. also see Note No.II | 1 No. Pl. also see Note No.II | Yes | 5.1/ 6.1 |
| | | | | 2x 230M (1-5/8") Pl. see Note No.III | | | | Yes | |

Note: a. Existing TV tower Height-300 M

Note: **I Interim arrangement - Only Antenna will be provided by AIR .**
II The quantity of Combiner /filter may increase /decrease.
III Exact length will be intimated at the time of placement of order.

SECTION 2.0 GENERAL SPECIFICATION:

SECTION 2.0

Note : Please refer tender documents for general term and conditions of contract for SETC 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, Indian Electricity Rules ,Unsatisfactory Workmanship, Damages Incurred During Erection , 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 insurance from manufacturer's works/factory to site etc **i.e. in totality** .

All equipment and items of SETC as per AIR specification shall be used for round the clock continuous operation without any interruption in VHF FM broadcast service at AIR station.

Each statement of this specification has to be complied with & supported by printed matter from the manufacturer of the equipment by the Tenderer .

1.0 SCOPE:

Supply, erection, Testing and commissioning (SETC) of Antenna System comprising of {16 Panel VHF FM Antenna , RF Cable, Antenna Switch Frame / Panel, Combiner , filter, RF Rigid Lines & Accessories including the Interim Set up as per AIR specification for each site for VHF FM Transmitters set up } .

The broad scope of above supply, Erection, testing and commissioning (SETC) on FM Band-II Aperture are as follows:

- 1.11 16 Panel Four Bay VHF FM antenna as per Specification. This will also include dismantling and packaging the existing 16 panel antenna (including supply of packaging).
- 1.12 RF cable as per Specification - This will also include the dismantling and packing of the existing 3-1/8" RF Cable. (As the case may be)
- 1.13 Combiner/ Filter as per specification - This will also include dismantling and packaging the existing diplexer(including supply of packaging).(As the case may be)
- 1.14 Antenna Switch Frame/Panel as per the specification.

1.15 RF Rigid Lines as per the specification.

2.0 For completion of the SETC all the items, fittings and accessories which are necessary for the setup , which may not have been specifically mentioned or which the Tenderer may not explicitly mention in the tender but all the same are necessary for the operation of the equipment shall be deemed to be included in the tender and shall be provided by the successful Tenderer without any additional payment by the Indentor . The full technical details and technical literature/ pamphlets shall be submitted by the Tenderer.

3.0 INSPECTION: Inspection will be as per detail given in Annexure I of AIR Specification by the representative of All India Radio at manufacturers works.

Before giving the call for inspection to the Indentor, the Tenderer should satisfy them selves that the offered equipment etc. are as per the AIR Specification and approved drawings. Tenderer shall submit one set of complete performance figures as per ATP to the Indentor before giving call for inspection to the Indentor.

Prior intimation for carrying out inspection and pre-despatch performance test as per ATP at works is to be given by the Tenderer to the indenter at least 6 weeks in advance.

The total inspection period for each SETC shall be 3 working days (16 Panel VHF FM Antenna, RF Cable, Antenna Switch Frame / Panel, Combiner ,filter RF Rigid Lines & Accessories including the Interim Set up). Expenses for inspection charges on account of providing of infrastructure are to be quoted separately.

3.1 Acceptance Test Procedure will be submitted by the Tenderer with in one month of placement of order in respect of all the equipment /items. This will include all tests so as to assess the performance of the equipment vis-à-vis all specifications .

4.0 The successful Tenderer shall supply within one month from the date of acceptance of the tender, 2 sets of complete design & drawing documents in respect of the setup for the approval of AIR. Tenderer should submit detailed design, complete drawings with full details as per the specification.

5.0 DESIGN & DRAWING DOCUMENTS :

(**Total 3 sets**)

{ SITE - Mumbai }

After approval of all the design document and drawings of complete set up (as per the specification)

The Tenderer shall send ,

one set of all above complete drawing documents **to site** i.e Installation officer /

Superintending Engineer/ Station Engineer, All India Radio, concerned;
(TOTAL - 1 SET)

one set of the above documents to the Chief Engineer of the Zone (WZ) and
(TOTAL - 1 SET)

one set of the above documents to Director Engg.(Proj.), P&D Unit, DG, AIR, New
Delhi-110001

(TOTAL - 1 SET)

i.e. in brief, 3 sets of such drawings and design document are required against SETC.

A soft copy of these documents on CD shall be provided to DE(Proj.), P&D Unit,
DG: AIR, New Delhi by the Tenderer.

6.0 All the necessary measuring equipment and tools etc. required for completion
of Erection of the project will be arranged by the Tenderer during SETC
and no additional amount shall be paid on this account.

7.0 Supply , Erection, testing and commissioning (SETC) of above “set-up” as per
specification shall be done by Qualified Engineer at site.

8.0 The Tenderer should either be original equipment manufacturer or supply the
equipment only from the original equipment manufacturer. Original manufacturers
should have ISO certification for the manufacturing work and the documentary proof
for all above are to be enclosed by the Tenderer with the Tender paper/documents.

9.0 The Tenderer may make a site visit before submitting the tender document.

10.0 DELIVERY PERIOD (FOR SETC):

10.1 SUPPLY, ERECTION, TESTING & COMMISSIONING: - 12 months from the date of
placement of order .

10.1.1 The time period for erection, testing and commissioning shall be as per 10.1
(from the date of placement of order) however, Tenderer shall try to complete the
project before the above period.

11.0 The Tenderer shall prepare the PERT chart of the total project activities and
submit the same to Zonal Office and Director Engg (Project), P&D Unit, DG, AIR,
New Delhi- 10001 after the placement of order and within one month.

12.0 All information submitted by the Tenderer & all markings, notes, designation
on the design, drawing documents & associated write-ups shall be in "English
language" only. All dimensions and units on drawings and all references to weights
and measures and quantities shall be in metric units.

13.0 Complete printed technical information in support of compliance statement should
be furnished with the tender to assess the full merit of the offer. The tender & the
associated information should be submitted in duplicate.

- 14.0 Descriptive information giving complete details of each equipment offered . shall be given by the Tenderer.
- 15.0 Make, model and type of individual units along with printed technical details shall be given by the Tenderer.
- 16.0 The Tenderer shall make his own arrangements for temporary power supply, water etc. and for the storage of equipment / material including the safe custody at erection site from the start of work & up to completion of the project. All responsibility regarding above arrangements shall be of the Tenderer.
- 17.0 The Tenderer shall make his own arrangements for providing accommodation for his workmen at site.
- 18.0 The Tenderer shall make his own arrangements for the labour, skilled and unskilled.
The Tenderer should conform to all local State laws/Central laws and regulations amended up to date concerning labour and their employment as applicable. The insurance etc of the labourers shall be the responsibility of the Tenderer including any kind of pre /post action and consequences relating to above insurance etc.
- 19.0 Prior approval of the Indenter in writing, shall be obtained, if the Tenderer desires to sublet or assign any section of the work Such permission or consent shall not, however, absolve the Tenderer from his liabilities in this contract or any part thereof.
- 20.0 The Tenderer is required to submit details of his previous experience in similar type of project i.e. the capacity of their organizational set up for undertaking such work.
- 21.0 The Tenderer shall indemnify the purchaser, his employees and purchaser employees from any liability that may arise out of infringements of patents and copy rights associated with the design, fabrication, erection of any equipment etc.
- 22.0 Tenderer shall submit detailed Supply, erection, testing and commissioning schedule of equipment/requirement offered as per specification. This list should be in the same format as in the price bid minus the price.
- 23.0 HANDING OVER OF DETAILED MANUALS & DRAWING:
- 23.1 At the time of handing over, the Tenderer shall hand over technical manuals (for erection, testing, commissioning, Operation, maintenance & theory of operation manuals, fault diagnostic with a copy of the Inspection Report carried out at factory and performance measurement carried out at the time of commissioning on site) of each site SETC (16 Panel VHF FM Antenna, RF Cable, Antenna Switch Frame / Panel, Combiner ,filter RF Rigid Lines & Accessories

including the Interim Set up) after incorporating the necessary corrections / changes etc. during the SETC to the following . **(Total :6 Sets)**

23.1.1 DE (Projects), P&D Unit, DG: AIR, New Delhi with One soft copy on CD of all these manuals, drawings, instructions, performance measurements, amendments, etc.

one set for site- Mumbai .

(TOTAL- 1 set)

23.1.2 **Chief Engineer (West Zone): - one set for site -Mumbai**

(TOTAL- 1set)

23.1.3 **Site consignee - The Superintending Engineer/Station Engineer**

The Sg. Engineer, AIR, Mumbai .

-- one set (Mumbai)

23.1.4 At the time of handing over, the Tenderer shall also hand over technical manuals of 16 Panel VHF FM Antenna, RF Cable, Antenna Switch Frame / Panel, Combiner ,filter RF Rigid Lines & Accessories only (after incorporating the necessary corrections/ changes, if any , during the SETC) for testing, operation, maintenance & theory of operation and fault diagnostic to the following.

23.1.4.1 DE(Transmitter Maintenance), DG:AIR - 1 set

23.1.4.2 Technical Library, P&D Unit, DG:AIR - 1 set

23.1.4.3 Staff Training Institute (Technical) - 1 set

Total - 3 sets

24.0 In support of Tenderer's claim an "up-to-date" list of their customers alongwith complete set of detailed actual performance figures for SETC project similar to AIR Specification (duly certified by the customers) must be furnished alongwith the tender.

A supply record of similar SETC project power wise and year wise in the last 2 years for field proven and satisfactory operation may be enclosed. Names, Address, E-mail, telephone nos. and Fax numbers of customers must be indicated.

25.0 In case of 'kits' complete details of component that form part of kit should be spelled out/clearly given i.e. the details of the component/item offered in the kit including their part no. and quantities.

26.0 INFORMATION TO PRECEDE DESPATCH OF EQUIPMENT:

Following information should be supplied to Indentor and each of the consignees,

prior to dispatch of equipment:

- 26.1 Detailed list of equipment under dispatch .
- 26.2 Photographs, detailed engineering drawings showing location/details of components in the various units and sub units with Item/part number marked thereon.
- 27.0 Tenderer shall take all the necessary safety precautions while carrying out the SETC work as per the relevant IS Standards in respect of all erection activities to ensure the safety of the his employees and purchaser employees. Tenderer shall use proper and specified/recommended tools and safety devices and ladders etc during the erection of project.
- 28.0 All material to be used at site of work shall be got verified from the AIR representative authorized by Directorate before commencement of erection.
- 29.0 The Tenderer is required to undertake a pledge for providing prompt after sale service. In any case, the response shall be made available within 48 hours.
- 30.0 After completion of work the Tenderer shall remove dust, dirt, debris and leave the building/premises in a clean condition .
- 31.0 Confirmatory documentary evidence of the equipment that all the equipment as per the individual specification have been actually purchased /imported from the original manufacturers shall be submitted by the Tenderer.
- 32.0 Tenderer shall submit the following details which are required along-with tender to assess the full merit of the offer :
"Complete information, details, parameters and drawings as mentioned in specification and information required for Fixing/ Mounting the various Fixtures / Accessories are to be submitted with tender."
- 33.0 TRAINING (OPTIONAL) (At site): Tenderer will arrange training at site/place as decided by Directorate for 3 working days.
- 34.0 SUPPLY, ERECTION, TESTING AND COMMISSIONING :
- The SETC { of 16 Panel VHF FM Antenna, RF Cable, Antenna Switch Frame / Panel, Combiner ,filter RF Rigid Lines & Accessories including the Interim Set up including the Interim Set up as per AIR specification for VHF FM Transmitters set up}, shall be undertaken by the Tenderer in accordance with ATP and in conformity with the AIR Specification.
- 34.1 SUPPLY: Supply of 16 Panel VHF FM Antenna, RF Cable, Antenna Switch Frame / Panel, Combiner ,filter RF Rigid Lines & Accessories including the Interim Set up etc. shall be as per SECTION 5.0 of AIR Specification.

34.2 ERECTION: 16 Panel VHF FM Antenna, RF Cable, Antenna Switch Frame / Panel, Combiner ,filter RF Rigid Lines & Accessories including the interim set up (as per SECTION 6.0) at site will be erected in the transmitter complex as per layout plan approved by AIR.

34.3 TESTING: 16 Panel VHF FM Antenna, RF Cable, Antenna Switch Frame / Panel, Combiner ,filter RF Rigid Lines & Accessories and associated equipment are to be tested after the erection, after making all the initial checks including physical inspection and continuity checks of wiring/cabling etc. as per drawings. Only after satisfying that erection is fit for testing (without the application of RF power), the testing will be taken up with RF power in a sequential manner in respect of all the equipment. The testing will be undertaken by the Tenderer as per standard practice followed by the manufacturer and in conformity with procedure laid down in ATP.

34.4 COMMISSIONING AT SITE: After erection and testing of the 16 Panel VHF FM Antenna, RF Cable, Antenna Switch Frame / Panel, Combiner ,filter RF Rigid Lines & Accessories up as per AIR Specification , for VHF FM Transmitters, performance figures/measurement for all parameters are to be taken by the Tenderer in the presence of AIR's representative as per ATP.

Field strength survey of actual 360° horizontal radiation pattern shall be carried out upto the threshold of 48 dBu i.e. minimum required signal strength for rural monophonic service by the Tenderer. The F.S. Survey shall also give the details of coverage corresponding to 74 dBu, 66 dBu, 54 dBu contours (Stereophonic service).

In brief, full antenna radiation pattern is to be got validated on site after commissioning.

The performance measurement of the 16 Panel VHF FM Antenna, RF Cable, Antenna Switch Frame / Panel, Combiner ,filter RF Rigid Lines & Accessories along with transmitter and associated equipment will be taken at site as per the Acceptance test procedure (ATP) approved by AIR .

35.0 In case of any tender where unit rate of any item/items appears unrealistic, such tender will be considered an unbalanced and in case the Tenderer is unable to provide satisfactory explanation , such a tender is liable to be disqualified and rejected.

36.0 On acceptance of the tender, the name of the accredited representative(s) of the Tenderer who would be responsible for taking instructions from DG:AIR ,New Delhi-110001 or his authorized representative shall be communicated in writing to Indentor.

We hereby fully agree to the above GENERAL SPECIFICATIONS { of 16
Panel VHF FM Antenna, RF Cable, Antenna Switch Frame / Panel, Combiner ,filter
RF Rigid Lines & Accessories as per AIR Specification for VHF FM Transmitter
in respect of site **Mumbai**} .

Signature of Tenderer with date and seal

Full Name in CAPITAL LETTERS:
Full Address with PIN code in CAPITAL LETTERS:
Telephone No.:
FAX No. :
E-Mail:

Witness Signature:
Full Name in CAPITAL LETTERS:
Full Address with PIN code in CAPITAL LETTERS:
Telephone No.:

(PURCHASE SECTION)
P & D UNIT, DG :AIR

SECTION 3.0 TECHNICAL SPECIFICATIONS

3.1 16 PANEL VHF FM ANTENNA

16 PANEL FOUR BAY VHF FM ANTENNA

1.0 INTRODUCTION:

- 1.1 The FM Antenna is required for use with FM transmitter of All India Radio, in Typical , Heavy Rain Fall, Humid as well as Dry , Salt Air Laden environment & Desert Conditions (as the case may be as per site conditions). The Antenna will consist of 16 Panels and each side or face consisting of four bays(level) of Antennae Panels.

Each Bay (level or stage) shall consist of 4 panels, which will be mounted on each of the four faces of the tower; so as to obtain omni directional pattern. (Tower height is given in Section 1.0 of AIR Specification).

- 1.2 The Power Feeding to the Antenna Shall be through Antenna Patch Panel --- for Splitting the Combined RF power in Two Equal parts for feeding to Upper & Lower Antenna Panel Assembly. The Antenna Switch Frame /panel shall also have arrangement for Feeding the Out Put Power of Two FM Xtrs or Two separately Combined Group of Xtrs --- to The Upper & Lower Portion Of Antenna Panel Assembly---for enabling the stand alone operation, in case of malfunctioning of Combiner/ Diplexers. The Antenna will be installed on a existing self-supporting tower. The FM aperture of tower will be of square cross-section of about 2500 mm x 2500 mm with Latticed Steel Structure . The tower shall also be having VHF TV Antennae in Band – I / Band–III and UHF TV Antennae in Band–IV / Band-V in addition to VHF FM Antenna in Band -II .

The transmitters will be provided by AIR and will conform to ITU-R standards. Two or more VHF FM Transmitters are to be multiplexed & fed to this Antenna. Provision is to be kept for addition of transmitters at a future date also.

2.0 ELECTRICAL PARAMETERS:

2.1. Polarization : Circular.

2.2 Input impedance : 50 Ω (ohm) unbalanced ,each.

2.3 Frequency Range : 88 -108 MHz.

2.4 **Return Loss :**

2.4.1 Return Loss : ≥ 26 dB over the Operating Frequency Range
(88 -108 MHz)

- 2.4.2 Return Loss Value(dB) in Graph form over entire (88 -108 MHz) frequency range to be enclosed.
- 2.5 Power Rating : ≥ 160 KW
- 2.6 Downward beam tilt : Between $[0.5^\circ$ to $1^\circ]$ for entire Operating Frequency Range
- 2.7 Null filling : Required, 15%.
- 2.8 **Antenna gain** (with respect to half wave dipole) - (Antenna gain in all directions over entire frequency range of 88 - 108 MHz should be enclosed with the tender)
- 2.8.1 ≥ 5 dBd in the direction of minimum radiation .
(Gain figure is for each polarization i.e Horizontal & Vertical and which shall be given by the tenderer separately and antenna shall be circularly polarized as per 2.1).
- Note : Gain figure is to be submitted in dBd only i.e. with respect to half wave dipole.
- 2.9.1 No. of Vertical Panels : 4 Nos.(i.e. No. of Bays = 4)
{on each face of Square tower}
- 2.9.2 No of Panels per Bay : 4 Nos.
- 2.10 Spacing between panels: Actual distance to be intimated in tender and a drawing showing profile Erection of panels also to be forwarded.
- 2.11 Vertical Plane: Expected Pattern for 0° to $\pm 90^\circ$ to be forwarded with tender.
- 2.12 Antenna panels feeding arrangements (For two RF cables): Antenna system shall be compatible for accepting RF power with **two RF cables** and also to facilitate operation of half Antenna system i.e. Upper or Lower half ---- under system fault or maintenance/contingency requirement ---- from either of the two RF cables.
- Full details and detailed schematic drgs of the above proposed feeding system from transmitters outputs in the transmitter hall to antenna on the existing tower shall be submitted with tender by the Tenderer along with Power Dividers ,Rigid lines, branch feeder cables/ Distribution Feed Cables
- 2.13 Antenna Mounting details: The Antenna panels will be mounted on Square Face of a Steel Latticed structure of existing tower in the FM aperture . Cross sectional size of the Tower will be about 2.5 m x 2.5m. All the dipoles of each panel will be mounted on a Reflector Panel.
- 2.14 Full Performance Details : Detailed drawings and data sheets are to be forwarded with Tender for the following.
- 2.14.1. Actual measured Field Radiation Pattern, for V&H vectors separately, for a

similar Antenna supplied elsewhere.

- 2.14.2 Calculated & Predicted Radiation Patterns for Horizontal & Vertical Planes for entire Operating Frequency Range of 88 Mhz to 108 Mhz.
- 2.14.3 Return Loss Graphs for Single Horizontal & Vertical Dipoles of Antenna Panel; Pair of Horizontal & Vertical Dipoles of Antenna Panel & Full Antenna Panel.
- 2.14.4 Return Loss Graphs of Power Divider, & its each sub power divider network system along with insertion loss figures ---- are to be given.
- 2.14.5 Performance Tables are required to be attached for
 - 2.14.5.1 Power & Voltage Ratings and Safety Factors.
 - 2.14.5.2 Power Ratings & Attenuation for Distribution Feeder Cables.
 - 2.14.5.3 Power Monitoring Unit Set up levels for Rigid Lines at FM Band II. (as applicable)
 - 2.14.5.4 Peak voltage ratings.

- 3.0 Pressurisation System : Pressurisation in the entire Antenna System is must through out the chain including main RF Coaxial cable , power dividers, splitters, branch feeder, sub distributor cables, antenna dipoles or panels .The RF coaxial cables used for branch feeder, sub distributor cables and up to the antenna dipoles or panels shall be air dielectric :

Full details of test values and operating values are to be given by the Tenderer in accordance with standard practice followed/ manufacturer recommendations.

4.0 ANTENNAE INPUT CHARACTERISTICS:

- 4.1 Input Connectors : 2× 4-1/2” power rating per input 80 KW for IEC 4-1/2”

5.0 MECHANICAL DETAILS : { For Entire Antenna Assembly }

- 5.1. Maximum Wind Speed : 180 km. / hour.
- 5.2 Weight of Antennae : ≤ 3500 Kg.
- 5.3 Wind Load : ≤ 4500 Kg
- 5.4 Vertical Antenna Aperture : ≤12, 000 mm

- 5.5. EXTERNAL MATERIAL : Panels / Dipoles will be made of stainless or Marine Brass Power Dividers & Rigid feed lines will be made of Marine Brass or Copper .

End Connectors on Dipoles and Feed Cables will be of standard & reputable makes & their makes should be indicated in Tender. All electrical contacts must be silver plated. Reflector Panels & clamps shall be constructed of hot dip galvanized M.S. material OR light weight alloy/ fiber reinforced materials . All fasteners will be of Stainless Steel or High Tensile non corrosive material.

- 5.6 INTERNAL MATERIAL: Inner lines of Dipoles will be of copper or Brass . All electrical contacts will be silver plated. All inners and bullets will be made of Beryllium copper and silver plated. Insulators will be made of high quality pure Teflon / PTFE.

6.0 All joints to be made completely air tight & water tight.

7.0 TEMPERATURE/RH: – 5° C to 55° C, & 95% , NC, Heavy rainfall area.

8.0 MOUNTING ARRANGEMENT : All the 16 panels will be fixed on vertical and horizontal supports available on the four faces of Tower. These supports may be of angle iron rails. Technical details are to be forwarded by the Tenderer.

9.0 INPUT CONNECTORS : To match with 4-1/2” EIA Flange connector.

10.0 ACCESSORIES : Antenna supply will be complete with Power Dividers, Rigid Lines, Distribution Feed Cables with matching End Connectors, Adaptors/ Reducers ; Clamps & Fasteners for Dipoles, Power Dividers and Reflector Panels etc. Full details, list and drawings to be forwarded with tender.

11.0 TECHNICAL DATA: Following technical details data and engineering drawings are to be submitted by the Tenderer.

11.1 LIGHTNING PROTECTION: Full Features for Lightning protection are to be provided.

11.2 Complete information, details, parameters and drawings as mentioned in specification and information required for Fixing/ Mounting the various Fixtures / accessories for the SETC set up are to be submitted with tender by the Tenderer.

11.3 Complete set of Engineering Drawings giving full details, Quantity & dimensions of Dipoles, Power Dividers, Rigid Lines, Distribution Feed Cables, Reflector panels & mounting Accessories and SETC system and complete list of items should be forwarded with tender.

11.4 Make, Model & Type of Rigid lines, Distribution Feed cables and Matching End Connectors as above should be given in tender.

11.5 Dead weight of Each Antenna Panel (Kg)with fully mounted Dipoles , Reflectors, Baluns & Screens. Individual weight (Kg)of Dipoles, Reflectors, Baluns, Screens & Power Dividers and all accessories separately and RF cable are also to be given in tender.

11.6 Wind Load of complete Antenna System with all 16 panels mounted on tower alongwith RF cable at 180 Km/hr as well as 198 and /216 Km/hr Wind speed should be given in the tender.

11.7 A write up giving working details and salient features of the Antenna system to be forwarded with tender.

11.8 Power handling capacity of following items shall be indicated in the tender

document by the Tenderer:

11.8.1 Individual Dipoles

11.8.2 Feed cables

11.8.3 End connectors

11.8.4 Power dividers

11.9 One assembled Panel to be indicated in tender.

11.10 Insertion loss (dB)figure from input point to the end of Distribution Feed cable shall also be indicated.

12.0 **Dead weight and wind load (KG):** Full technical details for complete antennae system shall be submitted by the tenderer along with the tender in the format given below:

| SNo. | Description | Dead Weight (KG) | Wind load (KG) At wind speed 216 Km /hr | Wind load (KG) At wind speed 198 Km /hr | Wind load (KG) At wind speed 180 Km /hr | Wind load (KG) At wind speed 160 Km /hr |
|------|---|----------------------|--|--|--|--|
| 1. | Single dipole | | | | | |
| 2. | Single panel circularly polarized antenna | | | | | |
| 3. | 16 panels circularly polarized antenna | | | | | |
| 4. | Antenna power dividers, distributors, main RF co-axial air dielectric branch cables, distributors cables etc. | | | | | |
| 5. | Antenna clamps hardware etc. | | | | | |

13.0 Continuous Average Power Rating (KW) etc. : Continuous Average Power Rating (KW) and full technical details for complete antennae system shall be submitted by the tenderer along with the tender in the format given below:

| SNo. | Description | Continuous average power rating (KW) | Size | Gain Circularly polarization (dBd) * | Gain Horizontal polarization (dBd)* | Gain Vertical polarization (dBd)* | VSWR |
|------|---|--------------------------------------|------|--------------------------------------|-------------------------------------|-----------------------------------|------|
| 1. | Single dipole antenna i.e. for horizontal or vertical polarization | | | | | | |
| 2. | Single panel circularly polarized FM antenna | | | | | | |
| 3. | 16 panel VHF FM Circularly polarized antenna fully pressurized | | | | | | |
| 4. | antenna input main RF power divider /splitter (as per design of manufacturer) | | | | | | |
| 5. | main branch RF co-axial air dielectric feeder cables (as per design of manufacturer) | | | | | | |
| 6. | sub power dividers /splitters (as the case may be / as per design of manufacturer) | | | | | | |
| 7. | distributors RF co-axial air dielectric feeder cables(as the case may be / as per design of manufacturer) | | | | | | |

Note :* Gain figures must be submitted in dBd only i.e. gain with respect to half wave dipole .

- 14.0 GUARANTEE: Tenderer shall submit with his tender an undertaking to accept the following guarantees:
- 14.1 A guarantee that the equipment supplied will be in accordance with these specifications, varied only to the extent stated in his tender and agreed to in the contract.
- 14.2 A guarantee to make good within 30 days at his own expense any component which becomes defective under normal operating conditions within 18 months from the date of acceptance of the equipment at respective site.
- 14.3 A guarantee to supply all components for a period of 10 years from the date of acceptance of equipment at site, at rates at which these are being supplied by him to other customers & also should match prices of original manufactures of these components prevailing at the time.
- 14.4 If at any stage, during next 10 years, the manufacturer stops production of this model of equipment , he shall intimate All India Radio in advance to enable the later to stock the critical items
- 15.0 Inspection /Acceptance tests: will be carried out at the suppliers works as per Annexure -I . It will be the responsibility of the supplier to arrange equipment and instruments for inspection. Charges for inspection, if any, may be quoted separately.

SECTION 3.0 TECHNICAL SPECIFICATIONS

3.2 RF CO-AXIAL CABLES

3.2.1 RF CO-AXIAL AIR DIELECTRIC FEEDER CABLE, 2X4- 1/8"

1.0 RF coaxial air di-electric , Co-axial Feeder Cable of size (Nominal) 4- 1/8"
1.1 Capable of handling ≥ 80 KW Average Power at around 40° C Ambient Temp
1.2 Attenuation ≤ 0.3 dB / 100M.
1.3 Impedance 50 ohm
Actual Cable length will be intimated at the time of order however feeder cable length may be considered as tentative as given in SECTION 5.0 of AIR Specification.

2.0 All accessories associated with Feeder cable are to be provided as per details given below.

- 2.1 4 -1/8" EIA flange connectors - 4 nos.
- 2.2 4 -1/8" EIA flange Gas Pass connector-4 nos
- 2.3 hoisting stockings,- 4nos .
- 2.4 earthing kits-6 nos .
- 2.5 wall gland-4 nos .
- 2.6 cable clamps with nut, bolt washer (adjustable width) and associated accessories.
- 2.7 Any other accessories offered for the completeness of the system (Items wise details of offered and included material , items & part are to be given by the Tenderer) - 1 Lot

3.2.1.1 Dehydrator with tubing & accessories :- As per cable manufacturer's recommendation for ensuring required Pressurisation in entire RF Cable and Antenna System -- Chain for supplying dry air for Pressurisation -- for two RF feeder cable and Antenna system.
Qty -2Sets.

GUARANTEE: Tenderer shall submit with his tender an undertaking to accept the following guarantees:

(i) A guarantee that the equipment supplied will be in accordance with these specifications, varied only to the extent stated in his tender and agreed to in the contract.

(ii) A guarantee to make good within 30 days at his own expense any component which becomes defective under normal operating conditions within 18 months from the date of acceptance of the equipment at respective site.

(iii) A guarantee to supply all components for a period of 10 years from the date of acceptance of equipment at site, at rates at which these are being supplied by him to other customers & also should match prices of original manufactures of these components prevailing at the time.

(iv) If at any stage, during next 10 years, the manufacturer stops production of this model of equipment, he shall intimate All India Radio in advance to enable the later to stock the critical items

3.2.1.3 Inspection /Acceptance tests: will be carried out at the suppliers works as per Annexure -I . It will be the responsibility of the supplier to arrange equipment and instruments for inspection. Charges for inspection, if any, may be quoted separately.

SECTION 3.0 TECHNICAL SPECIFICATIONS

3.2.2 RF FOAM TYPE DIELECTRIC FEEDER CABLE, 2X1- 5/8"(Only for Mumbai) -- Interim Arrangement

1.0 RF foam di-electric , Co-axial Feeder Cable Capable of size 1 - 5/8" Capable of handling ≥ 15 KW Average Power at around 40° C Ambient Temp & having Attenuation ≤ 0.7 dB per 100M . Actual Cable length will be intimated at the time of order however of feeder cable length may be considered as given in SECTION 5.0 of AIR Specification.

2.0 All accessories associated with Feeder cable are to be provided as per details given below.

2.1 1 -5/8" EIA flange connectors - 2 nos

2.2 hoisting stocking s,- 4nos per station or the quantities as per cable manufacturer's recommendations whichever is more.

2.3 earthing kits- 6nos per station or the quantities as per cable manufacturer's recommendations whichever is more.

2.5 wall gland-2 nos per station.

2.6 cable clamps with nut, bolt washer (adjustable width) and associated accessories.

2.7 Gas barrier connector - 2 nos.

2.8 Any other accessories offered for the completeness of the system (Items wise details of offered and included material , items & part are to be given by the Tenderer) - 1 Lot

GUARANTEE: Tenderer shall submit with his tender an undertaking to accept the following guarantees:

(i) A guarantee that the equipment supplied will be in accordance with these specifications, varied only to the extent stated in his tender and agreed to in the contract.

(ii) A guarantee to make good within 30 days at his own expense any component

which becomes defective under normal operating conditions within 18 months from the date of acceptance of the equipment at respective site.

- (iii) A guarantee to supply all components for a period of 10 years from the date of acceptance of equipment at site, at rates at which these are being supplied by him to other customers & also should match prices of original manufactures of these components prevailing at the time.
- (iv) If at any stage, during next 10 years, the manufacturer stops production of this model of equipment , he shall intimate All India Radio in advance to enable the later to stock the critical items

3.2.1.3 Inspection /Acceptance tests: will be carried out at the suppliers works as per Annexure -I . It will be the responsibility of the supplier to arrange equipment and instruments for inspection. Charges for inspection, if any, may be quoted separately.

SECTION 3.0 TECHNICAL SPECIFICATIONS

3.3 ANTENNA SWITCH FRAME/PANEL

1.0 ANTENNA SWITCH FRAME / PANEL: 8 Port Antenna Switch Frame / Panel with Mimic Diagram, Power Meters {for Forward & Reflected Power Readings at I/P & O/P Ports} shall have the provision for connecting the Combined Transmitters Power to a split Antenna System along with providing manual patching facilities.

The Antenna Patch panel should be compatible to input and patching arrangements with 4-1/8" RF Rigid Lines and output should be compatible to RF Feeder Cable of 4-1/8" . Reducers / Adopters 6-1/8" to 4-1/8" are also to be provided for each port so as to facilitate Connectivity with 4-1/8" Feeder Cable & Rigid Lines, for System integration.

Facilities to connect with the transmitter interlocks should be provided.

2. GUARANTEE: Tenderer shall submit with his tender an undertaking to accept the following guarantees:
 - 2.1 A guarantee that the equipment supplied will be in accordance with these specifications, varied only to the extent stated in his tender and agreed to in the contract.
 - 2.2 A guarantee to make good within 30 days at his own expense any component which becomes defective under normal operating conditions within 18 months from the date of acceptance of the equipment at respective site.
 - 2.3 A guarantee to supply all components for a period of 10 years from the date of acceptance of equipment at site, at rates at which these are being supplied by him to other customers & also should match prices of original manufactures of these components prevailing at the time.
 - 2.4 If at any stage, during next 10 years, the manufacturer stops production of this model of equipment , he shall intimate All India Radio in advance to enable the later to stock the critical items

2.0 ELECTRICAL DETAILS:

| Technical Detail | Specification |
|---------------------|--|
| Frequency Range | 88-108 MHz |
| Return Loss | >30 dB over operating frequency range |
| Insertion Loss | <0.1 dB over operating frequency range |
| Maximum Input Power | 160 KW |
| Input Connector | 6-1/8" EIA unflanged |
| Output Connector | 6-1/8" EIA unflanged |
| Ambient Temperature | 0°- 50° C |
| Humidity | 95 % |

3.0 MECHANICAL DETAIL:

| | |
|-------------------------------|---------|
| <u>Dimensions: (Maximum)</u> | |
| HEIGHT | 1900mm |
| WIDTH | 1200mm |
| DEPTH | 1200 mm |
| Weight | 150 kg |

4.0 The Antenna Patch Panel/Switch Frame: The 8 Port Unit shall be designed to connect combined RF output of FM VHF(Band -II)Transmitter to split antenna system for equal power, co-phased outputs to each antenna half.

Manual patching facilities for use during maintenance or emergency conditions shall be provided by the tenderer. The Patch Panel shall also have arrangement for directly connecting the two Transmitters (or group of Transmitters) to upper and lower half of antenna in case of combiner malfunctioning, For reference a suggestive 8 Port Antenna patch panel mimic diagram is enclosed (Suggestive drg no- TM -15348).

5.0 Power Monitoring Unit with meter: shall be provided to facilitate for measurement of forward and reflected power to each half of antenna on the Patch Panel.

6.0 Return Loss (dB)Graphs for Antenna Switch Frame/ Patch Panel shall be submitted by the Tenderer for entire VHF frequency range.

7.0 Insertion loss figures (dB)for entire VHF frequency range and stages of the Patch Panel are required to be given by the contractor.

8.0 Inspection /Acceptance tests: will be carried out at the suppliers works as per Annexure -I .

It will be the responsibility of the supplier to arrange equipment and instruments for inspection. Charges for inspection, if any, may be quoted separately.

3.0 TECHNICAL SPECIFICATIONS:

3.4 SPECIFICATION OF COMBINER :

Frequency of VHF FM Transmitter #1 : 107.1 Mhz
 Frequency of VHF FM Transmitter #2 : 100.7 Mhz
 (* Exact frequencies will be intimated at the time of placement of order).

1.0 Introduction :

Combiner are required for combining the RF Transmitter power, in cascade; of two or more FM Transmitters operating on different frequencies; for feeding to a single Antenna System. The nominal output of transmitters shall be available at 50 ohms, nominal Impedance. The Transmitter output shall be in conformity with the relevant ITU-R regulations.

Cascading type power combiner are required for Combining the FM Xtrs i.e. through Narrow Band input Port & Wide Band input Port along with all required Accessories Rigid Lines ,Connectors, Elbow, Bends & Reducers / Adopters etc. The wide band input port shall normally have a multiplexed RF input (though it can also have RF output of a single FM transmitter)--with the stipulation of minimum channel separation with respect to narrow band input frequency.

The combined RF power from Combiner / Combiner cascade will be fed to appropriate Antenna System through 50 ohm , nominal impedance transmission chain. The Antenna impedance will also be 50 ohms.

2.0 ELECTRICAL DATA:

| | | | |
|---|--|----------------------|--------------|
| 1 | Frequency Range | | 88 –108 Mhz |
| 2 | Minimum Channel Separation | | 800 KHz |
| 3 | Impedance | Input & Output Ports | 50 Ω (ohms) |
| 4 | Insertion Loss (between any input port to the combiner output) | Narrow Band Input | ≤ 0.3 dB |
| | | Wide Band Input | ≤ 0.1 dB |
| 5 | Return Loss | Narrow Band Input | >32 dB |
| | | Wide Band Input | >32 dB |
| 6 | 6.1 Channel Band width (Off Carrier) | | ± 200 KHz |
| | 6.2 Effective Constant Impedance Bandwidth(Off Carrier) | | ± 200 KHz |
| 7 | Isolation (between inputs) | Narrow Band | >32 dB |
| | | Wide Band | > 32 dB |

| | | | |
|----|---------------------|---|---|
| 8 | Group delay | | $\leq \pm 30$ n sec. |
| 9 | frequency response | | ≤ 0.1 db |
| 10 | Power Rating | Narrow Band Input Wide Band Input Combined Output | ≥ 25 KW ≥ 80 KW ≥ 100 KW |
| 11 | Ventilation | | Natural air ventilation |
| 12 | Ambient Temperature | | 0°- 50° C |
| 13 | Humidity | | 95 % |
| 14 | Connectors | Narrow Band Input | 3-1/8" EIA unflanged male |
| | | Wide Band Input | 4-1/2" EIA/ IEC unflanged male |
| | | Combined Output | 6-1/8" EIA/ IEC unflanged male |

3.0 MECHANICAL DATA:

| | | | |
|---|--|--|----------------|
| 1 | Dimensions (H) (W) (for fully assembled combiner.) (D) | | ≤ 2000 mm |
| | | | ≤ 1600 mm |
| | | | ≤ 2000 mm |
| 2 | Weight (per sub module) | | ≤ 500 Kg |
| | Weight (Total) of combiner | | ≤ 1000 Kg |

4.0 GENERAL:

4.1: Power Monitoring Units for monitoring of **forward** and **reflected power** at the Input ports and Output port of the Combiner shall be provided. Full details should be forwarded with the Tender.

4.2: The individual filters of the Combiner should be tunable in the Frequency range and tuning control should be lockable. It should be possible to easily tune the Combiner at site to a new frequency, in VHF FM Band-II, for N.B. input.

The various subsystems of Combiner, such as Filter Cavities, used in the Combiner Module --- which are N.B. port input frequency dependant -- are to be provided with inner probes of high grade copper along with mechanical devices to facilitate gradual and precise tuning procedure; required for on-site frequency change / fine adjustment of the N.B. input frequency.

- 4.3 **By-passing the Combiner:** In case of malfunction of a Combiner or other requirement such as maintenance / retuning of the Combiner ; the provision should exist for By-passing the particular Combiner from the Cascading Combiner Chain, ---- i.e. provision for connecting the W.B. Input Port directly to the W.B. Out put Port.

This feature is necessary to ensure that transmission of other transmitters is not affected due to problem in a particular Combiner / Transmitter. Full details including illustration schematic diagrams are to be given with Tender.

- 4.4: There should be adequate provision for drainage ; on account of condensation and adequate protection against ingress of moisture at critical points / locations in the combining chain.
- 4.5: Recommended spares should be quoted separately. The spare filters should also be able to be tuned to any frequency in the 88 MHz to 108 MHz.
- 4.6: Two Copies of the detailed manual, a complete set of engineering drawings and all other relevant documents including details of metering, monitoring and alarm should be forwarded with the tender for proper evaluation.
- 4.7 Complete set of Instruction Manuals including Erection instructions/drawings and tuning procedure should be supplied within two month of placement of the Supply Order.
- 4.8 All required Accessories including Patch panels, Rigid Lines ,Connectors, Elbow, Bends & Reducers / Adopters etc are to be given by the tenderer.

5. GUARANTEE: Tenderer shall submit with his tender an undertaking to accept the following guarantees:

- 5.1 A guarantee that the equipment supplied will be in accordance with these specifications, varied only to the extent stated in his tender and agreed to in the contract.
- 5.2 A guarantee to make good within 30 days at his own expense any component which becomes defective under normal operating conditions within 18 months from the date of acceptance of the equipment at respective site.
- 5.3 A guarantee to supply all components for a period of 10 years from the date of acceptance of equipment at site, at rates at which these are being supplied by him to other customers & also should match prices of original manufactures of these components prevailing at the time.

5.4 If at any stage, during next 10 years, the manufacturer stops production of this model of equipment , he shall intimate All India Radio in advance to enable the later to stock the critical items.

6.0 Inspection /Acceptance tests: will be carried out at the suppliers works as per Annexure -I . It will be the responsibility of the supplier to arrange equipment and instruments for inspection. This will include a set of full measurements and checking change of frequency & retuning. One copy of Manual including Tuning process should be forwarded within two months of Supply Order. Charges for inspection, if any, may be quoted separately.

3.0 TECHNICAL SPECIFICATIONS:

3.4.2 SPECIFICATION OF BAND PASS FILTER : **ELECTRICAL DATA:**

| | | |
|----|------------------------------------|--------------------|
| 1. | Frequency Range | 88 -108 Mhz |
| 2. | Impedance | 50 Ohm |
| 3. | Insertion loss | ≤ 0.1 dB |
| 4. | Power handling capacity | 25 KW |
| 5. | VSWR | < 1.1 |
| 6. | Input and output flange connection | 3-1/8" EIA |
| 7. | Bandwidth | ± 200 kHz |
| 8. | Rejection | Fc ± 4 MHz ≥ 40 dB |

1.0 **GUARANTEE:** Tenderer shall submit with his tender an undertaking to accept the following guarantees:

1.1 A guarantee that the equipment supplied will be in accordance with these specifications, varied only to the extent stated in his tender and agreed to in the contract.

1.2 A guarantee to make good within 30 days at his own expense any component which becomes defective under normal operating conditions within 18 months from the date of acceptance of the equipment at respective site.

1.3 A guarantee to supply all components for a period of 10 years from the date of acceptance of equipment at site, at rates at which these are being supplied by him to other customers & also should match prices of original manufactures of these components prevailing at the time.

1.4 If at any stage, during next 10 years, the manufacturer stops production of this model of equipment , he shall intimate All India Radio in advance to enable the later to stock the critical items.

2.0 Inspection /Acceptance tests: will be carried out at the suppliers works as per Annexure -I . It will be the responsibility of the supplier to arrange equipment and instruments for inspection. This will include a set of full measurements and checking of frequency . Charges for inspection, if any, may be quoted separately.

SECTION 3.0 TECHNICAL SPECIFICATIONS

3.5 RF RIGID LINES & ACCESSORIES :

RF COAXIAL RIGID LINES & ACCESSORIES FOR COMPLETENESS OF SYSTEM

1.0 Technical Specification of Rigid lines (50 Ohm):

| Sno. | Technical Parameter | 1-5/8" | 3-1/8" | 4-1/2" | 6-1/8" |
|------|-----------------------|------------------|------------------|------------------|------------------|
| 1.1 | Average Power Rating | ≥ 15 KW | ≥ 50 KW | ≥ 90 KW | ≥ 180 KW |
| 1.2 | VSWR | 1.05:1.0 | 1.05:1.0 | 1.05:1.0 | 1.05:1.0 |
| 1.3 | Attenuation | ≤0.60 dB/100M | ≤0.32 dB/100M | ≤0.25 dB/100M | ≤0.15 dB/100M |
| 1.4 | Ambient temperature | 40°C | 40°C | 40°C | 40°C |
| 1.5 | Inner Conductor Temp. | ≥ 100°C | ≥ 100°C | ≥ 100°C | ≥ 100°C |
| 1.6 | Peak Power Rating | 275 KW | 1100 KW | 1800 KW | 4000KW |

2.0 Complete erection material for connecting the output of each transmitter to input ports of Combiners such as rigid lines, elbows, unions and matching reducers, wherever necessary to complete the erection for feeding to the Antenna and Dummy Load .

Complete erection material and accessories for connecting the output of transmitters to input ports of Combiner and combined output from the output port of Combiner to Input of following Antenna Switch frame /Patch Panel - such as rigid lines, elbows, unions, matching adaptors, reducers, where ever necessary to complete the Erection - will also include the following items .

- 2.1 4 1/2" Rigid Line - 12 mtr.
- 2.2 4 1/2" Elbows with inners & bullets - 6 nos.
- 2.3 4 1/2" Couplings with inners & bullets - 20 nos.
- 2.4 4 1/2" Field Flange with inners & bullets - 2 nos.
- 2.5 4 1/2" to N Test Reducer - 1 no.
- 2.6 3 1/8" to 4 1/2" reducer adopter - 2 no.
- 2.7 Any other accessories offered for the completeness of the system (Items wise details of offered and included material , items & part are to be given by the Tenderer) - 1 Lot
- 2.8 Reducer adopter 6-1/8" to 4-1/2" - 3 Sets.
- 2.9 Reducer adopter 6-1/8" to 3-1/8" - 3 Sets
- 2.10 1-5/8" to 7/8" reducer/adopter-2 nos.
- 2.11 1-5/8" rigid line - 6 M
- 2.12 1-5/8" Elbows with inner and bullets - 6 nos.
- 2.13 1-5/8" Couplings with inner and bullets - 6 nos.
- 2.14 1-5/8" to N Test Reducer - 1 no.

Note: Following RF coaxial rigid lines /accessories are to be given by AIR. After completion of work , balance quantity , if any , will be returned by the tenderer to AIR immediately. However rate per number in respect of following RF coaxial rigid lines /accessories shall be quoted as “OPTIONAL ITEM” by the tenderer.

1. 3-1/8" rigid line - 18 M
2. 3-1/8" Elbows with inner and bullets - 18 nos.
3. 3-1/8" Couplings with inner and bullets - 40 nos.
4. 3-1/8" Field Flange with inners and bullets - 4 nos.
5. 3-1/8" to N Test Reducer - 2 nos.
6. 3-1/8" to 4-1/8" reducer/adopter-2nos.
7. 3-1/8" to 1-5/8" reducer/adopter-2nos.

GUARANTEE: Tenderer shall submit with his tender an undertaking to accept the following guarantees:

- (i) A guarantee that the equipment supplied will be in accordance with these specifications, varied only to the extent stated in his tender and agreed to in the contract.
- (ii) A guarantee to make good within 30 days at his own expense any component which becomes defective under normal operating conditions within 18 months from the date of acceptance of the equipment at respective site.
- (iii) A guarantee to supply all components for a period of 10 years from the date of acceptance of equipment at site, at rates at which these are being supplied by him to other customers & also should match prices of original manufactures of these components prevailing at the time.
- (iv) If at any stage, during next 10 years, the manufacturer stops production of this model of equipment , he shall intimate All India Radio in advance to enable the later to stock the critical items.

4.0 INSPECTION AT MANUFACTURER'S WORKS:

ANNEXURE-'I'

1.0 INSPECTION DETAILS AT MANUFACTURE WORKS

The inspection for acceptance of the 16 panel Four Bay FM Antenna, RF cable , Combiner , Filter, Antenna Switch frame/ panel and RF rigid lines will be carried out at the Works of the Manufacturer in accordance with Acceptance Test Procedure (ATP).

All facilities like complete set of measuring instruments, power supply, manual assistance, etc. will be provided by the supplier without any additional charges. Inspection will be as per Specification. Engineers of All India Radio will carry out detailed inspection at manufacturers works.

The manufacturer shall put up the 16 panel Four Bay FM Antenna, RF cable , Combiner , Filter, Antenna Switch frame/ panel and RF rigid lines, for test on the test bench at manufacturers works before the representatives and shall provide without any extra charges electric energy, consumable materials, tools, testing instruments, labour and assistance of every kind for carrying out acceptance tests.

The inspection shall be carried out by the AIR Engineers . The inspection period for SETC shall be 3 working days at the manufacturer works. Complete details and specifications of Supply part of SETC i.e. 16 panel VHF FM Antenna , RF cable , Combiner , Filter , Antenna Switch frame/ panel, RF rigid lines etc.will be checked and the parameter values will be measured.

The complete Acceptance Test Procedure (ATP) will be prepared by the manufacturer and submitted to Indentor for approval. This Procedure after modification (if required during the process of approval) shall form the basis for Performance/Inspection Tests to be carried out. ATP will also indicate full details of set up for measuring/testing equipment to be deployed during the Performance Measurement/ Inspection Test at factory.

Operation checking of the 16 panel VHF FM Antenna, Combiner , Filter , Antenna Switch frame/ panel etc. and measurements will be carried out at any three frequencies in the VHF band, 88 to 108 MHz. Complete set of instruments will be made available in advance and the list of these measuring instruments along with their set ups may be forwarded along with the Tender.

Exhaustive checking /measurements will be carried out so as to completely check the compliance of the 16 panel VHF FM Antenna , RF cable, Combiner , Filter , Antenna Switch panel and RF rigid lines with the requirements and as per the order.

It is mandatory that all these checking and measurements i. e. Operation checking at any three frequencies in the VHF band, 88 to 108 MHz, are carried out well in

advance and these measurements details, graphical printout notes and figures must be available, at the factory at the time of inspection.

These must also be submitted to All India Radio alongwith the call for inspection well in advance for analyzing etc. 16 panel VHF FM Antenna, Combiner , Filter ,Antenna Switch panel/Frame etc. will be tested for 24 hours of continuous operation on full rated power output.

Following information should also form part of above data which will also be checked for 16 panel VHF FM Antenna , RF cable , Combiner , Filter ,Antenna Switch panel/Frame, RF rigid lines with the requirements and as per the order during inspection by indenter's representative at manufacturer's works :-

1. Make , type , model no and country of origin of equipment Antenna , Accessories and spares and other items /equipment.
2. Dimension of Sub-Units and Accessories.
3. Working/operation of all Sub-Units and Accessories.
4. System configuration check and completeness of 16 panel VHF FM Antenna and other items /equipment
6. Checking meter readings and calibration.
7. Measurements of all parameters as per of specification . All the parameters will be measured on any 3 different frequencies in VHF FM band.
8. Checking of all power levels, meters, LEDs etc.
9. Checking of RF voltages on test points.

INSPECTION:

Tenderer shall quote charges for Inspection at manufacturer's works by two AIR Engineers for 3 working days in respect of all equipment/items of Section 5.0 of AIR Specification for SITC as per Section 1.0

| S.No. | DESCRIPTION | QTY | RATE | UNIT | AMOUNT |
|-------|--|------|------|------|--------|
| | Charges for inspection at manufacturer's works by two AIR Engineers for 3 working days in respect of 16 panel VHF FM Antenna, RF Cable, Antenna switch panel/frame & Combiner , Filter, RF Rigid Lines & Accessories (as the case may be). | | | | |
| 1.1 | Mumbai | 1 no | | each | |

Section 4.0 (page number 32 to 34)

TOTAL AMOUNT: (In figures and words)

Signature of Tenderer with date and seal
Full Name in CAPITAL LETTERS:

(PURCHASE SECTION)
P & D UNIT, DG: AIR

SECTION 5.0 SCHEDULE OF SUPPLY

SECTION 5.1 Schedule of Supply at Mumbai

| SNo. | DESCRIPTION | Qty | RATE | UNIT | AMOUNT |
|------|--|-------------------|------|----------------|--------|
| 1.0 | 16 Panel VHF FM (Band II) Complete Antenna System in conformity of Section 3.1 of AIR Specification mainly comprising of the following (but not excluding other features deemed necessary) | 1 complete system | | Set/ System | |
| 1.1 | Power Divider (As per design of manufacturer) | | | | |
| 1.2 | Distribution Cables (As per design of manufacturer) | | | | |
| 1.3 | Rigid line 3 1/8" EIA with complete accessories (As per design of manufacturer) | | | | |
| 1.4 | Rigid line 4-1/2" IEC with complete accessories (As per design of manufacturer) | | | | |
| 1.5 | Instruction books/manuals (As per Specification) | | | | |
| 1.6 | Panel reflectors (As per design of manufacturer) | | | | |
| 1.7 | Dipoles, Horizontal (As per design of manufacturer) | | | | |
| 1.8 | Dipoles, Vertical (As per design of manufacturer) | | | | |
| 1.9 | Any other item / hardware etc. offered for the completeness of the above antenna system - 1 lot (Item wise details of the offered item / hardware etc. shall be given by the tenderer) | 1 lot | | each | |
| 2 | RF coaxial Feeder Cable air di-electric of size 2x 4-1/8" as per Specification. *Actual length will be intimated at the time of placement of order. (The following accessories are to be included as part of RF Feeder cable) | 2x330 M each* | | M | |
| | 2.1 4-1/8" EIA flange connectors | 4 nos. | | each | |
| | 2.2 4-1/8" EIA flange Gas Pass connector | 4 nos. | | each | |
| | 2.3 Hoisting stockings (1 Set)for each 330 M cable as per recommendation of manufacturer. | 2 set | | each | |

| | | | | | |
|-------------|---|---------------|-------------|-------------|---------------|
| | | | | | |
| | 2.4 Earthing kits, (I Set Shall be with 3nos of earthing kits) | 2 sets | | each | |
| | 2.5 Wall gland/ feed through assembly with accessories | 2 nos. | | each | |
| | 2.6 Cable clamps with nut, bolt washer(adjustable width) (Suitable for two RF cables) | 330 sets | | Set | |
| | 2.7Any other accessories offered for the completeness of the system | 1 lot | | lot | |
| SNo. | DESCRIPTION | Qty | RATE | UNIT | AMOUNT |
| 3 | RF coaxial Feeder Cable foam di-electric of size 2x1-5/8" as per Specification. (for interim) *Actual length will be intimated at the time of placement of order. The following accessories are to be included as part of R.F. Feeder cable | 2x230 M each* | | M | |
| | 3.1 1-5/8" EIA flange connectors | 4 nos. | | each | |
| | 3.2 1-5/8" EIA flange Gas barrier connector | 4 nos. | | each | |
| | 3.3 Hoisting stockings (1 Set) for each 230 M cable as per recommendation of manufacturer | 2 Sets | | set | |
| | 3.4 Earthing kits, (I Set Shall be with 3nos of earthing kits) | 2 sets | | set | |
| | 3. Wall gland / feed through assemblies with accessories | 2 nos. | | each | |
| | 3.6 Cable clamps with nut, bolt washer(adjustable width) (Suitable for two RF Cables) | 230 sets | | Set | |
| | 3.7 Any other accessories offered for the completeness of the system | 1 lot | | lot | |
| 4 | Dehydrator with tubing and accessories : As per Cable manufacturer's recommendation for ensuring required Pressurisation in entire chain (to be supplied each for | 2 nos | | each | |

| | | | | | |
|-------------|---|------------|-------------|-------------|---------------|
| | supplying dry air for Pressurisation of RF feeder cable and Antenna system) | | | | |
| SNo. | DESCRIPTION | Qty | RATE | UNIT | AMOUNT |
| 5 | 8 Port antenna patch panel with power meters complete as per Section 3.3 of AIR Specification | 1 set | | Set | |
| 6.0 | Combiner complete as per Section 3.4 of AIR Specification . | 1 no. | | each | |
| 7 | Complete Erection material {RF Rigid lines & accessories as per Section 3.5 of AIR Specification as given below | | | | |
| | 7.1 4-1/2" Rigid Line | 12 M | | M | |
| | 7.2 4-1/2" Elbows with inners & bullets | 6 nos. | | each | |
| | 7.3 4- 1/2" Couplings with inners & bullets | 20 nos. | | each | |
| | 7.4 4-1/2" Field Flange with inners & bullets | 2 nos. | | each | |
| | 7.5 4-1/2" to N Test Reducer | 1 no | | each | |
| | 7.6 3-1/8" to 4-1/2" reducer adopter | 2 nos. | | each | |
| | 7.7 Any other accessories offered for the completeness of the system | 1 Lot | | each | |
| | 7.8 6-1/8" to 4-1/8" Reducer/Adopter | 3 Sets | | Set | |
| | 7.9 6-1/8" to 3-1/8" Reducer/Adopter | 3 Sets | | Set | |
| | | | | | |

| SNo. | DESCRIPTION | Qty | RATE | UNIT | AMOUNT |
|-------------|---|------------------|-------------|----------------|---------------|
| | 7.10 1-5/8" to 7/8" Reducer/Adopter | 2 nos | | No. | |
| | 7.11 1-5/8" rigid line | 6 M | | M | |
| | 7.12 1-5/8" elbows with inner and bullets | 6 nos. | | each | |
| | 7.13 1-5/8" couplings with inner and bullets | 6 nos. | | each | |
| | 7.14 1-5/8" to N test reducer | 1 no. | | each | |
| 8.0 | Band pass filter complete as per Section 3.4 of AIR Specification | 1 set/ system | | set/ system | |
| | TOTAL | | | | |

Section 5.1 Supply at Mumbai (page number 35 to 39)

TOTAL AMOUNT: (In figures and words)

Signature of tenderer with date and seal
Full Name in CAPITAL LETTERS:

**(PURCHASE SECTION)
P & D UNIT, DG:AIR**

SECTION 5.0 SCHEDULE OF (SUPPLY) (OPTIONAL)

SECTION 5.1 .1 Schedule of Supply at Mumbai (OPTIONAL)

| SNNo. | DESCRIPTION | Qty | RATE | UNIT | AMOUNT |
|--------------|---|------------|-------------|-------------|---------------|
| 1.0 | Complete Erection material {RF Rigid lines & accessories as per Section 3.5 of AIR Specification as given below | | | | |
| 1.1 | 3-1/8" rigid line | 6 M | | M | |
| 1.2 | 3-1/8" elbows with inner and bullets | 6 nos. | | each | |
| 1.3 | 3-1/8" couplings with inner and bullets | 6nos. | | each | |
| 1.4 | 3-1/8" field flange with inners and bullets | 1 no. | | each | |
| 1.5 | 3-1/8" to N test reducer | 1 no. | | each | |
| 1.6 | 3-1/8" to 1-5/8" reducer/adopter | 1 no. | | each | |
| 1.7 | Training at site for 3 working days (optional) | 1 Job | | 1Job | |
| | TOTAL | | | | |

Section 5.1 Supply at Mumbai (page number 40)

TOTAL AMOUNT: (In figures and words)

Signature of tenderer with date and seal
Full Name in CAPITAL LETTERS:

**(PURCHASE SECTION)
P & D UNIT, DG:AIR**

SECTION 6.0 SCHEDULE OF ERECTION, TESTING & COMMISSIONING

SECTION 6.1 Schedule of Erection, testing & commissioning { of 16 panel VHF FM Antenna, RF Cable, Antenna switch panel/frame & Combiner, RF Rigid Lines & Accessories including the interim set up } at Mumbai

| S No. | Description | Qty. | Rate | Unit | Amount |
|-------|--|------------------------|------|----------------|--------|
| 1 | <p>(Interim arrangement) Making arrangement for the interim set up for diverting the existing broad- cast services on dipole antennas (2 nos.) alongwith RF co-axial cables size 1-5/8"(2nos) including all related Erection work of adopter /reducer connectors etc. at both the ends complete as required. (Existing TV Tower Height -300 M)</p> | One job | | job | |
| 2 | <p>(Dismantling for Combiner/diplexer) Removing the existing rigid lines connections in the existing transmitter hall along with other necessary hardware fitting/fixtures along with removing the existing diplexer and packing (including supply of packaging) etc. of the diplexer complete as required. (Dismantling for 16 panel Antenna) Removing the existing 16 panel antenna along with other hardware fitting/fixtures etc. and packing (including supply of packaging) of the antenna complete as required. (Existing TV Tower Height -300 M)</p> | One job One job | | job job | |
| S No. | Description | Qty. | Rate | Unit | Amount |
| 3 | <p>(New Erection) (FM#II new and existing FM#I) Erection, testing , commissioning of new combiner/filter as per specification in the existing transmitter hall including placement, fixing, Erection of rigid lines/connections of RF chain including the transmitters (existing FM # 1 & new FM #2 transmitter) interconnections of combiner including the rigid line connections from last cascading combiner output port to the input of Antenna Switch Frame/Patch Panel along</p> | | | | |

| | | | | | |
|------|--|-----------|--|------|--|
| | with fixing of necessary hardware of the systems complete as per site requirement as required. | | | | |
| | The following list is suggestive list for Erection work involving various items - but may vary as per actual site condition. | | | | |
| 3.1 | 4 1/2" Rigid Line | 12 M | | M | |
| 3.2 | 4 1/2" Elbows with inners & bullets | 6nos | | each | |
| 3.3 | 4 1/2" Couplings with inners & bullets | 20n os | | each | |
| 3.4 | 4 1/2" Field Flange with inners & bullets | 2nos | | each | |
| 3.5 | 4 1/2" to N Test Reducer | 1no | | each | |
| 3.6 | 3 1/8" to 4 1/2" reducer adopter | 2nos | | each | |
| 3.7 | 3 1/8" to 1 5/8" adopter/reducer | 2nos | | each | |
| 3.8 | 3- 1/8" Rigid Line | 18 M | | M | |
| 3.9 | 3- 1/8" Elbows with inners & bullets | 18n os | | each | |
| 3.10 | 3- 1/8" Couplings with inners & bullets | 40n os | | each | |
| 3.11 | 3- 1/8" Field Flange with inners & bullets | 4nos | | each | |
| 3.12 | 3- 1/8" to N Test Reducer | 2no. | | each | |
| 3.13 | 3 1/8" to 4 1/8" reducer adopter | 2 nos | | each | |
| | | | | | |

| S No. | Description | Qty. | Rate | Unit | Amount |
|-------|--|---------|------|------|--------|
| 3.14 | Reducer adopter 6-1/8" to 4-1/8" | 3 Sets | | Set | |
| 3.15 | Reducer adopter 6-1/8" to 4-1/2" | 3 Sets | | Set | |
| 3.16 | Any other accessories offered for the completeness of the system (Items wise details of offered and included material , items & part are to be given by the tenderer) | 1job | | job | |
| 3.17 | 1-5/8" to 7/8" Reducer/Adopter | 2 nos | | No. | |
| 3.18 | 1-5/8" rigid line | 6 M | | M | |
| 3.19 | 1-5/8" elbows with inner and bullets | 6 nos. | | each | |
| 3.20 | 1-5/8" couplings with inner and bullets | 6 nos. | | each | |
| 3.21 | 1-5/8" to N test reducer | 1 no. | | each | |
| 4 | Erection, testing and commissioning of antenna switch frame/panel as per specification including making various RF co-axial lines input /output connections for feeding to the lower and upper half of the 16 panel VHF FM antenna complete as required. | One job | | job | |
| 5 | (Dismantling of existing 16 P antenna) 5.1 Removing and stacking the existing 16 Panel VHF FM antennae panels, power divider branch feeders and associated accessories - in such a manner as the same can be dispatched and re-assembled at a new location. | One job | | job | |
| S No. | Description | Qty. | Rate | Unit | Amount |
| | (New Erection) 5.2 Erection, testing and commissioning of new 16 panel VHF FM antenna as per specification on the existing tower in the FM aperture after unpacking, physical checking/necessary care for the safety of the antenna system like cleaning, ingress of moisture pressurisation etc. at site before Erection in accordance with the Erection manual of the manufacturer along with hauling of the complete panel antenna system alongwith | One job | | job | |

| | | | | | |
|--------------|--|-------------|-------------|-------------|---------------|
| | reflectors ,power dividers, distributor feed cables complete, as per requirement at site. Existing TV Tower Height -300 M | | | | |
| 6 | (Dismantling of existing feeder cable) 6.1 Removing the existing 3-1/8" RF cable along with its mounting fixtures and accessories and packing the RF cable on cable drum and accessories in boxes, so as the same can be dispatched and used at new locations. (Existing TV Tower Height -300 M) | One job | | job | |
| S No. | Description | Qty. | Rate | Unit | Amount |
| | (New feeder cable 2x4-1/8" Erection) 6.2 Erection, testing and commissioning of new RF co-axial cables as per specification on the existing tower upto height of 300 M including modification/ fabrication of the cable tray as per drawing for the vertical portion alongwith supply of complete hardware material and accessories etc. complete as required at site. | One job | | job | |
| | 6.3 Erection, testing and commissioning of new Dehydrator with tubing and accessories including making pressurisation connections etc. as per specification / manufacture's recommendations complete as required at site. | 1job | | job | |
| | 6.4 Horizontal tray including protecting of MS canopy , rate per meter shall be quoted by the tenderer. (tentative quantity, however actual quantity in running length shall be paid to the tenderer by the indenter). | 30M | | M | |

| | | | | | |
|--------------|---|-------------|-------------|-------------|---------------|
| 7 | Checking of complete RF set up from transmitter to antenna as above before application of RF power and recording the test and measurement values in the form of graphical printout for necessary reference as per specification of technical parameters. | One job | | job | |
| S No. | Description | Qty. | Rate | Unit | Amount |
| 8 | Testing of the complete RF chain on full RF power from transmitter through combiners, antenna switch frame/panel (antenna patch panel) on the newly installed 2x4-1/8" RF cables on the 16 panel VHF FM antenna. | One job. | | job | |
| 9 | Final performance measurements of the complete RF chain i.e. RF cable, combiner, antenna switch panel/frame, 16 panel antenna as per specification alongwith graphical printouts of the measurements like VSWR/return-loss - for entire frequency range of 87.5 MHz to 100 MHz, isolation, horizontal/vertical pattern circulatory for omni-directional pattern. Actual F.S. pattern upto the signal strength of 48 dBu. Including actual F.S. pattern upto the signal strength for 54 dBu, 66 dBu & 74dBu . | 1job | | job | |
| 10 | Earthing of complete set up as per manufacturer recommendations.(Earthing kits for each RF cable are to be provided at different locations and complete earthing work shall be as per either manufacturer recommendation or as per AIR drawing TM - 15108/2 and TM-15175/2 | Three jobs. | | job | |

TOTAL AMOUNT: (In figures and words)

Note : 1) The tenderer shall take up the work at Metros in Mumbai in co-ordination/consultation with the concerned Superintending Engineer of AIR and Doordarshan and the Chief Engineer (West Zone), Project Wing and Maintenance Wing.

2)The Erection, testing & Commissioning work shall be carried out at site probably during the night hours from 0.00 hrs. to 05.30 hrs. after getting the written permission of the competent authority for the start of work in accordance with the terms and conditions mentioned in the permission issued by AIR Dte./ Doordarshan Dte.

3) Tenderer is required to take into consideration the aspect of the constraint in the time made available by the AIR for the Erection, testing & Commissioning work at the site as above and the job is required to be completed in the stipulated and scheduled time frame as given in the permission, as above.

4) 16 Panel VHF FM antenna, RF coaxial cables including Dehydrator with tubing and accessories, RF coaxial rigid lines combiner and Antenna switch Frame/panels will be part of supply to be arranged by the tenderer as per specification.

5) The dipole antennas and dehydrator required for **interim set up** shall be provided by AIR, however, fixing of these antennas will be undertaken by the tenderer as part of interim set up Erection.

6) The quantities mentioned in Section 6.0 of AIR Specification **Erection, testing and commissioning** are as per the tentative requirement anticipated.

7) The quantities mentioned in the schedule of requirement of **Erection, testing and commissioning** in SECTION 6.0 may **increase or decrease** as per site requirement. However payment will be made to the tenderer **as per actual quantity used / erected at site after satisfactory completion of work**.

Tenderer **shall quote the rates per meter length /per number / per job** in respect of Erection, testing and commissioning,

SECTION 6.0 SCHEDULE OF ERECTION, TESTING & COMMISSIONING

**SECTION 6.1 Schedule of Erection, testing & commissioning { of 16 panel VHF FM Antenna, RF Cable, Antenna switch panel/frame & Combiner, RF Rigid Lines & Accessories *including the interim set up* }
at Mumbai (page number 41 to 49)**

Signature of tenderer with date and seal

Full Name in CAPITAL LETTERS:

**(PURCHASE SECTION)
P & D UNIT, DG:AIR**