



Ministry of Information and Broadcasting

REPORT OF THE TECHNICAL COMMITTEE

**Constituted to short list equipment essential for
operating Community Radio Stations and lay down
their specifications**

28th JANUARY 2014

Report of the Technical Committee constituted to short list equipment essential for operating Community Radio Stations and lay down their specifications/Benchmarks

1. BACKGROUND

1.1 Ministry of Information and Broadcasting introduced a new scheme namely “Supporting Community Radio Movement in India” in the 12th five year Plan for providing financial support to new and existing Community Radio Stations under the component “Community Radio Support Scheme” (CRSS). Under the said scheme, the Ministry would grant financial support to Community Radio Stations for purchasing equipments essential for operating a CR Station to the extent of 50% of the total estimated expenditure, subject to a maximum ceiling of Rs. 7.50 lakhs. Detailed guidelines delineating procedure for implementing CRSS has been formulated. It has been envisaged in the guidelines that a Technical Committee would be set up in the Ministry in order to shortlist and lay down specifications for the equipments for which the grant is provided to Community Radio Stations under CRSS.

1.2. Hence, in order to shortlist and lay down benchmarks/specifications for equipment essential for operating a Community Radio Station, a Technical Committee was constituted by the Govt. vide Order No. 402/101/2012-CRS(Part), dated 31.07.2013 with the following composition:

(i)	Sh. V.K. Singla, Retd. E-in-C (AIR)	Chairman
(ii)	Sh. Yogender Pal, Advisor (DAS), Ministry of I&B	Member
(iii)	Sh. B.M. Baveja, Sr. Director & Group Coordinator, Department of Electronics & Information Technology, M/o Communications & IT	Member
(iv)	M.K. Pattanaik, A.W.A., Wireless Planning & Coordination Wing, Department of Telecommunication.	Member
(v)	Sh. N. Ramkrishanan, Community Radio Forum of India	Member
(vi)	Ms. Pinki Chandran, Community Radio Association	Member
(vii)	Ms Alka Malhotra, Prog. Comm Officer, UNICEF	Member
(viii)	Ms. Iskara Panveska, UNESCO	Member
(ix)	Archana Kapoor, Radio Mewat, Nuh, Mewat-122107	Member
(x)	Arti Jaiman, Gurgaon Ki Awaaz, Gurgaon, Haryana	Member
(xi)	Deputy Director (CRS), Ministry of I&B -	Member-Secretary

2. RECOMMENDATIONS OF THE COMMITTEE:

2.1 The first meeting of the Committee was held on 14.08.2013. Committee decided that following basic principles would be kept in mind while finalising the list of equipment and their benchmarks:

- a) No Member or his/her organisation should be associated with manufacturing/supplying of equipment etc. for CRS to avoid conflict of interest and maintain transparency.
- b) Only such equipment should be shortlisted which have provision of providing initial training and after sale support.
- c) Shortlisted equipment should be of good quality with reasonable price.
- d) The listed equipments should generate a multi vendor response and should not be specific to particular manufacturer/vendor.
- e) Before finalizing the list and benchmarks, committee should visit few operational stations.

2.2 Technical Committee visited functional Community Radio Stations, Gurgaon Ki Awaz and Radio Mewat on 26.08.2013. It was observed that one of the major difficulties being faced by CRS is technical support for setting up as well as maintenance. The biggest challenge for CRS is knowledge of Transmitters, Cable, Antenna & Towers. The coverage of station depends on the working of these systems. The CRS staff need continuous support and guidance on these issues. Report of the Chairman of Committee on the visit is at **Annexure-I**.

2.3 During visit committee also observed that:

- a) Audio quality of stations is poor & mushy. It was felt that the CR stations should use Audio Processor, which increases the average level of the audio signal.
- b) The loss due to RF cable is very high.
- c) The actual power being delivered by transmitter should be measured with the help of power meter and vendor/integrator should properly certify the power output of transmitter at the time of installation.
- d) CR stations should try to have separate earth for Audio to provide better quality.
- e) In rural/remote areas Diesel may not be easily available at all time for running DG set. Therefore, solar power generator may also be used in place of DG set.
- f) A facilitation/support centre is must to provide continuous technical support/guidance to community radio stations.

2.4 After detailed discussions and visit to operational stations, the committee shortlisted following 18 equipment for providing financial assistance under the said scheme:

**LIST OF EQUIPMET TO BE SUPPORTED UNDER THE PLAN SCHEME
“SUPPORTING COMMUNITY RADIO MOVEMENT IN INDIA”**

S.N.	Name of equipment/quantity to be supported
1	50 W FM Transmitter in 1+ 1 configuration with rack
1A	50 W FM Transmitter (Single)
2	Transmission Tower, any one of the following:
A	Self Supported Transmission tower up to 30 meter
B	Guyed wire Transmission tower up to 30 meter
C	Concrete Transmission tower up to 30 meter
3	2 bay, vertically polarized (Omni Directional) VHF Transmitting Antenna conforming to WPC regulation
4	Low loss RF Cable with N connector on both ends
5	Off Air Monitoring set up/Logger
6	Monitor, 50 W
7	8 Channel on-air Broadcast console 1+1
8	Dynamic cardioids/condenser Microphones up to 6 nos.
9	Portable solid state field recorders up to 8
10	Headphones- up to 8
11	Personal computers –up to 5 (one with on air recording/automation software)
12	2 channel sound card with differential input –up to 5
13	3 KVA, 3 phase or single phase input online UPS with 30 minutes back up
14	Phone in equipment up to 4 lines with provision conference facility/Phone in system.
15	3 KVA generator set/Solar Power Generator
16	Split air conditioners, 0.5 ton to 1.5 ton -2 Nos
17	Audio Processor
18	Dummy Load

2.5 Committee finalized the benchmarks/specifications for each of the shortlisted item, which were then placed in public domain on 16.12.2013 to obtain comments/remarks of stakeholders for transparency. The last date for furnishing comments was 31.12.2013.

2.6 Following three organizations furnished comments by due date i.e. 31.12.2013:

- (i) Broadcasting Engineering Consultants India Ltd.
- (ii) Community Radio Station, Radio Bundelkhand
- (iii) HDL

2.7 The Committee considered the comments received in its meeting held on 10.01.2014. The details of the comments received and the view/decision of the committee thereon is at **Annexure-II**.

2.8 The final specifications of shortlisted equipment, after incorporating the suggestions received are at **Annexure-III**.

Sh. V.K. Singla,
E-in-C (Retd), All India Radio

Sh. Yogender Pal, Advisor (DAS),
Ministry of I & B

Sh. B.M. Baveja, Sr. Director &
Group Coordinator, Department
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M.K. Pattanaik, A.W.A.,
Wireless Planning & Coordination
Wing, Department of
Telecommunication

Ms Alka Malhotra, Prog.Comm
Officer, UNICEF

Sh. N. Ramkrishanan, Community
Radio Forum

Archana Kapoor, Radio Mewat

Ms. Pinki Chandran, Community Radio
Association

Arti Jaiman, Gurgaon Ki Awaaz

ANNEXURE-I

The Technical committee for Community Radio Support Scheme (CRSS) visited community Radios “Gurgaon Ki Awaj” & Mewat F.M. on 26/08/2013 to see the equipments installed at CRS to finalize the list of equipments for CRSS. This is being discussed on the next meeting of the Technical Committee to prepare the specification of equipments.

During the visit it was found that one of the major difficulties faced with the CRS is Technical support in addition to financial constraints faced by the station.

This technical support is not only required during the setting up of this CRS but also afterwards for its maintenance etc. Normally the difficulties faced in the station chain/Recordings can be given requisite training for the same. Infact, it was found that some innovations were also made locally for acoustic treatment of multi-purpose studio e.g. by using egg trays etc.

But, the actual position regarding echo of R/T of the studio and how can these be controlled or even leakage of sound through doors etc. may require some guidance for CRS. Use of microphones/balancing etc. may also be informed for better use/recordings.

There seems to be some problems due to earthing of CRS station especially audio earths which have not been provided separately. This can help in reduction of noise in the programs relayed by CRS.

The biggest challenge seems to be for the knowledge of F.M. Transmitters, Cable, Antenna & Tower. It's found that these may not be understood by the Local staff and is like a black box for them. But proper working of these plays an important role for coverage area of the Transmitters. The main issues in this regard can be:-

- Output power of F.M. Transmitter may be less.
- The transmitter may not be properly matched.
- The rating of cable/loss in cable may not be proper.
- Gain of the antenna may not be as per standard.
- The direction of antenna may not be proper.
- The connectivity of antenna may not be proper especially if aluminum antenna is provided.
- The tower may be tilted due to loosening of Guy Ropes etc. leading to tilt of antenna.
- Proper protection from lightening may not be provided. Area of coverage of 50 Watt Transmitters for CRS with ERP of 100 watt on 30 mts tower may be around 7-8 kms. But it seems, no such survey/field strength measurements are taken after installing CRS. These reading can be taken as a reference in future for any deterioration of equipments/faults in the R.F. Chain.

Since there is virtually no knowledge of these aspects with CRS staff, they can be given guidance or even help as a support for the system. Even the repair of equipments especially F.M. Transmitter is a big issue with CRS. Support can be given for this during normal running of the CRS or even while installing. It can help CRS in proper coverage of their programs which was found lacking in both the centers visited on 26/08/2013.

Sd/-
(V.K.Singla)
Engineer Chief (Rtd.)
AIR, & Chairman Technical Committee

ANNEXURE-II**COMMENTS RECEIVED FROM STAKE HOLDERS/VENDORS ON THE LIST OF EQUIPMENT ESSENTIAL FOR OPERATING COMMUNITY RADIO AND THEIR SPECIFICATIONS.****1. Broadcasting Engineering Consultants India Ltd. (BECIL):**

S.N	Comments of BECIL	Decision/views of Technical Committee
1	<p>1. 50 Watt FM Transmitter (Page – 4)</p> <p>a) Frequency: May be changed to: 88 – 108 MHz.</p> <p>b) Electricals: A.C. Input: May be changed to: 230 V \pm 10%, 50 Hz \pm 3 Hz.</p> <p>c) Environmental: May be added : Relative Humidity : 90 %, Non – Condensing,</p> <p>The following specs may be added / included.</p> <p>a) Output Power : 50 Watt, Capable to deliver 60 Watt continuously Output impedance: 50 Ohms, Unbalanced</p> <p>b) Permissible VSWR : Less than 1.50</p>	<p>a) Committee decided that the broadcasting band is from 87.5 MHz to 108 MHz. Therefore it should not be changed. The transmitter will broadcast only on the frequency allocated. Changing of frequency from 88-108 MHz may also lead to problem in case of imports etc. Therefore, it was decided not to change it.</p> <p>b) A.C. Input of 230 V \pm 10% may be of very high end and may not get multivendor response, which will be against basic principles adopted for laying the specifications.</p> <p>c) Committee is of the view to keep specifications as simple as possible and features which do not make much difference may be left out. Therefore, committee decided not to include relative Humidity.</p> <p>a) Output Power/impedance: With regard to 60 Watts continuous power, it was felt that it may become brand specific. However, it was decided to include 50 Watts continuous power for 24 hours and not more than 60 Watts. Output impedance of 50 Ohms Unbalanced was accepted.</p> <p>b) Committee also accepted and incorporated VSWR in transmitter specifications.</p>

2	<p>2. Mast or Transmission Tower</p> <p>i) Page No. 5, 1st Para, Lines 3 & 4 may be modified as: Masts / Towers may be procured. The offer must include Supply and Erection of Tower, including construction of foundations, mounting of antenna, R.F. Cable and Cable Tray.</p> <p>ii) Page No. 5: Self Supporting Mast: 1st Line to be modified as: “Latticed Steel, Self Supporting Tower are ideal for installations where space</p> <p>a) Page No. 6 : Anchors: Sr. Nos., 2 & 3 may be modified as :</p> <p>2. Dia of Anchor Bolts: 16mm</p> <p>3. Length of Anchor Bolts: As per requirement.</p> <p>b) Page No. 8: B “Lattice Steel” may be added to the heading.</p> <p>c) Page No. 9: “Lattice Steel” may be added to the heading of Fig.</p>	<p>i) Although the specifications of Masts/Towers have details about Foundations, antenna hosting and cable routing etc., however, committee decided to incorporate the comments in the specifications to have more clarity.</p> <p>ii) Committee was of the view that mentioning of Latticed Steel is not necessary as requirements of wind load and wind velocity etc. for mast/tower have been specified, irrespective of type of steel.</p> <p>a) The committee accepted proposed modifications in Anchors and decided to incorporate them in specifications.</p> <p>b) & c): Not accepted, as mentioned in comments 2(ii) above.</p>
3	<p>3. VHF Transmitting Antenna (Page No. 12)</p> <p>a) Impedance: May be changed to: 50 Ohms, unbalanced.</p> <p>b) Gain: May be changed to 3 db (5 dbd). The words “(ERP) should not exceed 100 W” may be deleted as ERP is system calculation for technical parameters and not function of antenna.</p>	<p>a) Impedance of 50 Ohms, unbalanced was accepted and incorporated.</p> <p>b) Gain of 3db was also accepted and incorporated. Also, it was decided to remove the line 100 W ERP from antenna and mention it separately.</p>
4	<p>4 Specifications of Low Loss Feeder Cable with N- Connector</p> <p>The size of the cable may be changed to ½” Foam Di-electric Cable, which is easily available as well produced in India also. The proposed 5/8” Air Di-electric Cable is not easily available in India and is costly and not commercially viable for a CRS. Moreover, a De-hydrator is required to remove moisture from the Air</p>	<p>After discussion, committee accepted the justification and decided to change the cable size of ½” or 5/8” Foam Di-electric type, instead of including De-hydrator.</p>

	Dielectric Cable and neither De-hydrator is included in the list of CRS Equipment nor its specifications are given. For Foam Di-electric Cable, dehydrator is not needed.	
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2. Radio Bundelkhand:

S.N	Comments of Radio Bundelkhand	Decision/views of Technical Committee
1	<p>Page 5 (A) Please add the following component:</p> <p>Chemical Earthing</p> <p>The concept of Earthing is changing from made to order earthing to readymade earthing which is available off the shelf from an electrical dealer in your electrical market and is an easy ready-to-install component.</p>	<p>The standard/norms for earthing have been specified, which can be provided with any kind of earthing. Therefore, mentioning of a specific kind of earthing has no relevance.</p>
2	<p>Page 12 Please add the following component:</p> <p>The Dummy Load</p> <p>This is basically a resistor, but constructed in such a way that it presents a load to the amplifiers output independent of frequency (unlike the aerial). The three characteristics of a dummy load we're interested in are:</p> <ol style="list-style-type: none"> 1. It should be suitable for the frequency we're interested in, about 100MHz, 2. It should be rated to take the power we're trying to produce, 3. It should have a resistance of 50R (to match the output network of the amplifier). 4. Dummy loads designed for the 2 meter band will work well in the VHF FM band. Most test gear for this band (dummy loads, VSWR meters, power meters, wave meters, RF voltmeters, frequency counters etc.) will work on the frequencies we're interested in. 5. Even if you tune everything correctly 	<p>Committee agreed to include a Dummy Load of 50 Watt, matching transmitter specifications.</p> <p>With regard to low pass/band pass filter to stop broadcast of harmonics, committee decided to incorporate following specification in transmitter specifications:</p> <p>“ Transmitter should comply ITU norms for Harmonic separation.”</p>

	<p>you're still going to have some harmonics generated by the last stage. A sensible operator won't let these harmonics reach the aerial.</p> <p>6. To stop harmonics reaching the aerial we need either a Low Pass Filter or a Band Pass Filter.</p> <p>Band pass Filter A Band pass Filter (BPF) only allows through a narrow band of frequencies, i.e it has a narrow bandwidth, a good one would be less than 1MHz. It needs standard 50R input and output impedance and be able to take the power you want to use. It also has to be tuned to the frequency you want let through.</p> <p>A well-designed TX will have a filter built into it. It needs to be in a well screened case to stop harmonics leaking out.</p>	
3	<p>Page 15 (7) On-Air Broadcast Console/Mixer: Minimum required quantity 2 or more should be added.</p>	<p>The list of equipments, already mentions 1+1 Broadcast console.</p>
4	<p>Page 17 (9) Use of Portable Solid State Field Recorder:</p> <p>In the view of community radio set-up, MP3 based field solid state would be better option instead of wav format recorders. An average CR generates approximate 300-400 mb data per day so they need MP3 recorders to minimize HDD space and these are available (branded model) in range of 6000/- to 8000/- Rs. in the local market</p> <p>One minute of music, sampled at CD quality will make a file about 10 MB in size! With the average song being 3 min. long, .wav files have a voracious appetite for hard drive space. Files this large are also difficult to transfer over the internet. If the rate of sampling is lowered, the file size can be reduced at the expense of lower quality sound. MP3 was developed as a form of compression which will reduce the size of .wav files, with minimal loss of</p>	<p>For use MP3 based field recorders, it was decided that wave format is a mother format, which may be converted in other formats. Also, the editing is easier in wave format.</p> <p>Therefore, committee decided to keep initially wave format only and reconsider it in future reviews based on the response of stations.</p>

	quality.	
5	Page 20 Personal Computers (11): Required quantity at least 2 Nos. with external professional quality sound card (if it is used with analog channel mixer)	The quantity of Personal Computers is already mentioned up to 5. The stations may choose any quantity as per their requirement and budget.
6	Page 21 UPS & Battery 3.3 Back up time: 30 minutes - is not sufficient (at full load?)	UPS with more than 30 minutes back up are costlier and not available easily. In addition, provision of DG set has also been kept. Therefore, it was not accepted.
7	Page 22 14. PHONE- IN- UNIT: Please give specific brand name of telephone hybrid system.	A particular brand name cannot be specified. Stations may choose any brand which complies with the bench marks laid down.
8	<i>If possible, please add estimated INR values of illustrated equipments. This is a very crucial component for CRS. It will be useful, if you could provide these in three categories with varying budget pockets viz. Low cost, medium cost and high cost.</i>	To provide the estimated values is not the mandate of Technical Committee. Also, the values would depend on the brand selected by the station. However, CRS PMU/Screening Committee may consider listing approximate costs.

3. HBL Power Systems Ltd.:

S.N	Comments of HBL	Decision/views of Technical Committee
1	Outer Diameter of Concrete Tower: As requirement is from 15Mtr to 30 Mtr, hence outer diameter of tower will vary. However for 30 Mtr tower outer diameter of Bottom is 600mm and tapering to 190mm at the top is sufficient. Hence request to modify the clause accordingly.	Committee agreed and comments were incorporated in the specifications.
2	Lightening Arrestor: As per the spun concrete tower design, internal earthing arrangement is available, hence no separate braided copper wire is required for lightening arrestor from the top of the tower to nearest earth pit.	Committee agreed and comments were incorporated in the specifications.
3	Antenna hoisting arrangement: As Spun concrete tower is circular, hence no 3 faces. We request to modify the clause accordingly stating that "Antenna shall be made on circular faces of the tower. This supporting pole will be fixed in VHF FM	Committee agreed and comments were incorporated in the specifications.

	Band-II aperture on one of the circular face”,	
4	Painting: As tower is of concrete, hence primer coats are not required. We request to modify the clause accordingly.	Committee agreed and comments were incorporated in the specifications.
5	Earthing: As per the spun concrete tower design, internal earthing arrangement is available, hence no separate braided copper wire is required for lightning arrestor from the top of the tower to nearest earth pit.	Committee agreed and comments were incorporated in the specifications.

ANNEXURE-III**List of CRS equipment to be supported under the Plan Scheme “Supporting Community Radio Movement in India”**

S.N.	Name of equipment
1	50 W FM (CRS) Transmitter in 1+ 1 configuration with rack
1A	50 W FM (CRS) Transmitter (Single)
2	Transmission Tower, any one of the following:
A	Self Supported Transmission tower up to 30 meter
B	Guyed wire Transmission tower up to 30 meter
C	Concrete Transmission tower up to 30 meter
3	2 bay, vertically polarized (Omni Directional) VHF Transmitting Antenna conforming to WPC regulation
4	Low loss RF Cable with N connector on both ends
5	Off Air Monitoring set up/Logger
6	Monitor, 50 W
7	8 Channel on-air Broadcast console 1+1
8	Dynamic cardioids/condenser Microphones up to 6 nos.
9	Portable solid state field recorders up to 8
10	Headphones- up to 8
11	Personal computers –up to 5 (one with on air recording/automation software)
12	2 channel sound card with differential input –up to 5
13	3 KVA, 3 phase or single phase input online UPS with 30 minutes back up
14	Phone in equipment up to 4 lines with provision conference facility/Phone in system.
15	3 KVA generator set/Solar Power Generator
16	Split air conditioners, 0.5 ton to 1.5 ton -2 Nos
17	Audio Processor
18	50 Watts Dummy Load, matching transmitter specifications

BENCHMARKS/SPECIFICATIONS OF EQUIPMENT TO BE SUPPORTED UNDER THE PLAN SCHEME “SUPPORTING COMMUNITY RADIO MOVEMENT IN INDIA”

1. 50 Watt FM (CRS) Transmitter

The transmitter must be capable of delivering 50 Watt continuously for 24 hours and not more than 60 Watts conforming to ITU norms for operation between 87.0 Mhz to 108 mhz along with technical manuals for instalation, testing, commissioning, operation & maintainance, including theory of operation and fault diagnosis. The equipment must have onsite warntee for one year of operation or 1.5 years of supply, which ever is earlier. In addition vendor/supplier is to provide training on operationa and maintainance of the transmitter to the operating staff. All measurement and test certificates from concerned authorities, where ever specified, should accompy the transmitter.

Deatiled specifications are as below:

Audio input	XLR connector, balanced or unbalanced, true differential, nominal input impedance of 10 k Ω , +4 dBm @ 75kHz Deviation
THD	< 0.01%, 30Hz-15 kHz
Output Impedance	50 Ohms, unbalanced
Frequency	87.0-108 MHz
Frequency	Crystal controlled, +/- 200 Hz, complying with ITU specifications.
Audio response	\pm 0.5 dB 20 Hz to 15 kHz
Signal to Noise Ratio	1. Weighted > 70 db 2. Unweighted > 75 db
AM Synchronous	> 60 db
AM Asynchronous	> 65 db
Harmonic Separation	Should comply ITU norms for Harmonic Separation

VSWR	Transmitter should be capable to withstand VSWR up to 1.5
Analog metering display	PA DC Voltage and current, RF forward power at PA and reflected power at PA
LED Indication	Integrated fault, VSWR fault
Monitoring	Built in on-board FM demodulator. Standard audio line output on XLR for monitoring. LED bargraph display to indicate the frequency deviation of the transmitter.
Electricals	AC input: 230 V \pm 5%, 50 Hz, \pm 3 Hz
Environmental	Ambient Temperature range: -5°C to + 45°C
Cabinet	Standard 2U height cabinet with 19" rack mounting fixture.

2. Mast or Transmission Tower

Mast (tower) is used to mount antenna at a desired height. For community radio maximum height of antenna should not exceed 30 meter from ground level. Any one of the following types of Masts/Towers may be procured. The offer must include Supply and Erection of Tower, including construction of foundations, mounting of antenna, R.F. Cable and Cable Tray.

- i) **Guyed Mast:** A guyed mast is a tall thin vertical structure that receives support from guy lines. It is cheapest, but requires lot of space.
- ii) **Self-Supporting Mast:** Self-supporting Towers are ideal for installations where space requirements are limited. It is costlier than guyed mast.
- iii) **Concrete Tower:** Reinforced concrete towers are relatively expensive to build but provide a high degree of mechanical rigidity in strong winds.

A. Specifications of Guyed Mast:

- i) Height: Maximum 30 Meter & Minimum 15 meter (From Ground)
- ii) Wind load: 47 kg/cm²
- iii) Wind Velocity: 170 km/hour
- iv) Able to bear a load of 25 kg in addition to cable, cable tray & ladder
- v) The design should be approved/vetted by a recognised Engineering College/Institute

Mast Section:

1	No. of Sections	Minimum 8 sections
2	Length of Each Section	3 to 4 meters
3	Make & finish	Hot Dip Galvanized
4	Cross Section	Triangular with 3 vertical on 3 corners of triangle of side 12 inches.

Lower Base Plate

1	Length minimum	500 mm
2	Breadth minimum	500 mm
3	Thickness	10 mm
4	Finish	Hot Dip Galvanized

Guys

1	Min. No. of Guy Levels	4 Nos.
2	Min. Guys per Level	3 Nos.
3	Min. dia of the Guy	8 mm.
4	Construction of Guy	6x19 Hemp Core
5	Min. Length of Guys	To suit the base.

Foundation Bolts

1	No. of Foundation bolts	4 Nos.
2	Dia. Of foundation bolt	Min 20 mm

Anchors

1	No. of Anchors	3 Nos.
2	Dia of Anchors Bolts	16 mm
3	Length of Anchors Bolts	As per requirement

Straining Screws

1	No. of straining screws	1 No. per guy
2	Dia of Bolt	Min 16 mm
3	Length of straining screw	18"
4	Finish	Zinc Plated

Dee Sackles

1	No. of Dee-Shackles	3 nos. per guy
2	Dia. Of Dee-Shackles	10 mm
3	Finish	Zinc Plated

Thimbles

1	Size	10 mm
2	Quantity	2 nos. per guy
3	Finish	Zinc Plated

Lightening protection: The tower will be provided with a suitably designed system of lightening protection in accordance with the provision of IS:2309/1969. Braided copper wire will be provided for Lightening Arrestor from top of the tower to the nearest earth pit.

Foundation: Suitable RCC foundation based on the site condition, local terrain, soil conditions, nature of sub soil, water table and its seasonal variations etc will be laid. Foundation will be protected by provision of pitching work on sloping terrain to protect the foundation from erosion. The cement, sand, and concrete used shall be of best grade in the standard ration 1:2:4. The foundation shall be watered and cured is thoroughly cured.

Antenna hoisting arrangement: Provision for fixing 100 mm dia N.B. Supporting seamless GI pipe of 8 meter length for side mounting VHF FM Pole type Antenna shall be made on three faces of the tower. This supporting pole will be fixed in VHF FM Band-II aperture on one of the three faces, to be intimated at the time of erection of tower based on the coverage requirements. The fixtures of the antenna shall not foul with the cable routing from the power divider to the antenna.

RF coaxial cable routing: The cable run between the tower base and transmitter building shall be through a horizontal cable G.I. pipes or G.I. angle iron structures and the rack will be covered by Semi Circular G.I. Sheet cover.

Painting: The tower shall be provided two or more coats of paints in addition to two primer coats after erection. The tower shall be painted to have equal alternate bands of international orange and white colors with top and bottom painted in orange as per latest Civil Aviation Regulations.

Earthing: The tower shall be provided with a suitably designed complete system of lightening protection in accordance with the provision of IS:2309/1969 including necessary earthing based on the specific resistivity of the soil and sub-soil water level. Braided copper wire of 30 square mm dia to be provided for Lightening Arrestor from top of the tower to the earth pits.

B. SELF SUPPORTED TRANSMISSION TOWER

- i) Height: Maximum 30 Meter & Minimum 15 meter (From Ground)
- ii) Wind load: 47 kg/cm²
- iii) Wind Velocity: 170 km/hour
- iv) Able to bear a load of 25 kg in addition to cable, cable tray & ladder
- v) The design should be approved/vetted by a recognised Engineering College/Institute

Construction details: Steel members and section used in the fabrication are galvanized, conforming to relevant IS specification i.e. IS: 2629 for tower members IS: 1367 for fasteners and IS:1573 for washers: Structural steel of the tower members conform to IS: 8500, IS:226, IS:2062 and IS:7215 or latest IS as applicable. Assembly of all tower members and other structures on tower shall be by means of hexagonal nuts and bolts along with locking nuts. Minimum thickness of members should be 4 mm. The bolts are treated with standard threads to take the full depth of the nut. The overall force co-efficient the solidity ratio, actual obstruction area of tower has been considered. The basic wind velocity for the site has been taken from the revised BIS Code No. IS:875/1987. The schematic of the tower is provided on the overleaf.

Lightening protection: The tower will be provided with a suitably designed system of lightening protection in accordance with the provision of IS:2309/1969. Braided copper wire will be provided for Lightening Arrestor from top of the tower to the nearest earth pit.

Foundation: Suitable RCC foundation based on the site condition, local terrain, soil conditions, nature of sub soil, water table and its seasonal variations etc will be laid. Foundation will be protected by provision of pitching work on sloping terrain to protect the foundation from erosion. The cement, sand, and concrete used shall be of best grade in the standard ration 1:2:4. The foundation shall be watered and cured is thoroughly cured.

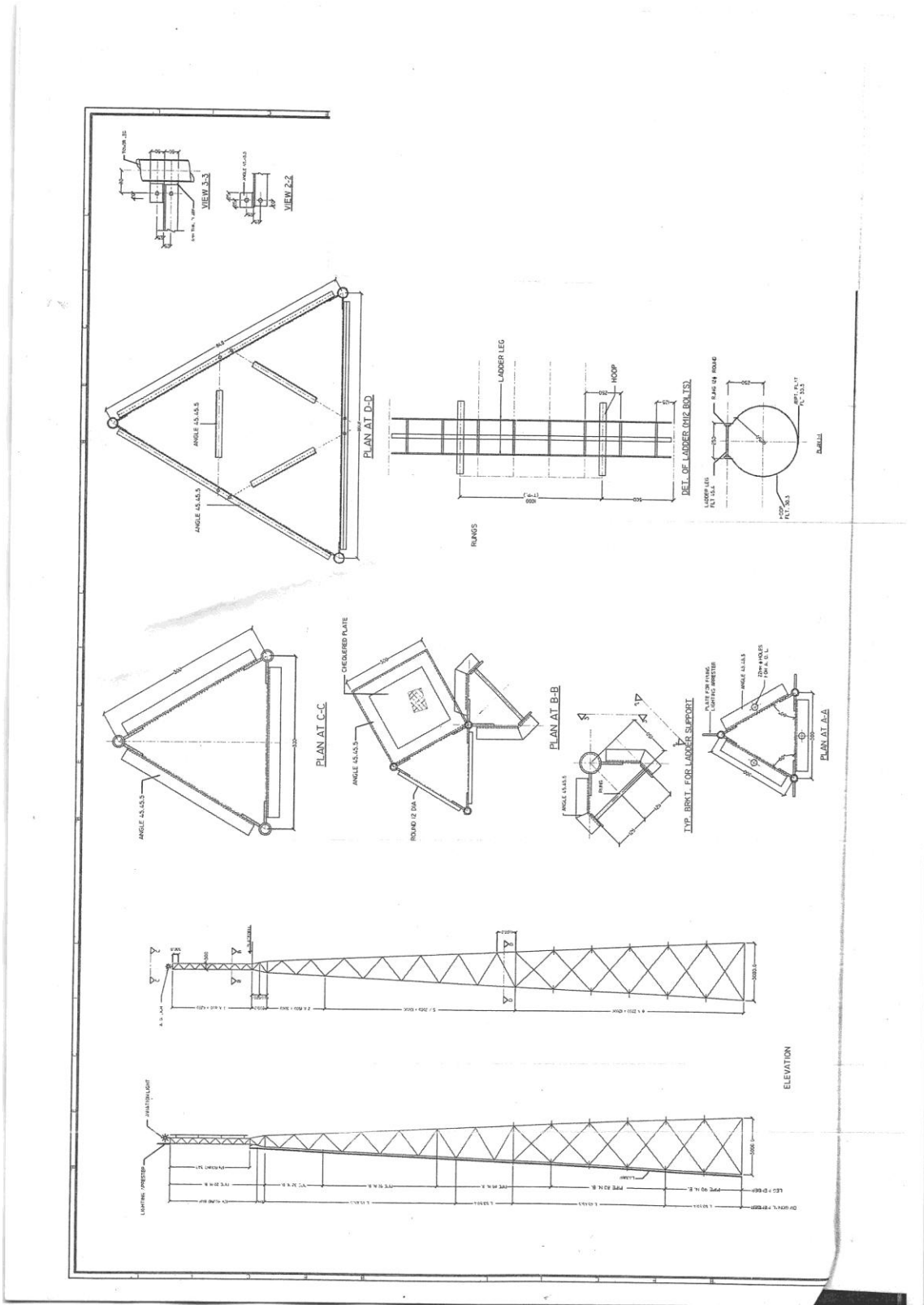
Antenna hoisting arrangement: Provision for fixing 100 mm dia N.B. Supporting seamless GI pipe of 8 meter length for side mounting VHF FM Pole type Antenna shall be made on three faces of the tower. This supporting pole will be fixed in VHF FM Band-II aperture on one of the three faces, to be intimated at the time of erection of tower based on the coverage requirements. The fixtures of the antenna shall not foul with the cable routing from the power divider to the antenna.

RF coaxial cable routing: The cable run between the tower base and transmitter building shall be through a horizontal cable G.I. pipes or G.I. angle iron structures and the rack will be covered by Semi Circular G.I. Sheet cover.

Painting: The tower shall be provided two or more coats of paints in addition to two primer coats after erection. The tower shall be painted to have equal alternate bands of international orange and white colors with top and bottom painted in orange as per latest Civil Aviation Regulations.

Earthing: The tower shall be provided with a suitably designed complete system of lightening protection in accordance with the provision of IS:2309/1969 including necessary earthing based on the specific resistivity of the soil and sub-soil water level. Braided copper wire of 30 square mm dia to be provided for Lightening Arrestor from top of the tower to the earth pits.

Fig: SELF SUPPORTED TRANSMISSION TOWER



C. Concrete Tower:

Report of Technical Committee constituted to lay down specifications/benchmarks for CRS equipment

DETAILS OF THE MONOPOLE

The 30 m high pre-stressed spun concrete monopole, self-supporting with mountings at different heights. The entire height of the monopole is to be divided into minimum 3 panels/segments. As requirement is from 15Mtr to 30 Mtr, hence outer diameter of tower will vary. However, for 30 Mtr tower outer diameter of Bottom must be 600 mm with tapering to 190 mm at the top. The cross-section should be annular with thickness varying along height capable of the following:

- i) Height: Maximum 30 Meter & Minimum 15 meter (From Ground)
- ii) Wind load: 47 kg/cm²
- iii) Wind Velocity: 170 km/hour
- iv) Able to bear a load of 25 kg in addition to cable, cable tray & ladder
- v) The design should be approved/vetted by a recognised Engineering College/Institute

ANALYSIS AND DESIGN

The monopole should be analysed for the various load combinations. The monopole should be modeled as a beam element. The wind load on the pole should be calculated by using the Gust factor method as per Clause 8 of IS 875 – Part 3.

The wind loads due to antennae and the panels should be calculated and applied in the analysis. Dynamic analysis should be done and analysis results to be presented.

As per IS 456 – 2000, the following load combinations should be considered in the analysis:

- (i) 1.0 Dead load (DL) + 1.0 Wind Load (WL)
- (ii) 1.5 Dead Load + 1.5 Wind Load
- (iii) 0.9 Dead Load + 1.0 Wind Load

The design of the pre-stressed monopole is to be done as per the limit state method. The limit state for serviceability and collapse is to be checked for the worst load combination of DL + WL (for service load combination) and 1.5DL + 1.5WL (for ultimate load combination).

LIMIT STATE OF SERVICEABILITY - DEFLECTION

The deformations under service loads at any point on a structure shall not exceed the following:

- (i) A rotation of 4 degrees about the vertical axis (twist) or any horizontal axis (sway) of the structure.
- (ii) A horizontal displacement of 3% of the height of the structure.

LIMIT STATE OF SERVICEABILITY – CRACKING

Cracking should be within permissible limits given in clause 22.7.1, IS 1343-1980, for type 3 members.

LIMIT STATE OF SERVICEABILITY – MAXIMUM COMPRESSION

Maximum permissible compressive stress in flexure due to final pre-stress should be as per clause 22.8.1.1, IS 1343 – 1980,

LIMIT STATE OF COLLAPSE – FLEXURE

The design of the section for the ultimate moment should be based on Clause 22.1.1 of IS 1343 – 1990.

Lightening protection: The tower will be provided with a suitably designed system of lightening protection in accordance with the provision of IS:2309/1969.

Foundation: Suitable RCC foundation based on the site condition, local terrain, soil conditions, nature of sub soil, water table and its seasonal variations etc will be laid. Foundation will be protected by provision of pitching work on sloping terrain to protect the foundation from erosion. The cement, sand, and concrete used shall be of best grade in the standard ration 1:2:4. The foundation shall be watered and cured is thoroughly cured.

Antenna hoisting arrangement: Provision for fixing 100 mm dia N.B. Supporting seamless GI pipe of 8 meter length for side mounting VHF FM Pole type Antenna shall be made on circular faces of the tower. This supporting pole will be fixed in VHF FM Band-II aperture on circular faces of the tower, to be intimated at the time of erection of tower based on the coverage requirements. The fixtures of the antenna shall not foul with the cable routing from the power divider to the antenna.

RF coaxial cable routing: The cable run between the tower base and transmitter building shall be through a horizontal cable G.I. pipes or G.I. angle iron structures and the rack will be covered by Semi Circular G.I. Sheet cover.

Painting: The tower shall be provided two or more coats of paints after erection. The tower shall be painted to have equal alternate bands of international orange and white colors with top and bottom painted in orange as per latest Civil Aviation Regulations.

Earthing: The tower shall be provided with a suitably designed complete system of lightening protection in accordance with the provision of IS:2309/1969 including necessary earthing based on the specific resistivity of the soil and sub-soil water level.

3. VHF TRANSMITTING ANTENNA

An antenna is an electrical device which converts electric power into radio waves. For community radio antenna must be wideband with copper dipoles and stainless steel/copper mounting boom. It should have weather and corrosion resistance to suit tropical climate.

Frequency	87.0 MHz to 108 MHz
Power Rating	200 Watt
Impedance	50 Ohms, Unbalanced
Return loss at frequency of operation	Better than: 23 dB (VSWR 1.15) (factory tuned at operating frequency) Typical: 26 dB (VSWR 1.1)
Beam width V	Less than 80°
Beam width H	omnidirectional
Pattern	Offset Circular
Polarization	Vertical
Termination	N – Male
Gain	3 dBd*
Clamps	GI
Bays	2
Max Wind Velocity	150 Km/hour
Wind Load (with speed at 150 Km/hour)	10 kg
Lightning protection	DC grounded
Mounting Position	End

- * **The Effective Radiated Power (ERP) of the system (i.e transmitter power + antenna gain – cable loss) should not exceed 100 Watts**

4. Specifications of Low Loss Feeder Cable with N Connector

Foam Di-electric RF Cable of 1/2" or 5/8" size to connect the transmitter with antenna. Its inner conductor (wire) should be made of copper/Copper clad Aluminum Wire and outer conductor of corrugated copper. The detailed specifications are as below:

Attenuation of Power: Below 2.3 db /100 meter (0.688 db/100 feet) (over the complete range 87.5 to 108 MHz.)

Cable Type : Foam Dielectric
Size : 1/2 Inch or 5/8 Inch

STRUCTURE :

	½ Inch	5/8 Inch
Inner Conductor Material	Copper Wire / Copper Clad Aluminum Wire	Copper Wire / Copper Clad Aluminum Wire
Diameter Inner Conductor	4.6 to 4.8 mm	6.3 mm
Diameter Dielectric, mm (in)	11.3 to 12.1 mm	13.7 mm
Outer Conductor Material	Corrugated Copper	Corrugated Copper
Diameter Copper Outer Conductor	13.8mm	19.0 mm
Diameter Over Jacket Nominal,	16 to 16.2 mm	21.4 mm
De-electric	Foam	Foam

MECHANICAL SPECIFICATIONS :

Cable Weight	0.22 to 0.23 Kg /Meter	0.70 Kg/meter
Minimum Bending Radius, Single Bend	70 to 125 mm	80 mm
Minimum Bending Radius, Repeated Bends	125 mm	250 mm
Tensile Strength, N	1100 N	2400 N

ELECTRICAL SPECIFICATIONS :

Impedance	50 ± 1.0 Ohm	50 +/- 1.0 Ohm
Peak Power Rating	30 kW	30

TEMPERATURE RANGE :

Operation Temperature	-25 to + 65°C	-25 to + 65°C
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5.

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Recording time:	90 Days minimum for 24 hours
Analog line inputs:	Balanced (XLR breakout cable supplied)
	+24dBu clipping level (+8 / +4 / 0dBu nominal level)
	20k input impedance
	48kHz sampling
	24-bit converters
	80kbps / 128kbps / 256kbps / lossless compression (selectable per channel)
ES-3 line inputs:	transformer-coupled (XLR breakout cable supplied)
	32kHz – 96kHz 24-bit sampling
	80kbps / 128kbps / 256kbps / lossless compression (selectable per channel)
Analog line output:	Balanced (XLR breakout cable supplied)
	40 ohm output impedance (minimum load 600 ohms)
	+24dBu peak level (+8/+4/0dBu nominal level)
AES-3 line output:	transformer-coupled (XLR breakout cable supplied)
	48kHz 24-bit sampling
	External AES-11 sync input
Skimming:	16 optically-isolated user-assignable inputs
	Daily event list display linked to audio log
	Sequential playing and archiving of multiple events
FM Capture:	87.5 – 108.5MHz tuning range (50kHz steps)
	BNC antenna connection
	48kHz sampling
	64kbps compression
	Maximum 24 stations
	Optional RDS Program Information and Radio Text logging
Storage:	Up to 3 x 2TB SATA hard discs
	RAID-5 (striping) or RAID-1 (mirroring)
	DVD R/W drive (+/- formats supported)
Processor:	64-bit Pentium dual-core or quad-core
	2GB RAM
Operating system:	Windows based 64-bit edition or equivalent

6. STUDIO MONITOR

A 50 watt active monitor, required to monitor the quality of programme, with following specifications:

General Features:

1. Active Monitors shall be professional, high quality, near field (1 to 1.5 Mtr. distance) and suitable for continuous use in Broadcast studios.
2. Monitor shall have attractively designed rugged & magnetically sealed enclosure/cabinet.
3. The Loudspeakers in the Monitors shall be of high fidelity two-way speaker system consisting of woofer & tweeter.
4. Active Monitor shall be Bi-amplified (i.e. it will have two amplifiers, one for connection to the woofer section of a loudspeaker while the other for connection to the combined mid and tweeter section) and shall have perfectly matched active crossover network.
5. Monitor shall have balanced XLR connector for feeding audio input to monitor.
6. Monitor shall have overall volume control facility for precise overall level matching.
7. Monitor shall have low & high frequency level controls.
8. The monitor shall have protection against open circuit, short circuit, current & thermal overloads.
9. The monitor shall work on 230 V \pm 5% AC 50 \pm 2 Hz, Single Phase power supply.

Technical Specifications:

1. Frequency response: Within \pm 3 dB between 50 Hz & 18 kHz with respect to 1 kHz. A frequency response curve shall be supplied with each unit.
2. Amplified Power: Total amplified Power of 50 W.
3. LF Trim : \pm 2 dB
4. HF Trim : \pm 2 dB
5. Input impedance : \geq 10 k ohms (balanced)
6. Nominal Input Level : 0 dBu
7. Input Level Range : -10 dBu to +10 dBu
8. Maximum SPL continuous: > 104 dB.

7. On-Air Broadcast Console/Mixer:

Description	Specification
Frequency Response	Eight Mic./Line Input to any output, 20Hz - 20kHz , <1 dB
THD + N	Mic. sens. -30dBu, +10dBu at all outputs @ 1kHz , <0.006%
Noise	Measured RMS, 20Hz to 20 kHz Bandwidth
	Mic. E.I.N. @ unity gain, 150 Ohm source impedance -128 dBu
	Mix Output, 8 inputs routed to mix <-86 dBu
	Group & Centre Outputs <-86 dBu
	Aux Outputs <-86 dBu
Crosstalk (@ 1kHz, typical)	Input Channel Mute <-97 dB
	Input Fader cut-off <-95 dB
	Pan isolation <-77 dB
	Adjacent channel crosstalk <-99 dB
	Group to Mix <-89 dB
CMRR	Typical @ 1kHz 90 dB
Input & Output Max Levels	Mono & Stereo Mic. Inputs + 15 dBu
	Mono & Stereo Line Inputs + 30 dBu
	Stereo Returns & Insert Returns + 20 dBu
	Any output + 20 dBu
	Nominal Operating Level 0 dBu
	Headphone Power , 2 x 250mW into 200 Ohms
Input & Output Impedances	Mic. Inputs, 2 K ohms
	Line Inputs and Stereo Returns, 10 K ohms
	Input channels Insert Return, 5 K ohms with EQ in, otherwise 3k Ohms
	Mix, Group, Aux, Matrix & Direct outputs, 150 Ohms
	Insert sends, 75 Ohms
	Recommended Headphone Impedance ,50-600 Ohms
EQ (Mono input)	High pass filter (Mono input) 100Hz, 18 dB/octave
	HF, 13 kHz, +/-15 dB, 2nd order shelving
	LF, 80 Hz, +/-15 dB, 2nd order shelving
Metering	Input channels, Single LEDs, Signal Present & Peak

	Outputs , 2 tri-color 12-segment LED bargraphs
Output	1+1 stereo, additional output for head phone and line monitoring
Power	AC mains supply (internal PSU), 90V-240V AC, 50 Hz universal input
	Power consumption, Less than 100W
Operating conditions	Temperature range, -10°C to +30°C
	Relative humidity ,0% to 80%

8. Dynamic Cardioid Microphone

TECHNICAL SPECIFICATION

Essential features of Microphone

- i) The microphone shall be designed for vocal recording with brightened mid-range and bass roll-off.
- ii) The microphone shall have cardioid /super cardioid pattern so as to isolate main sound source and minimize background noise.
- iii) The microphone shall have rugged metal body and shall have shock mount capsule to reduce handling noise without compromising its acoustic properties.
- iv) Microphone shall have hum compensation coil for providing hum rejection.
- v) Microphone shall have very good on/off axis & proximity response.

Electrical Specification:

- i) Frequency Range: 50 Hz to 15 KHz
- ii) Frequency Response: The microphone shall have ± 3 dB frequency response over a range of 150 Hz to 1.2 KHz.
- iii) Frequency response going up to maximum +10 db peak with reference to 1 KHz in the High frequency range starting from 1.2 KHz to 15 kHz.
- iv) Bass roll off giving roughly 8 to 10 dB attenuation at 50 Hz with reference to 1 kHz.
- v) Polar Pattern: Cardioid/Super Cardioid.
(Typical polar diagrams at different frequency shall be supplied)
- vi) Front to Back ratio: at least 10 dB from 250 Hz to 4 kHz
- vii) Sensitivity: Better than 1.75 mV/Pa (-52.4 dBV – reference 0dBV= 1Volt/Pa)
- viii) Output Impedance : ≤ 600 ohms for connecting to Audio input of Load impedance ≥ 2000 ohms
- ix) Connector: 3 Pin XLR
- x) Environment conditions: The unit shall perform satisfactorily in the dry temperature range of 5°C to 40°C and humid conditions of 85% RH at 40°C.

8. Condenser Microphone:

TECHNICAL SPECIFICATION

- i) The microphone shall be designed for vocal recording with brightened mid-range and bass roll-off.
- ii) The microphone shall have cardioid /super cardioid pattern so as to isolate main sound source and minimize background noise.
- iii) The microphone shall have rugged metal body and shall have shock mount capsule to reduce handling noise without compromising its acoustic properties.
- iv) Microphone shall have hum compensation coil for providing hum rejection.
- v) Microphone shall have very good on/off axis & proximity response.
- vi) The microphone shall be supplied with a table top stand & a break resistance stand adaptor capable of rotating 180°.

Electrical Specification:

- i) Frequency Range : 50 Hz to 15 KHz
- ii) Frequency Response : The microphone shall have ± 3 dB frequency response over a range of 150 Hz to 1.2 KHz.
- iii) Frequency response going up to maximum +10 db peak with reference to 1KHz in the High frequency range starting from 1.2 Kz to 15 KHz.
- iv) Bass roll off giving roughly 8 to 10 dB attenuation at 50 Hz with reference to 1kHz.
- v) Polar Pattern : Cardioid/Super Cardioid. (Typical polar diagrams at different frequency shall be supplied with the tender)
- vi) Front to Back ratio : at least 10 dB from 250 Hz to 4 kHz
- vii) Sensitivity : Better than 1.75 mV/Pa (-52.4 dBV – reference 0dBV= 1Volt/Pa)
- viii) Output Impedance : ≤ 600 ohms for connecting to Audio input of Load impedance ≥ 2000 ohms

- ix) Weight : Shall not exceed 350 Grams (without cable)
- x) Connector : 3 Pin XLR
- xi) On-off Switch : Mike shall have on/off switch
- xii) Environment conditions : The unit shall perform satisfactorily in the dry temperature range of 50C to 400 C and humid conditions of 85% RH at 400 C.

9. Portable Solid State Field Recorder:

1. FEATURES AND FACILITIES

- i) The recorder shall be lightweight, reliable, rugged, small sized, self contained, one hand operative with LCD display. The recorder shall be designed to withstand tropical conditions.
- ii) The recorder shall have the facility to record on semiconductor memory.
- iii) The recorder shall have the capability of recording stereo audio in 16 bit PCM linear digital format (.WAV file format).
- iv) The buttons/switches for various operations like recording, play, pause, fast forward, rewind/ review should be provided on the front panel in clearly marked logical layout. The buttons/switches should be quite sturdy for reliable operation.
- v) The record/stop buttons should be so located that it should be possible to easily operate the recorder for recording/stop while on move. Other necessary switches, buttons and controls, etc. should be provided at easily accessible locations.
- vi) Necessary indicators showing the mode of operation, level, status of the battery and the memory card capacity, recorded time and remaining time etc. should be distinctly visible on LCD display panel.
- vii) The LCD display panel shall have backlit display.
- viii) The recorder shall have the facility to save and delete the recorded material.
- ix) The recorder shall have built-in or externally attached Stereo microphone. The capsule of this stereo microphone should be protruding out of equipment and should be clearly visible. Stereo microphone connected to equipment using a cable shall not be accepted. In case of externally attached stereo microphone, the connection should be such that the microphone doesn't get disconnected by sudden jerk.
- x) The equipment will also have the provision of connecting external microphone for recording. This provision will be in addition to provision at Para 9. However, only one microphone will be operational at a time. Necessary connector/cable for connecting external microphone will be quoted & supplied.
- xi) The recorder should provide facility for transfer of audio data to workstation through USB connectivity.

- xii) The equipment should have level indicators for displaying programme level during recording/playback.
- xiii) The equipment will operate on a battery of adequate capacity to support at least 90 minutes continuously recording. The equipment will have facility to indicate Low battery level.

2. TECHNICAL SPECIFICATION

2.1 Recording/Play Mode

2.1.1 Recording media 2 GB (or higher) semi-conductor memory

2.1.2 Recording Format PCM Linear Digital (.WAV)

2.1.3 Supported Sampling Rate At least 32/44.1/48 KHz, selectable

2.1.4 Supported Bit Resolution ≥ 16 bits

2.2 Power

(a) Internal Battery AA or AAA

OR

(b) Internal Chargeable battery along with charger

OR

(c) (a) and (b) both

2.3 Input

(a) With a built-in /externally attached Stereo microphone

(b) Provision for connecting external microphone

(c) Provision for line input

2.4 Output:

Connectivity through USB 2.0 to Audio Workstation for Data Transfer

2.5 Monitoring:

Provision for headphone monitoring

2.6 Measurements

2.6.1 Frequency Response at Nominal input and output levels w.r.t. 1 KHz and from 50 Hz to 15 kHz : **within ± 3 dB**

2.6.2 THD + Noise at -60 dBu input level and 0 dBu output level (50 Hz.to 15 kHz.) : **≤ 0.3 %**

3. WEIGHT

Total weight of recorder including batteries should be less than 500 grams (excluding carrying case of equipment).

4. DIMENSIONS

The recorder should have compact body and its overall dimensions should be such that it can easily be held in palm or pocket by the recording personnel.

5. CLIMATIC CONDITIONS

The unit should be designed to work satisfactorily and meet all the specifications in climatic conditions as existing in India.

10. Headphones

TECHNICAL SPECIFICATION

1. Essential features of Headphone

- i) The headphone shall be designed to reproduce full audio spectrum (without any coloration) for quality monitoring in broadcast studios.
- ii) It shall be lightweight in construction and shall have provision for stereo/mono monitoring.
- iii) Left & right earpieces shall be matched to reproduce stereo images correctly.
- iv) The headphone shall have padded headband so that it is comfortable for extended use.

2. Electrical Specification :

- i) Frequency Range : The headphone shall reproduce faithfully audio in the range of 20-22000 hz.
- ii) Electrical impedance : Less than 75 ohms/Channel
- iii) Sensitivity at 1Khz : 100 dB SPL at 1mW input
- iv) Max Power handling capacity : 100 mW
- v) Total harmonic distortion : 0.5% at max. permissible input level.

3. Mechanical requirement :

- i) Headphone Diaphragm material : Hard polyvinyl chloride or similar
- ii) Ear-pads Material : Leatherette and velvet
- iii) Sound coupling to ear/Transducer : Circum-aural/super aural
- iv) Average pressure on ears : Max 4/6 N
- v) Cord Length (may be detachable) : At least 5 Meter
- vi) Phone Plug : Gold plated stereo mini jack (3.5 mm) with gold plated screw-on adaptor (3.5 mm to 6.35 mm)
- vii) Head-strap shall be adjustable.

11. Personal Computers

Intel Core i3 Processor, 2.93 GHz, 2 MB Cache, 800 MHz, 2 GB DDR2-RAM, 500 GB SATA Hard Disk Drive, Double layer DVD Drive, Minimum 18.5” TFT screen, Multimedia Keyboard, USB 2-button Optical Mouse, 6 USB 2.0 port(2 front, 4 Rear), 10/100 LAN, 2 Nos. Speakers, PCI slots, Genuine & licensed operating system (to be specified by applicant).

12. SOUND CARD

Specifications:

General

sample rates (kHz): 44.1/ 48/88.2/ 96/ 176.4/192

Main Inputs

max input: +14.0dBu (+4 dBu setting), +6 dBV (Consumer Setting), 0dBV (-10 DBV setting)

dynamic range: 99 dB @ (A-weighted)

THD + N: Less than 0.0024%, (at 0 dBFS)

frequency response: 20Hz to 20kHz \pm 0.3dB,

impedance 10k Ohms minimum

Main Outputs

max output: +14.0dBu (+4 dBu setting), +6 dBV (Consumer Setting), 0dBV (-10 DBV setting)

dynamic range: 103dB (A-weighted)

THD + N: Less than 0.0015%, (at 0 dBFS)

frequency response: 20Hz to 20kHz, \pm 0.3dB

impedance (unbalanced): 150 Ohms

13. UPS & Battery

S. No.	Description of ON-LINE UPS	Specification
1	Out put	
1.1	Capacity	3 KVA single phase/3 phase
1.2	Output Voltage	230 (default) 220,240 VAC (User Selectable Single Phase)
1.3	Output Voltage Regulation (Typical)	+/- 1% Static, 5% Dynamic
1.4	Output Connections	(6) ICE C13
1.5	Efficiency at full load, Nominal Line	91%
1.6	Output FREQUENCY (Sync to Mains)	50 Hz, +/- 3 Hz
1.7	Bypass	Automatic / Manual
1.8	Overload Capacity	105% + infinite, 125% + 1 Min., 150% + 30 Seconds
1.9	Output Voltage Distortion	< 3 % for Linear Load, < 5% for Non-Linear Loads.
1.10	Crest Factor	3:1
1.11	Heat Dissipation (Wars) Nominal Line	192
2	Input	
2.1	Nominal Input Voltage	220,230 (default), 240 VAC single phase
2.2	Input Frequency	45-65 Hz Auto-Selecting
2.3	Input Connection	IEC-C20
2.4	Input Voltage Range	160-280 VAC (at full load), 100-280 VAC
2.5	Input Power Factor	>0.95
3	Batteries	

3.1	Battery Type	Maintenance Free, Sealed, 5 Year Typical life time, Exide / Amaron or equivalent
3.2	Recharge Time to 90 % Capacity	< 3 Hours
3.3	Back up Time	30 Mins
3.4	Battery Rack	To be Provided
	Temperature	-5° C to + 45° C

14. PHONE- IN- UNIT

Essential features of Phone-in console

- i) The Digital Phone-in-console shall consist of a 19” Rack mountable base unit & a wired Remote Control Unit.
- ii) Console should be DSP based and all the processing in the console shall be performed in the digital domain. Console shall have at least 20 bit digital signal processing for optimal performance at all time.
- iii) Console shall be capable of interfacing 2 or more PSTN or 2 or more GSM interface.
- iv) Console shall have two digital hybrids and a switch matrix to connect any of the incoming call to either of hybrid.
- v) It should be possible to connect two lines ON-AIR at a time independently or simultaneously in conference mode.
- vi) The console shall provide two individual outputs containing only the Receive signal (from caller) of Telephone line i.e. Caller’s Voice only of selected (ON-AIR) telephone lines. These outputs shall be on Balanced XLR connectors in Analog format.
- vii) The console shall have one input (“Send to Caller”) to send Mix-Minus signals from Studio Console into the selected (ON-AIR) Telephone lines. This input shall be on Balanced XLR connectors in Analog format.
- viii) It should be possible to control the levels of send (i.e. Studio console’s Mix-Minus Output) & Receive (i.e. Caller’s voice) signals independently.
- ix) Each Hybrid shall provide AGC/limiting function and dynamic equalization for Receive (“from Caller”) to ensure consistent caller audio levels. Necessary noise gating and shaping features shall also be available to work on lines in noisy conditions.
- x) Each hybrid shall provide adequate separation, elimination of feedback and distortion between send and receive signals.

- xi) Feature of caller ducking (dynamic reduction in volume of Caller's voice when announcer speaks) should be available.
- xii) It should be possible to screen the incoming calls, put them on hold/ON-AIR and disconnect them using the remote control unit.
- xiii) Control unit shall have Call control system and dialer, Visual telephone Lines's status (i.e. indication of connected lines, Calls on hold, Ready caller status and callers ON-AIR Status etc.).
- xiv) Audio level meters for send and receive signals of both the hybrids shall be available on the front panel of the console/Control Unit.
- xv) The console shall provide music/audio to on-hold callers. It should be possible to provide external audio input for on-hold callers.

Technical Specification :

- i) Telephone Lines : 2 or more PSTN or GSM interface.
- ii) PSTN Line Interface : Standard
- iii) Line Input ("Telephone Transmit To Caller")
 - a) Analogue : Balanced on XLR connectors.
 - b) Level : 0 dBu (Nominal) & 10 dBu maximum
 - c) Impedance : ≥ 5 k Ohm
- vii) Line Output ("Telephone Receive From caller")
 - a) Analogue : Balanced on XLR connectors.
 - b) Level : 0 dBu (Nominal) & 10 dBu maximum
 - c) Impedance : ≤ 200 ohms
- viii) Isolation between send & Receive : > 50 dB
- xi) Digital Signal Processing : With in-build DSP (20 bit or better)
- x) Audio Performance (On both Receive & Transmit Ckt)
 - a) Frequency response : 250 Hz – 3500 Hz, ± 1 dB
 - b) THD + N : $< 0.2\%$
 - c) Signal to Noise Ratio : > 55 dB
 - d) These measurements are to be taken with Phone line level of - 15 dBu and 0 dBu at Line Input/output with various processing options turned off.
- xi) Power Supply : 230 V $\pm 5\%$ AC 50 ± 2 Hz , Single Phase supply

15. Generator Set up to 5 KVA (Petrol/Disel)

DETAILED SPECIFICATIONS

Diesel engine and alternator shall be close coupled and mounted on a base plate of robust construction.

SPECIFICATION FOR ALTERNATOR, DIESEL ENGINE AND MANUAL/AMF CONTROL PANELS:

1. ALTERNATOR:

- (a) The Alternator shall be self excited and self regulated of specified KVA rating in single/three phase at 240/415 Volt, 50 Hz, 1500 RPM and 0.8 power factor and shall conform to IS:13364 (Part 1):1992(reaffirmed 2003)
- (b) The alternators shall be screen-protected drip proof with Minimum IP-21 degree of protection as per IS:4691/85. The class of insulation of the Alternator would be 'H'. The rated voltage of Alternator will be 240V for single phase & 415 V for three phase.

2. DIESEL ENGINE (Naturally Aspirated):

- (i) Diesel Engine shall be air cooled, electric start developing required B.H.P at 1500 RPM with Class A-2 Governing or better for alternator to deliver continuous output of specified power at 0.8 pf LAG at NTP conditions (all rating shall be tested at 0.8 PF lag). The Diesel Engine should be capable of providing 10% overload for one hour for every 11 hours continuous running at full load.
- (ii) Naturally aspirated engines shall be ISI MARKED as per IS:10,001/1981.
- (iii) The specific fuel consumption of engine shall be as per IS specn.
- (iv) The Diesel Engine shall be complete with the following accessories:
 - (a) Fuel tank with capacity for 12 hours continuous running at full load.
 - (b) Engine instrument Panel consisting of starting switch with Key, Lube Oil temperature and pressure gauges, cooled engines), RPM indicator and hour meter.

- (c) Safety controls to shut down the engine in the event of low lube oil pressure or high cylinder head temperature in case of air-cooled engines or high water temperature in case of water-cooled engines.
 - (d) Radiators in case of water-cooled engines.
 - (e) Exhaust silencer of Residential type.
 - (f) 12V starting system complete with starter motor, charging alternator and Cutout.
 - (g) Lead Acid Battery or semi maintenance free battery of suitable ratings with connecting cables and the battery/ies shall conform to relevant IS Specn. The batteries of only following make shall be accepted: Exide, TUDOR, Amco, Amaron, Amar Raja, Tata Green, Cummins pulse lite, Standard Furukawa, Prestolite.
 - (h) Standard set of tools consisting of a set of 3 spanners, one screw driver, one standard plier and one nose plier of appropriate size shall be provided to the consignees along with DG sets, free of cost for each of DG sets.
3. MANUAL CONTROL PANEL:
- (i) The Control Panel shall have the following instruments:
 - (a) Composite meter for digital display of
 - i) Generator voltage.
 - ii) Load Current.
 - iii) Power Factor.
 - (b) One MCCB of suitable rating for DG sets.
 - (c) Push button-switch for ON and OFF operation.
 - (d) Pilot lamps, three in case of single-phase and five numbers in case of three phase (one for each phase, one for load on set and one for charging on).
 - (e) Battery charger complete with voltage regulator, voltmeter and ammeter should provide for Trickle charging as well as Booster charging for charging the battery from mains. This will be in addition to the battery charging alternator fitted on the engine.
 - (ii) All the components in the control panel shall be properly mounted, duly wired and labeled. Suitable terminals are to be provided for panel incoming and outgoing connections. The instruments/Components shall be of reputed make.
4. Supplier shall furnish complete & satisfactory TTC for engines, alternators complete with enclosure to be used by them for EACH rating of DG sets clearly indicating make, model and ratings of the DG sets tested at the time of registration and pre-dispatch inspection. The TTC of three phase alternators shall cover 'unbalanced load test' as per cl.24 of IS:13364(part-1 or part-2)/1992 as applicable. However all the engine models /ratings shall need relevant certifications as per norms. Either of the following types of TTC shall be acceptable:
- i) Type Test Certificate issued by recognized Government Lab.
 - ii) Type Test Certificate issued by recognized Government Lab irrespective of whether engines and alternators were tested at firm's lab or some other lab, but witnessed by Government representative.
 - iii) Type Test Certificate issued by BIS, irrespective of engines and alternators were tested at firm's lab or some other lab, but witnessed by BIS/ Government representative.
 - iv) Type Test Certificate issued by DQA on basis of test conducted at manufacturer's lab in presence of DQA officers.
5. The testing of diesel generating sets, for all ratings, shall be done at 0.8 PF lag.
6. Testing shall be done at continuous power output for each rating.

7. Necessary gauge/meters shall be fitted to indicate (a) the quantity of fuel left in the fuel tank, and (b) hours of DG set operation.
8. DG Sets shall conform to norms of Central Pollution Control Board (CPCB).
9. DG sets shall meet the requirements of Environmental(Protection) Rules 1986 as laid down by Min. of Environment & Forests read with GSR 371 (E) dated 17.5.2002,GSR 520(E) dated 01.7.2003 and No.448 (E)dated 12.07.2004 in respect of noise and emission norms. DG sets shall also meet all other statutory requirements as notified by Govt. from time to time.
10. Supplier shall furnish following documents issued by a Govt authorized agency at the time of registration and pre-despatch inspection:
 - a) Type approval certificate (TAC) for emission norms for EACH model/family of engine.
 - b) TAC from for noise level norms EACH model of DG set.
 - c) COP for EACH model of DG set and engine used in DG set.
11. Scope of supply shall include supply and commissioning of the complete DG set at the consignee's end but shall exclude installation and erection.

15. Solar Power Generator:

TECHNICAL DATA SHEET OF SOLAR POWER PACK SYSTEM (1/2/3 kW)

Charge Controller

Type : MPPT

Array Input: 40V-88V

Inverter

Type: Bi Directional MOSFET Based, PWM with instantaneous sine wave control of Micro Processor

Load Power Factor: 0.8 lag to Unity

Nominal Voltage: 240V AC

Frequency: 50Hz (± 0.5 Hz in stand alone mode)

Overload Capacity: 125% for 4m, 150% for 1m

Waveform: True Sine Wave

Harmonic Distortion (Total): Linear Load Max <3%

Regulation : $\pm 2\%$

Efficiency: >90% (DC to AC)

Cooling : Forced Air

Battery

Type: Lead Acid Wet Cell/Maintenance free

Rating: 160 Amp/hour

Voltage : 48V

Environmental Features

Storage Temperature: -25°c to $+55^{\circ}\text{c}$

Ambient Temperature: 0°c to 40°c

Humidity: Upto 95% RH, Non Condensing Acoustic

Noise Level: <55db @ 1.5Mtr.

Altitude: <1000Mtrs. Above sea level (without derating)

Protections/Controls/Indications/Additional Features must be available for the following:

Load Surge Current:

Output Short Circuit:

Output Overload:

Output Over Voltage:

Output Under Voltage:

Battery Low Trip:

High/Low Frequency:

Over Temperature:

Input Surge Voltage:

Input Under/Over Voltage:

LED indication:

Array Blocking Diode:

RS 232 Port for Monitoring:

Auto Restart in case of Over Load Shut Down:

Alarms: For all Important Protections.

16. Split Air Conditioner (0.5 ton and 1.5 ton)

1. Air conditioners suitable for 230V, 50 Hz single phase AC supply shall be capable of performing the functions as cooling, dehumidifying, air circulating and filtering.

The air conditioners shall be complete with automatic temperature control and cut-in-cutout for variable temperature range 16 to 30 degree C. The differential of the thermostat for cut-in-cut-out shall not be greater than +/- 1.75 degree C. The Air conditioners may either be provided with adjustable step less type mechanical thermostat or electronic thermostat as per IS: 11338:1985.

2. Outdoor unit of the air conditioners shall be fitted discharge cooled type rotary/scroll type compressor operating on Refrigerant R-22 (or non-CFC refrigerant R-410A in case of Split Air Conditioner) with suitably rated capacitor start electric motor.

It shall be equipped with overload protection and shall be mounted on resilient mountings for quiet operation. The Rotary compressor shall be of Matsushita/Hitachi/Toshiba/Carrier/Emerson/LG/Tecumseh make and shall be covered by manufacturers test certificate and TTC to JISS or ASHRAE.

3. The minimum thickness of the base in outdoor unit shall be 1.20 mm & sheet thickness for rest of the body shall be 0.70 mm (Min.) with galvanized coating thickness of 120 g/sq. m and shall be provided with stiffeners for robust construction and shall have rounded corners. Galvanized sheet shall conform to IS: 277/2003. Steel parts/ front panel etc. shall have stove-enamelled finish preceded by thorough cleaning of the

surface, phosphated and undercoat of anti-corrosive primer paint. Alternate methods of corrosion protection like plastic powder coating, electrostatic paintings shall also be acceptable in lieu of stove enamelled finish.

4. The casing of the indoor units shall be made of ABS/HIPS/GS and shall be impact resistant. The control box of indoor unit shall withstand flame retardant test to Grade V-O as per UL-94. For impact resistance the unit duly packed and dropped from a height of 1 m shall show no damage. The filter pads provided shall be washable.
5. Remote cordless control with LCD/LED Display shall be provided with one On/Off timer, selecting fan speed (three speed) and setting up of temperature. Display shall be provided on indoor unit or on handset or on both.
6. Maximum power consumption of the split air conditioners shall be measured at capacity rating test conditions. Overall power factor of the unit shall be at least 0.85 at capacity rating test conditions.
7. Servicing: Free servicing shall be provided for 15 months from the date of dispatch or 12 months from the date of installation of air conditioner whichever is earlier. Firm is also required to send service engineer at least 3 times during the warranty period.
8. Warrantee: Warrantees shall be provided for 15 months from the date of dispatch or 12 months from the date of installation of air conditioner, whichever is earlier. The compressor shall have additional warrantee under AMC of 4 years (In addition to above warrantee of 12/15 months on whole unit.)
9. Installation: The installation charges at consignee's site shall include the following work:-
 - i) Mounting/Fitting indoor and outdoor units at the respective locations.
 - ii) Laying refrigerant piping of 6mtrs length and connecting both the units after drilling hole/holes in the wall, if required. The thickness of the copper tubing shall not be less than 0.70mm.
 - iii) Insulating the suction pipe with expanded polyethylene foam with 5mm thick tubing.
 - iv) Laying 15mm drain pipe 6m length to drain out the condensate water being formed in the indoor unit.
 - v) Leak testing of the entire system.
 - vi) Charging Refrigerant gas in the unit.
 - vii) Suitable electric wiring between indoors and outdoors units up to 6 mtrs length up to switch within 3 m of location of indoor unit. Switches/ Sockets /Plugs are not included in the scope of supply.

Installation/ Warranty Charges for Split Air-Conditioner

Split Air-Conditioner With Rotary Compressor (R22 Refrigerant)

Specification:-

The scope of installation shall include installation at consignee's site.

Specification :-

Split type air conditioners with BEE Star rating label & rating capacity conforming to IS: 1391(Part-2)-1992 with amdts No.1 to 4 fitted with rotary compressor suitable for using HCFC refrigerant (R-22) for wall mounting .

17. Broadcast Audio Processor:

Specifications:

1. The Broadcast Audio Processor shall be designed for continuous, unattended and trouble free operation in the broadcast chain of a VHF FM Transmitter at a community Radio Station.
2. The processor shall have Digital Signal Processing technique. It shall be able to provide minimum 5 band audio processing with compression, limiting, clipping automatic wideband gain control etc.
3. The processor shall have phase limiter to maximize audible transparency and should have provision for stereo enhancement and high/low frequency enhancement.
4. The processor shall help to reduce noise and enhance loudness & clarity.
5. Radio Frequency Interference (RFI)/ Electromagnetic Compatibility (EMC) filters and power supply surge protection shall be provided at the mains input.
6. The processor shall meet the following technical parameters:

a) Analog Audio Input:

1.	Configuration:	Left and Right/ Stereo
2.	Nominal Input Level:	Software adjustable from -4.0 to +12.0dBu

3.	Maximum Input Level:	+24 dBu (impedance>10k Ω)
4.	A/D Conversion	Minimum 24 Bit
5.	Connectors:	Balanced XLR Female, EMI Suppressed.

b) Analog Audio Output:

1.	Configuration:	Left and Right/ Stereo. Flat or pre-emphasized (at 50 μ s or 75 μ s) software selectable.
2.	Output Level(100% peak modulation)	Adjustable from -6.0 to +20 dBu software adjustable.
3.	Signal to Noise: (20Hz to 15 kHz)	\geq 80 Db unweighted
4.	Distortion (20Hz to 15 kHz)	\leq 0.02% THD.
5.	Cross Talk: (20 z to 15 kHz)	\leq -70 Db
6.	D/A Conversion:	Minimum 24 Bit
7.	Connectors	Balanced XLR Male, EMI Suppressed.

c) Remote Computer Interface:

1.	Configuration	TCP/IP Protocol via modern of Ethernet interface
2.	Connectors:	RS-232 Port or RJ-45, EMI Suppressed

d) Power:

1.	Voltage	230 Volts AC \pm 5%, 50Hz \pm 2%
	Connector:	IEC, EMI Suppressed, detachable 3-wire power chord.
	Safety Standards:	UL, CE.

e) Environmental:

1.	Operating Temperature:	0 ⁰ to 50 ⁰ C
2.	Relative Humidity:	Up to 95% Non Condensing
3.	Working Altitude:	Up to 3000 Mts. Above mean sea level.

f) Physical

1.	Dimensions:	To fit in Standard 19" Rack. Width, Height & Depth be specified by vendor.
2.	Weight:	To be specified by the vendor

18. Dummy Load:

Dummy Load of 50 Watts, matching transmitter specifications.