(3) Construction of one sound studio of 24 m^2 and accompanied facilities for local broadcasting service are planned in the transmitting station building.

(4) For covering the recording work including the Far Western Development Region, one set of outside broadcasting wagon is planned.

(5) Station buildings consisting of a 643 m^2 ferro-concrete structure and a one-story brick structure building are planned.

4-3 KATHMANDU STUDIO CENTRE

(1) In order to produce and send programmes throughout the country, one set of master control facility and five sets of sub-control facilities are planned for the five sound studio sub-control rooms.

(2) For connecting the Studio Centre with the Kathmandu transmitting station, one STL programme transmission device with annexed facilities is planned.

(3) One engine generator device of 100 kVA is planned.

(4) Two one-story ferro-concrete brick structure buildings (studio and equipment block) with a total area of 1,119 m^2 are planned.

5. CONSTRUCTION SCHEDULE (Refer to Table S5-1)

(1) To accomplish the construction work of this Radio Network Expansion Project, a term of 15 months at least is required.

(2) In order to execute this construction work, excellent broadcasting facility consultants and architects are to be selected to manage and carry out the construction work orderly.

Table S5-1

CONSTRUCTION SCHEDULE

PROJECT \ MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. KATHMANDU STUDIO CENTRE															
1 EQUIPMENT	MANUFACTURE									TRANSPORTATION			TEST TRANSMISSION / INSTALLATION		
2 BUILDING	TRANSPORTATION						CONSTRUCTION								
2. KATHMANDU TRANSMITTING STATION															
1 EQUIPMENT	MANUFACTURE									TRANSPORTATION			TEST TRANSMISSION / INSTALLATION		
2 BUILDING	TRANSPORTATION						CONSTRUCTION								
3 ANTENNA	MANUFACTURE						TRANSPORTATION			CONSTRUCTION					
4 ANTENNA FOUNDATION & RADIAL EARTH	MANUFACTURE			TRANSPORTATION			CONSTRUCTION								
3. POKHARA TRANSMITTING STATION															
1 EQUIPMENT	MANUFACTURE									TRANSPORTATION			TEST TRANSMISSION / INSTALLATION		
2 BUILDING	TRANSPORTATION						CONSTRUCTION								
3 ANTENNA	MANUFACTURE						TRANSPORTATION			CONSTRUCTION					
4 ANTENNA FOUNDATION & RADIAL EARTH	MANUFACTURE			TRANSPORTATION			CONSTRUCTION								

6. CONSTRUCTION COSTS (Refer to Table S6-1)

(1) A total capital of about 1,948 million Yen(105 million Rs) is required. In the total amount, the costs for the related construction work, such as roads, land leveling and electric power lines are excluded.

(2) For the costs of the related construction work, excluded from the construction cost, domestic capital will be necessary.

Table S6-1

ESTIMATION OF CONSTRUCTION EXPENSE FOR ESTABLISHMENT PROGRAMME OF MEDIUM WAVE RADIO BROADCASTING NETWORK OF THE KINGDOM OF NEPAL (DRAFT)

As of 1981
Unit: Th. ¥
(Th. Rs.)

No.	Description	Broadcasting Facility	Building & Antenna	Total
1	Kathmandu Transmitting Station	226,464 (12,242)	293,630 (15,872)	520,094 (26,114)
2	Pokhara Transmitting Station	263,411 (14,238)	293,630 (15,872)	557,041 (30,110)
3	Kathmandu Studio Centre	209,925 (11,347)	503,740 (27,229)	713,665 (38,576)
4	Sub-total	699,800 (37,827)	1,091,000 (58,973)	1,790,800 (96,800)
5	Consultant Fee & Overhead Cost	157,420 (8,509)		
6	Grand Total	1,948,220 (105,309)		

Note: The transportation expense is included in the construction expense for each Station/Centre.

SECTION 1 OUTLINE OF DETAIL DESIGN OF BROADCASTING EQUIPMENT

SECTION 1 OUTLINE OF DETAIL DESIGN OF BROADCASTING EQUIPMENT

1-1 TRANSMITTING STATION FACILITY

The fundamental way of thinking about a common design for both Kathmandu and Pokhara transmitting station is described at first.

For both stations, the necessary number of technicians is stationed at the transmitting station for operation and maintenance of station, and the equipment are designed on the premise that the station is of attended operation.

Namely, in principle, the fundamental operations; such as switch on and off of transmitter, selection of change-over from main transmitter unit to stand-by transmitter unit, selection of input programmes are all operated manually. Although the operational condition of principal facilities can be supervised at the control and supervision console.

The output power for the stand-by transmitter unit is 10 kW. The reason why the output power is determined to 10 kW, in comparison with the 100 kW output power of the main transmitter unit, is to reduce the operational expense (maintenance and operation cost, etc.) of the engine generator during failure of city electricity power.

In order to increase the reliability of the transmitter system, a full air cooling system is adopted for cooling the transmitter and engine generator equipment. In addition, the direct coupling system is adopted to feed the antenna base to eliminate the use of a long feeder line.

In the following, the outline of the design for each equipment of Kathmandu and Pokhara transmitting stations is described.

(1) Kathmandu Transmitting Station

The principal equipment to be installed at Kathmandu transmitting station are shown in the following table.

Table 1-1

	Equipment	Quantity
1)	Main transmitter unit (output power 100 kW, frequency 792 kHz)	1 set
	Stand-by transmitter unit (output power 10 kW, frequency 792 kHz)	1 set
2)	Attachments to transmitter	1 set
3)	Main electric power board, engine generator equipment	1 set
4)	STL equipment (receiving part)	1 set
	Radio Engineering link equipment	1 set
5)	Transmitting antenna equipment	1 set
6)	Measuring instruments, maintenance tools, etc.	1 set
7)	Accessories, spare parts	1 set

The composition of each equipment, fundamental functions and way of considering the design are respectively described in the following.

1) Transmitter

The output power of the main transmitter unit is 100 kW and the stand-by transmitter unit is 10 kW. The modulation system for both transmitters is the final stage plate-modulation type. For the high power stages, forced air cooled vacuum tubes are used, but for the initial stages, solid-state circuitry is used to improve the reliability and to ensure stability and improve the maintenance.

The necessary meters for supervising the operational condition of the transmitter and the switches for operation are all mounted on the front panel of the transmitter,

facing the control-supervision console which is explained later, to facilitate the operation of the transmitter. The switch of the transmitter is mounted on the main transmitter body and also on the control-supervision console. The switch of the transmitter unit has priority over the operation of the control-supervision console, and a changeover switch is provided in front panel of the transmitter and named as "Manual (transmitter side)" and "Remote (control-supervision console side)".

The switch to select the main transmitter unit and stand-by transmitter unit is fixed on the control-supervision console. In addition, the transmitter unit which is not connected to the transmitting antenna is always connected to the dummy antenna.

2) Equipment attached to transmitter unit

The equipment attached to the transmitter unit consists of the following.

a) Control-supervision console

A console type control-supervision console provided with operational and supervisory functions is installed in the supervision room of transmitter room.

(Control function)
Switch on/off of transmitter unit.
Adjustment of audio input level of transmitter unit.
Changeover between transmitter unit and dummy antenna.

(Supervisory function)
Indication of transmitter unit in use.
Indication of transmitter unit output power and degree of modulation.
Indication of audio signal level (selective switch).

Audio monitor (selective switch)
Indication of abnormality of principal equipment in station and alarm by buzzer.

(Other equipment)
An interphone device connecting each room in the transmitting station.
A radio order line device between studio centre and transmitting station.

b) Programme input equipment

A rack is installed in the supervision room of the transmitter room, and the following equipment are contained in it to process the audio input signal.

Input programme switch, audio level meter and an audio volume control.

Line equalizer, limiting amplifier.

Audio monitor amplifier and speaker.

Jack panel (Displayed in form of block diagram).

c) Antenna dummy load

A common air-cooled dummy load device for the 100 kW and 10 kW transmitter unit is installed in the dummy load device room.

d) Surge protector

For measures to prevent lightning and surge current, a surge protector is installed.

3) Main electric power board, engine generator

At normal condition, the city electricity is used for operating the transmitting station, but in case of city power failure, the 100 kW transmitter unit is changed over to the 10 kW stand-by transmitter unit and the necessary power for the transmitter and related equipment is supplied by operating the engine generator. With regard to the changeover between city power and engine generator power, the city power has the priority.

a) Main electric power board

The main power board is located in the power room (except for some of those for the transmitter unit which are explained in the next section.) The equipment in the power room consists of automatic voltage regulator, incoming power board, distribution board and transformer.

b) Engine generator

The performance of the generator is such as; capacity 70 kVA, 3-phase 50 Hz, 400 V, 4-poles, 1500 r.p.m. and it is coupled directly to a 86 horse power diesel engine. In addition, a set of battery with charger is installed for starting the engine generator, and an automatic voltage regulator and a fuel tank are respectively attached to it. In the incoming city power lines, an excess and deficiency voltage detector is inserted to detect the voltage level and in case the voltage level is lower/higher than the normal level, it will send a signal to the control board of the engine generator room and also to the control-supervision console in the transmitter room, to notify the preparation of the engine generator operation.

4) STL device (receiver, radio order line device)

The details are described in item 1-1-2 (3).

5) Transmitting antenna device

In considering the antenna structure, in view of the resistance against earthquakes and limitation of height due to area of the station site on one hand, and the electrical characteristics of the transmitting point in a valley on the other hand, the vertical directivity of the antenna was designed in consideration of both ground-wave service and

nighttime space-wave service. For the practical operation of the antenna a class of 0.31λ was considered to be appropriate and a mast of 100 m height above ground level with 3-direction guys was adopted. The steel antenna mast of a base isolated type is adopted so that the transmitter output power could be fed directly to the antenna base through the antenna tuning unit to eliminate the use of a long feeder. In addition, a crown shape platform is equipped on top of the mast for maintenance of antenna and prevention of lightning.

With regard to the earthing of antenna, more than 120 lines of radial earth are buried around the base of the antenna mast extending to almost all over the station site.

6) Measuring instrument and maintenance tools

The necessary measuring instruments and maintenance tools for maintenance and repair of transmitter facilities are provided.

7) Spare parts

A set of necessary consumption goods (for instance, vacuum tubes) for operating and maintaining the transmitting station and special parts (for instance, parts for diesel engine) are respectively provided for the transmitting station.

(2) Pokhara Transmitting Station

The fundamental way of thinking about the facilities to be installed at Pokhara transmitting station is the same as that of Kathmandu transmitting station, in general, except for the facilities described in the following.

In Pokhara transmitting station, a small studio is designed in the station building for the service of local programmes.

An outdoor broadcast wagon is also designed for coverage of outdoor programmes and events. On the other hand, the programmes from Kathmandu studio centre are sent to the transmitting station through the TCC lines. In addition, a shortwave receiving equipment is installed in the station for use in case of emergency.

The facilities for Pokhara transmitting station are given in the following table.

Table 1-2

	Equipment	Quantity
1)	Main transmitter unit (output power 100 kW, frequency 684 kHz)	1 set
	Stand-by transmitter unit (output power 10 kW, frequency 684 kHz)	1 set
2)	Attachment to transmitter	1 set
3)	Main electric power board, engine generator equipment	1 set
4)	Transmitting antenna equipment	1 set
5)	Attached studio equipment	1 set
6)	Measuring instruments, maintenance tools	1 set
7)	Accessories, spare parts	1 set
8)	Outdoor broadcast wagon (with radio equipment)	1 set
9)	Emergency shortwave receiving equipment	1 set

Explanation on each equipment is given in the following.

1) Transmitter unit

The scale of transmitter unit, policy of design are same as that of Kathmandu transmitting station.

2) Attachments to transmitter

The attachments are the same as that of Kathmandu transmitting station.

3) Main electric power board, engine generator equipment

With regard to this equipment the scale and policy of design are same as that of Kathmandu station, except that there is a power distribution system for the attached studio, instead of the STL device.

4) Transmitting antenna equipment

Same as Kathmandu transmitting station. A 0.27 λ class 100 m height antenna with 3-direction guy is installed. In addition, as the ground conductivity of Pokhara site is also relatively low, more than 120 radial earth lines are buried all over the station site.

5) Attached studio equipment

Explained in item 1-2-2 (2), 1), 20 m^2 class production studio.

6) Measuring instruments, maintenance tools

The contents are the same as those of Kathmandu station, except that the measuring instruments for the studio equipment are provided instead of the measuring instruments for the STL device.

7) Accessories, spare parts

The contents are the same as those of Kathmandu station, except that the spare parts for the studio equipment and

outdoor broadcast wagon are provided instead of the spare parts for the STL device.

8) Outdoor broadcast wagon

Explained in item 1-2 (2), 2), OB wagon.

9) Emergency shortwave receiver facility

Explained in item 1-2 (2), 1), 20 m^2 class production studio.

1-2 STUDIO FACILITY

According to the Preliminary Design Report the following studio facilities are installed and the equipment for each facility is denoted in Table 1-3.

(Kathmandu studio centre)

Continuity studio (Master Control)---1 (including one Master Control Studio)

Music studio----------1

Programme production studio----------2

Talk studio----------1

(Pokhara transmitting station)

Programme production studio----------1

Outdoor broadcast wagon----------1

The outline of each facility is explained in the following.

(1) Kathmandu Studio Centre

The outline of programme production equipment for Kathmandu studio centre is shown in the drawings of Fig. KS-001 Part 1 of VOL IV.

1) Master control room

The planned master control is to be annexed to the existing master control, and has a continuity studio (announce studio, 15 m^2 class), and is provided with functions to perform the following.

a) Production of live programme.
b) Reproduction of taped programme.
c) Switching of programme.
d) Programme transmission to Kathmandu and Pokhara transmitting station.

A real-time display is installed for supervising the operational condition of transmission.

In addition to this, the following equipment are installed;

a) A master clock to drive the slave clocks in the studio centre and to generate time-signal for broadcast use.
b) An engineering line device for communication in building and to transmitting stations.
c) An all-wave radio receiver for monitoring and supervising the programme ON-AIR.

Furthermore, with regard to measures for city power failure, the power for the announce studio equipment and some of master control room equipment and STL equipment to Kathmandu transmitting station are to be fed from the battery system to continue the transmission of programme. The maximum operation period of the battery system is 10 minutes.

2) Music studio (140 m^2 class)

This studio is designed for recording programmes, such as light-music, folk song, audience participating programmes, and lectures, etc. A portable echo machine is provided to be shared with other studios.

3) Programme production studio (two 60 m^2 class of same layout)

This studio is designed for recording programmes, such as drama, small scale music programmes, talks, and interviews etc.

4) Talk studio (15 m^2 class)

This studio is designed for recording talk programmes, interviews and information programmes.

(2) Pokhara Transmitting Station

The Pokhara transmitting station normally transmits the programmes received from Kathmandu studio centre, in the form of it was received, but, whenever necessary, it can transmit the programmes produced at their studio or OB wagon.

In the drawings of Fig. PT-007 Part 1 of VOL IV, the outline of programme production equipment for Pokhara transmitting station is shown.

1) Programme production studio (20 m^2 class)

The studio obtains the function of a continuity studio. It is designed for broadcasting live programmes such as news, disk jockey etc., and recording of talk programmes and interview programmes etc. It is also for reproducing taped programmes and switching of broadcast programmes.

In addition, an emergency short-wave receiver is installed to receive the short-wave programmes of the existing Khumaltar transmitting station, in case the programme transmission line between Kathmandu studio centre and Pokhara transmitting station fails.

This studio in the transmitter building is provided with electro magnetic shielding in order to prevent interference from its own transmitter.

2) OB wagon

The wagon is designed for outdoor programme production and for gathering outdoor programme sources. The wagon produces programmes in recorded forms and it is equipped with a compact light-weight mixing unit and recording equipment. The wagon selected employs a powerful diesel engine provided with four-wheel drive, for climbing hills and running on rural roads.

A walkie-talkie is equipped for communication between the spot and the transmitting station. The programmes taped at outdoor are reproduced at the studio in the transmitting station.

(3) Programme Transmission Equipment

An STL device is installed to connect the distance of 5.8 km between Kathmandu studio centre and Kathmandu transmitting station, for transmission of programmes. In considering the influence of trees and buildings on the radio wave propagation, the transmitter power and frequency was decided to 10 W and 160 MHz.

A press-talk type 150 MHz engineering link is installed between Kathmandu studio centre and Kathmandu transmitting station. The programme transmission line and engineering line between Kathmandu studio centre and Pokhara transmitting station are not to be included in this design.

In the drawings of Fig. KS-013 Part 1 of VOL IV, the constitution of STL transmission and engineering link system between Kathmandu studio centre and the transmitting station is shown.

(4) Power Supply Equipment

The electric power is supplied from the city power lines. The power for programme production equipment is stabilized through an automatic voltage regulator, in considering the variation of voltage. The details are given in item 2-6 of "Electrical Equipment".

(5) Outline of Principal Programme Production Equipment

The performance for all equipment to be used are in principle, the monaural system.

1) Disk player
Turntable speed: 33-1/3,45, 78, r.p.m.
Asynchronous motor.

2) Open reel type recorder and reproducer
Tape speed: 19, 38 cm
Asynchronous motor.

3) Cartrige tape equipment
Tape speed: 19 cm. NAB-A standard.
Asynchronous motor.

4) Cassette tape equipment
Stereo performance with noise suppressor attached.
Not synchronized with power source.

(6) Outline of Other Equipment

1) Master Clock
Crystal clock, Accuracy is within 1×10^{-7} day.
Powered by battery-floating system, with operate 30 minutes without city electricity. Provided with time signal generator.

2) Interphone
Call system, push button selection.

SECTION 2 OUTLINE OF DETAIL DESIGN OF BUILDINGS AND TOWERS

SECTION 2 OUTLINE OF DETAIL DESIGN OF BUILDINGS AND TOWERS

2-1 BUILDING

2-1-1 Layout of Building

(1) Kathmandu Studio Centre

The layout of the building is shown in the drawings of VOL IV. According to the suggestion of the HMG of Nepal, the centre is located in the central part of the site and for access, the existing road is used.

The centre consists of two building blocks; studio block and equipment block. The engine generator room, power board room and equipment room, etc., are all installed in an equipment block apart from the studio block, to prevent from vibration and noise from this block. The two building blocks are connected with a roofed passage.

The floor area of these building blocks is as follows.

Studio block	894.0 m^2
Equipment block	216.0 m^2
Roofed passage	9.0 m^2
Total	1,119.0 m^2

(2) Kathmandu Transmitting Station

The location of the building is shown in the drawings of VOL. IV. The area of the site is about 44,400 m^2. A 100 m antenna mast is erected in the central part of the site, and the station building is located about 3 meters apart from this antenna mast, so that the antenna feeder can be drawn directly into the tuning unit room. The front of the building is facing north-north west, considering the relation to the access road.

The floor area of the building is 643 m^2.

(3) Pokhara Transmitting Station

The location of the building is shown in the drawings of Vol IV. The area of the site is about 50,870 m^2. The relation between the location of the 100 m antenna mast and building is the same as that at Kathmandu transmitting station, but the difference is that the front of building is facing south, in relation to the access road.

The area of the building floor is 643 m^2.

2-1-2 Floor Plan and Cross Section

(1) Kathmandu Studio Centre

The floor plan and cross section are respectively shown

Table 2-1 Kathmandu Studio Centre
(Floor area of each room)

Building	Name of Room	Floor Area (m^2)	Sub-total (m^2)
Studio	Music studio	140.0	228.0
	Sub-control room	28.0	
	Sound-lock room	12.0	
	Music instrument store room	18.0	
	Storage room	30.0	
	Production studio-1	72.0	108.0
	Sub-control room	26.0	
	Sound-lock room	10.0	
	Production studio-2	72.0	108.0
	Sub-control room	26.0	
	Sound-lock room	10.0	
	Talk studio	24.0	54.0
	Sub-control room	20.0	
	Sound-lock room	10.0	

(Continued)

Building	Name of Room	Floor Area (m2)	Sub-total (m2)
	Master control room	108.0	130.05
	Announce studio	15.3	
	Sound-lock room	6.75	
	Performer's waiting room	30.0	265.95
	Service room	20.25	
	Inquiry office	11.7	
	Entrance hall	66.0	
	Air conditioning equipment room	30.0	
	Corridor	108.0	
Equipment	Engine generator room Battery room Electric power board room	72.0	216.0
	Equipment room	72.0	
	Maintenance staff room	18.0	
	Storage room	18.0	
	Water-closet (Men)	12.0	
	Water-closet (Ladies)	12.0	
	Corridor	12.0	
Roofed passage		9.0	9.0
Total		1,119.0	1,119.0

in the drawings of Vol IV, the building is a single-story consisting of 6^m x 6^m span-work, in principle.

The floor area for each room is shown in Table 2-1. The studio and master control room occupies most of the space and there is only one office for inquiry service.

With regard to the height of rooms, the music studio is 8.0 m, programme production studio is 6.0 m and the rest are all 4.5 m.

The points particularly taken into consideration in the floor designing are as follows.

1) The entrance for the music studio is planned near the main entrance hall of the building so that it provides convenient access to audience.

2) The layout for each studio, sub-control room and front sound-lock room is of the same pattern, to make a clear distinction of movement, flow and equality of arrangement of sub-control equipment.

3) The performers waiting room common for the studios, is planned almost in the centre part of the building to shorten the path of flow.

4) The place of the master control room is planned so as to provide windows at wall and improve room conditions.

5) The equipment room, engine generator room, electric power room etc., which generate noise and vibration are planned in a equipment block separated from the studio block and connected to the studio block with a roofed passage.

(2) Kathmandu Transmitting Station

The building, as shown in the floor plan and cross section in the drawings of Vol IV, is a single-story building consisting of 6^m x 6^m span-work, in principle,

Table 2-2 Kathmandu Transmitting Station
(Floor area of each room)

Name of Room	Floor area (m^2)	Sub-total (m^2)
Transmitter room (including supervision room)	163.2	282.0
Tuning unit room	17.6	
Dummy load room	15.4	
Blower equipment room	19.8	
Storage room (1)	18.0	
Storage room (2)	30.0	
Storage room (4)	18.0	
Office (1)	12.0	60.0
" (2)	12.0	
" (3)	12.0	
" (4)	12.0	
" (5)	12.0	
Workshop	24.0	24.0
Kitchen	20.0	32.0
Wash room	12.0	
Engine generator room	} 72.0	124.0
Electric power board room		
Maintenance staff room	16.0	
Storage room (3)	36.0	
Entrance hall	15.0	121.0
Water-closet	12.0	
Air conditioning equipment room	24.0	
Corridor	70.0	
Total	643.0	643.0

same as the studio centre building.

The floor area for each room is shown in Table 2-2. The total floor area is 643 m^2, and has office rooms, stores and wash room etc., suitable for attended operation. The height of the story is 4.0 meters.

The entire building is shielded and the tuning unit room and transmitter supervision room are both double-shielded.

The points which were taken into consideration in the floor designing are such as;

1) An antenna tuning unit room is located in the corner of the building so that the stay of the antenna mast will not touch the building.

2) An office for maintenance staff for engine generator and electric power board etc., is provided.

3) A storage room for equipment related to transmitter, electric power board and engine generator is separately provided.

4) As the station is of attended supervision, an office, kitchen and wash room is provided.

(3) Pokhara Transmitting Station

The floor plan and cross section are shown in the drawings of Vol. IV. The layout is the same as Kathmandu transmitting station, except for the studio, sub-control room and sound lock room, which are provided instead of a storage room (4) and two offices.

The floor area for each room is shown in Table 2-3. The total floor area is 643 m^2. The entire building is provided with shielding material, and in addition to this, an antenna tuning unit room is shielded individually and the studio, sub-control room and sound lock room are provided with double shield, as a whole.

The points which were taken into consideration in the floor planning are same as those of Kathmandu transmitting station.

Table 2-3 Pokhara Transmitting Station
(Floor area of each room)

Name of Room	Floor area (m^2)	Sub-total (m^2)
Transmitter room (including supervision room)	163.2	264.0
Tuning unit room	17.6	
Dummy load room	15.4	
Blower room	19.8	
Storage room (1)	18.0	
Storage room (2)	30.0	
Studio	24.0	54.0
Sub-control room	20.0	
Sound-lock room	10.0	
Office (1)	12.0	36.0
(2)	12.0	
(3)	12.0	
Workshop	24.0	24.0
Kitchen	20.0	32.0
Wash room	12.0	
Engine generator room	72.0	124.0
Electric power board room		
Maintenance staff room	16.0	
Storage room (3)	36.0	
Entrance hall	15.0	109.0
Water-closet	12.0	
Air conditioning equipment room	24.0	
Corridor	58.0	
Total	643.0	643.0

2-1-3 Acoustics

(1) Condition of Surroundings in View of Noise

With regard to vehicle noise for Kathmandu studio centre, as there is a considerable distance to the road, consideration was only paid to vehicles arriving and leaving Radio Nepal building. For Kathmandu transmitting station, there was no problem to consider, because there is no studio and furthermore, because the distance from the station to the road is over 100 m.

However, for Pokhara transmitting station, there exists a studio, but as the station is located about 150 m away from the road, consideration was only taken on vehicles arriving and leaving the station.

On the other hand, regarding air plane noise, Kathmandu studio centre is about 5 km away from the airport and off the flight route, but as jet planes will take off and land, slight measures for reducing noise were taken into account. For Pokhara transmitting station, a local airport exists at a distance of about 2 km, but, as small planes only use this airport, and that the station is off the flight route, only slight measures for reducing noise were considered.

There was nothing specially consider for Kathmandu transmitting station.

(2) Countermeasures against Noise

In accordance with the Preliminary design policy, the target values against air conditioning noise of each room are as follows.

Announce studio Talk studio	}	NC - 15
Production studio Music studio	}	NC - 20
Sub-control room		NC - 25

Master control room	NC - 30
Performer's waiting room	NC - 30
Offices	NC - 35

NC; Noise criteria curve : For example NC-5 means that 5 dB of Speech Interference Level.

For the structure of walls around the studios, reinforced-concrete was adopted in considering the reduction of noise.

To prevent transmission of solid borne sounds of foot steps etc., the studios are of the floating structure. In addition, sound-proof doors and windows are used for studios.

(3) Room Acoustics

The dimensions of studios were determined in accordance with the policy of the Preliminary design, and the structures are based on acoustic design.

The walls and ceilings of music and programme production studios are constructed in uneven forms, in considering the scattering of sound. The music studios are provided with absorptive curtains, so that the reverberation time can be varied.

The approximate dimensions for the studios are given in Table 2-4.

Regarding the design for sub-control rooms, room acoustics was taken into consideration.

Table 2-4

Name of Station	Name of Studio	Usage	Dimension of Studio							Reverberation Time (sec) at 500 Hz
			Length (m)	Width (m)	Height (m)	Floor Area* (m^2)	Total Surface Area S (m^2)	Volume V (m^3)	V/S (m)	
Kathmandu Studio Centre	Music Studio	Music	12.8	8.5	5.0	108.8	473.2	544.0	1.15	0.43∿0.64
	Production Studio-1	Music Speech	7.6	6.5	3.5	49.4	219.5	172.9	0.79	0.27
	Production Studio-2	Music Speech	7.6	6.5	3.5	49.4	219.5	172.9	0.79	0.27
	Talk Studio	Speech	5.2	3.1	2.4	16.6	73.8	39.8	0.54	0.15
	Announce Studio	Speech	3.6	2.55	2.3	9.4	47.7	21.6	0.45	0.13
Pokhara Transmitting Station	Studio	Music Speech	5.05	3.1	2.4	15.7	70.6	37.7	0.53	0.15

Note: The length, width and height are mean values. * Effective floor area

2-2 BUILDING STRUCTURE

2-2-1 Structural Design

As shown in the drawings the building design is reinforced-concrete rigid frame construction, and bearing walls are located in a well balanced manner, resistive to earthquakes.

The structure of the foundation is a solid one of reinforced-concrete, and the weight of building is directly supported by a footing on the ground, and a footing beam is adopted to prevent uneven settlement and for measures against earthquakes.

The structural analysis and design was performed in accordance with the habitual practice in the Kingdom of Nepal, with reference to the Japanese Building Standard Law and Related Regulations, and various structural design standards set out by the Architectural Institute of Japan.

The live loads adopted for the design were determined by referring to the Japanese Building Standard Law and Related Regulations and the load standards formulated by the Architectural Institute of Japan and BS.

For special rooms (studio, master control room, sub-control room and transmitter room, etc.), the weight of equipment to be installed was calculated and then the live loads were determined by referring to the standard values adopted by NHK.

The lateral seismic force coefficient of 0.15 was adopted for the structural design against earthquakes.

For the structural design against wind load, the maximum instantaneous wind velocity of 50 m/sec. (at a height of 10 m above ground level) was adopted.

As the influence of wind load on the building body is small in comparison with that of earthquakes, the structual strength against wind load was not considered.

2-2-2 Outline of Structure and Scale of each Building

(1) Structure of Kathmandu Studio Centre

The building is one-storied with rigid frame of reinforced-concrete. The walls surrounding the studio are of reinforced-concrete structure, considering the resistance against earthquakes and acoustics, and walls other than bearing walls are of brick structure.

An expansion joint is provided in the roofed passage between the studio and equipment building.

The floor slab and roof slab are of reinforced-concrete structure. On the roof slab, an additional shelter made of steel structure is built, and it is to be covered with roofing materials.

For the type of foundation a continuous footing and an independent footing are adopted, both of reinforced-concrete structure.

The allowable bearing capacity of soil to be adopted for the design is to be 15 t/m^2.

(2) Structure of Kathmandu Transmitting Station

The building is one-storied with rigid frame of reinforced-concrete. The bearing walls are of reinforced-concrete structure, and the rest are of brick structure.

The floor slab and roof slab are of reinforced-concrete structure, and on the roof slab, an additional shelter made of steel frame is built, and covered with roofing materials.

The foundation of building to adopt is an independent footing of reinforced-concrete.

The bearing capacity of soil to adopt for the design is 15 t/m^2.

(3) Structure of Pokhara Transmitting Station

The structure is the same as that of Kathmandu Transmitting Station except for that a soil bearing capacity of

20 t/m^2 is adopted. In addition to this, bearing walls made of reinforced-concrete are adopted for the walls surrounding the studio.

2-2-3 Materials to be employed for Structure and Construction Method

In consideration of the importance of the building and facilities, the structural materials will be strictly selected, and for the way of construction, those methods established in the Kingdom of Nepal are adopted as a policy.

(1) Steel Materials: All steel materials to use are to be products conforming to the Japanese Industrial Standards (JIS), and completed products are to be imported for use at the site.

(2) Reinforcing Steel Bars: All bars conforming to the Japanese Industrial Standards (JIS) are used.

(3) Concrete: The building structure (frame members - column, girder, beam, floor slab, roof slab, bearing wall and foundation) are made of concrete with crushed stone and cement conforming to the Japanese Industrial Standards (JIS).

2-3 STEEL ANTENNA MAST

2-3-1 Structural Design

The structural analysis and design were carried out by referring to the Japanese Building Standard Law and Related Regulations, and various structural design standards set out by the Architectural Institute of Japan. The structural calculation for the guy wire was performed by the habitual method adopted by NHK.

The structural design against wind pressure was made on the basis of the maximum instantaneous wind velocity of 50 m/sec. (at 10 m above ground level in height), and extra margines for altitude are considered.

As the influence of earthquake on tower/masts are small in comparison with that of wind load, structural strength against earthquakes were not considered.

Velocity for design: $q = 90\sqrt[4]{h}$

q; Pressure of Velocity (kg/m^2), h; Height (m)

2-3-2 Outline of Steel Mast (Antenna) Structure

The structure and scale of mast for Kathmandu and Pokhara transmitting station are of the same design.

The mast (antenna) is 100 m in length, and it is a steel cylindrical type with a diameter of 40 cm. It is supported by five-stage guy wires extended to three directions. The base of mast is isolated with a base insulator, and under the insulator a spherical acceptor is placed to avoid harmful power applying onto the insulator.

These are mounted on a reinforced-concrete independent foundation of about three meters in height above ground level. The five-stage guy wires in each directions are respectively anchored to the three steel anchor frames buried in concrete blocks located at a distance of about 80 m from the centre of the mast. In each guy wire, insulators are inserted at proper intervals, and for the insulators in the guy wire of the very top stage, choke coils are attached.

For airplanes flying at night, three pairs of aviation obstruction lights are mounted on the mast, one on the top and the others at two intermediate points of the mast. For aviation obstruction marking in the daytime, the entire mast is painted red and white in seven bands.

In order to extend the effective length of the antenna, a platform with a diameter of two meters is mounted on the very top of the mast.

2-3-3 Materials to be used for Structure

(1) Steel Mast: Products conforming to the Japanese Industrial Standards (JIS) are used.

(2) Guy Wire: All products conforming to the Japan Steel Standard (JSS) are used.

(3) Base Insulator, Wire Guy Insulator, Obstruction light and other Parts: Products conforming to JIS and its related standards, the Broadcast Technical Standards of NHK and Specifications established by NHK are to be imported and used.

(4) Reinforcing Bars: All products conforming to JIS are used.

(5) Concrete: Concrete with crushed stone are used for the foundation and anchor block. Cement conforming to JIS is used.

2-4 AIR CONDITIONING, HEATING, VENTILATION FACILITY

The condition of internal temperature, and humidity for designing was assumed as follows.

Kathmandu Studio Centre and Transmitting Station

Summer season	27°C	50 %
Winter season	20°C	50 %

Pokhara Transmitting Station

Summer season	27°C	50 %
Winter season	20°C	50 %

2-4-1 Kathmandu Studio Centre

All rooms in the centre are heated with fresh air by means of the air handling units which have built-in electric heaters, except for the music studio and master control room which are air-conditioned with two packaged air-conditioners.

The amount of intake air for the music studio and master control room is 25 m^3/hr. person respectively throughout the year. For the other rooms, it is 25 m^3/hr. person during the winter season and for the summer season the amount is calculated according to the condition of the load.

The air conditioning, heating and ventilation systems are divided as follows,

No. 1	Music studio	--	A packaged air conditioner
No. 2	Master control room	--	same as above
No. 3	Production studio	--	An air handling unit
No. 4	Other places	--	same as above

In addition to the above, ventilation equipment for water-closet room, engine generator room, electric power board room, battery room and equipment room are respectively installed.

2-4-2 Kathmandu Transmitting Station

A ventilation equipment is installed in the air-cooling transmitter, transmitter room, tuning unit room, electric power board room, engine generator room and dummy load room. For the rest of the rooms, fresh air is fed with handling unit (with built-electric heater).

2-4-3 Pokhara Transmitting Station

The constitution of this station is foundamentally the same as that for Kathmandu transmitting station, but the difference is that air-cooling of the studio and sub-control room is provided by a packaged air conditioner.

2-5 PLUMBING

The city water supply is used. The sewage is drained to the sewage disposal, and then to the gutter, while the rain water and other water drained directly into the gutter.

As for each water-closet, one western style chamber pot and one eastern type are installed.

2-5-1 Kathmandu Studio Centre

An intake water tank is newly built underneath the equipment room floor, to store the city water. This water is supplied to the necessary places by water pumps with a pressure tank.

With regard to fire extinguish equipment, one indoor and one outdoor fire hydrant is installed in the position shown in the design drawings.

An underground oil tank for the engine generator of maximum capacity of 2,000ℓ is newly installed with the necessary pipings.

2-5-2 Kathmandu Transmitting Station

As shown in the design drawings a water tank is newly installed underneath the equipment room floor, and the stored water is supplied to each place by water pumps with a pressure tank.

In the kitchen, an electric kettle, an electric range, a sink, etc., are equipped. In the wash room, a bath and a shower facility is provided.

As for fire extinguish facility, a fire hydrant is installed at one place and fire extinguishers are provided for the transmitter room as well.

In addition, an underground oil tank for the engine generator of maximum capacity of 3,000ℓ is also installed with the necessary pipings.

2-5-3 Pokhara Transmitting Station

The equipment for this station are same as those for Kathmandu transmitting station.

2-6 ELECTRICAL EQUIPMENT

2-6-1 Electric Power Board, Engine Generator Equipment (Separate Construction Work)

An electric power board and an engine generator equipment is respectively installed in the power board room and engine generator room.

The incoming power transformer is a 11,000/400 V type, and the capacity of the transformers for the three places are as follows.

Kathmandu Studio Centre	150 kVA
Kathmandu Transmitting Station	600 kVA
Pokhara Transmitting Station	600 kVA

An I.V.R is inserted in the output line of the incoming power transformer. The capacity of the engine generator is as follows.

Kathmandu Studio Centre	100 kVA x 1 (set)
Kathmandu Transmitting Station	70 kVA x 1 (set)
Pokhara Transmitting Station	70 kVA x 1 (set)

The engine is a forced air-cooling type with a starter-motor.

The electric power block diagram for the above three stations are respectively given in Fig. KS-006, KT-003, PT-003.

2-6-2 Battery Equipment (Separate Construction Work)

For Kathmandu studio centre, two sets of batteries are installed in the power room with battery chargers. The two sets of batteries are used for the following purpose.

Engine generator starter, fire alarm, emergency lighting --- 1 set

Broadcast equipment, building clock --- 1 set

For the two transmitting stations, two sets of batteries, same as those above, are respectively installed in the engine generator room, but there is no studio equipment installed in Kathmandu transmitting station.

2-6-3 Main Power Line Equipment

For Kathmandu studio centre, the low voltage distribution board is also installed in the power board room, and from this board, the power is fed to the broadcast equipment distribution board, the lighting distribution board and the motor control board, etc.

For the two transmitting stations, the low voltage distribution board for the transmitters is installed in the transmitter room, and the other low voltage distribution boards is installed in the power board room, to feed power to each power board and motor control board in other places.

2-6-4 Lighting and Plug Socket Equipment

Fluorescent lighting equipment are principally used. The intensity of illumination for studios, transmitter room and offices is 400 lux, and for other rooms, it is about 200 lux. Plug sockets are equipped at all of the necessary places.

Emergency D.C. lights are installed near the emergency exits which will be supplied by the batteries in case of city power failure. After the engine generator starts operating, some of the lighting equipment will be supplied by the engine generator power.

2-6-5 Motor Power Equipment

Motor power control boards are installed in the equipment room and air conditioner room, to supply power to each load. However, the power control board for the transmitter room ventilation is installed in the transmitter room.

The start and stop of equipment, excluding the water supply and drainage pumps etc. which operate automatically, are operated by a push-button switch.

The fire hydrant pumps can be started at each fire hydrant box.

2-6-6 Earthing

For the transmitting antenna of the two transmitting stations, a radial earth shown in the design drawings are respectively installed.

In addition, for the studio centre and two transmitting stations, an earthing poles are provided for the incoming electric power board, transmitter and lightning arrester. All the buildings concerned on the programme, a lightning conductors are installed on the building roof because the buildings are located in heavy lightning districts.

2-6-7 Fire Alarm Equipment

A thermally-sensitive fire detector is installed in each room and a manual push button alarm is installed near each fire hydrant box as well. The alarm receiver for the studio centre is installed in the inquiry office and these for the transmitting stations is located in the transmitter room.

2-6-8 Clock Equipment

In respect to Kathmandu studio centre, a crystal oscillator type master clock is to be installed (separate construction work) in the master control room, and slave clocks in each studio and offices, and the necessary piping and wiring work will be performed. (The clock is separate construction work)

With regard to the transmitting stations, a one-second readable type clock operated by a dry battery is to be installed in the studio, sub-control room, transmitter room and offices, and the necessary piping and wiring work will be performed.

2-6-9 Telephone Equipment

At this stage, so that the telephone lines can be wired in the future, the conduit tubes are only installed.

2-6-10 Interphone Equipment

Interphone sets will be installed as shown in the design drawings, and the necessary piping and wiring work for these will be performed. (Interphone is separate construction work)

2-7 BUILDING MATERIALS

Among the materials produced in the Kingdom of Nepal, those mentioned as follows are to be adopted as construction material brick, rock, sand, gravel, lumber, terrazzo, marble and fuel tank.

Among the available materials in the Kingdom of Nepal, lighting fixtures and plug sockets which will be imported from foreign countries can be used for electric equipment. The rest will be imported from Japan. However, the cement which is to be used for places other than those of building structure will be the product of the Kingdom of Nepal.

SECTION 3 CONSTRUCTION SCHEDULE

SECTION 3 CONSTRUCTION SCHEDULE

The items which were taken into consideration in planning the construction schedule are as follows.

(1) The entire construction work should be completed within 15 months.

(2) As the minimum term is estimated for each activity, the construction schedule is to be managed strictly.

(3) In relation to the limited term, the construction work is to be carried out in parallel at the following three locations.

1) Kathmandu transmitting station
2) Pokhara transmitting station
3) Kathmandu studio centre

(4) For the overall adjustment of the two transmitting stations and studio centre equipment, the last thirty days (one month) of the construction schedule are allocated for the final test.

The construction schedule was prepared under the following premises.

(1) The construction schedule is the total number of months from the date of entry of work.

(2) For the management of the construction work, a separate detailed PART/Time construction schedule showing the progress of construction work is to be prepared.

(3) The expected term for each construction work in the construction schedule is as following.

1)	Manufacture of broadcasting equipment	8.5 months
2)	Manufacture of antenna mast	6 months
3)	Installation of transmitter equipment (including final test and acceptance test)	3 months

4)	Transportation of building material (including 1.5 month for preparation of shipping)	5 months
5)	Transportation of broadcast equipment	3.5 months
6)	Installation of transmitting antenna mast	3 months
7)	Construction of Kathmandu and Pokhara station building	7 months
8)	Construction of Kathmandu studio centre building	13 months

(4) The construction work of transmitter building and transmitting antenna overlaps 2.5 months, the consultant are to give necessary instructions so that the two construction works can be carried on smoothly to prevent occurrence of accidents as well.

(5) In constructing the transmitting antenna the steel mast installation work is to be started two months after completion of the foundation work.

SECTION 4 ESTIMATION OF CONSTRUCTION EXPENSE

SECTION 4 ESTIMATION OF CONSTRUCTION EXPENSE

The necessary total construction expense (excluding expense for incidental construction work) for this project is 1,948 million Yen (105 million Rs.).

The items are shown in the Table S7-1 (Summary). The estimation of the expenses was made as of the year of 1981, under the condition that there will be great economical change within the year.

(1) Considering the project will be taken effect in 1981, the expense was derived by increasing the expense for September 1980 by 7 %.

(2) The cost of equipment and construction material are both estimated on the condition of CIF site.

(3) The exchange rate for currency is as follows.

US$1 = ¥220

US$1 = Rs.11.9

Rs.1 = ¥18.5

(4) The breakdown of the total construction expense into respective items is given below.

1) Expense for equipment and installation work.
   700 million Yen (38 million Rs)
2) Construction expense for transmitting station building and transmitting antenna.
   1,091 million Yen (59 million Rs)
3) Consultant fee and expense relative to the project.
   157 million Yen (9 million Rs)

(5) The expense for the following incidental construction work is excluded from the construction expense.

1) Wiring work to the drop point and connection work at drop point. (voltage of drop point is 400V)
2) Water supply work and connection work at supply point.
3) Expense related to acquisition of construction site.

4) Site clearance and levelling.

5) Entrance road.

6) Fence and gate-post.

7) Necessary programme and engineering lines from Kathmandu Studio Centre to Pokhara Transmitting Station. (VHF-STL and engineering link between studio centre and transmitting station in Kathmandu are included in the construction expense.)

8) Drainage, complete sanitation and necessary connection work.

9) Staff quarter at Kathmandu and Pokhara Transmitting Station.

10) Security guards quarter at Kathmandu and Pokhara Transmitting Station.

APPENDIX

MINUTES OF DISCUSSION ON THE PRELIMINARY DESIGN FOR THE ESTABLISHMENT PROGRAMME OF MEDIUM WAVE BROADCASTING NETWORK IN THE KINGDOM OF NEPAL

In response to a request of His Majesty's Government of Nepal for the Establishment Programme of Medium Wave Broadcasting Network in the Kingdom of Nepal, the Government of Japan had conducted the preliminary design study and has sent through Japan International Cooperation Agency a supplementary explanation team to the Kingdom of Nepal headed by Mr. Seikichi Sakakibara, Deputy Director, Engineering Division, Broadcasting Department, Ministry of Posts and Telecommunications for 3 weeks from November 18th, 1979.

The team submitted Draft Final Report on the above-mentioned prliminary design and has held a series of discussions and exchanged views with the Authorities concerned of His Majesty's Government of Nepal on the report.

As a result of the exchange of views and discussions, both parties, Radio Nepal Authorities and Japanese Team, have agreed on the Draft Final Report as proposed by the Japanese Team.

The major points confirmed between Radio Nepal Authorities and Japanese Team are attached herewith in the Annex.

榊原盛吉

Seikichi Sakakibara
Leader of the Japanese Team

B P Shah

Bhogya Prasad Shah
Acting Director General
Department of Broadcasting
Radio Nepal
Ministry of Communications
His Majesty's Government of Nepal.

Signed at Kathmandu on
5th December 1979.

ANNEX

1. The transmitter control system will be rack panel type.

2. Surge protectors for power supply system will be considered.

3. Electric power supply for the transmitting stations and the studio centre shall be required with 400 volts, 50 Hz, 3 phase, 4 wire system.

Minutes of discussions on the detail design report on the establishment programme of Medium Wave Radio Broadcasting network in the Kingdom of Nepal.

In response to a request of His Majesty's Government of Nepal for the establishment Programme of Medium Wave Radio Broadcasting Network in the Kingdom of Nepal, the Government of Japan had prepared Detail Design Report and has sent through Japan International Corperation Agency a supplementary explanation team to the Kingdom of Nepal, headed by Mr. Seikichi Sakakibara, Deputy Director, Engineering Division, Broadcasting Department, Ministry of Posts & Telecommunications for 10 days from March 9, 1981.

The team submitted Detail Design Report and held a series of discussions with the Authorities of His Majesty's Government of Nepal. The team also visited the construction sites in Kathmandu and Pokhara.

As a result of the exchange of views and discussions, both parties: Radio Nepal Authorities and Japanese Team have agreed on the Detail Design Report as prepared by the Japanese Team.

It is agreed that the Japanese Government will provide ten copies of the Final Report of the Detailed Design to the H.M.G. of Nepal.

Both sides agreed on the pre-construction work to be carried out by HMG Nepal as described in the Annex.

榊原盛三

Seikichi Sakakibara
Head of the Japanese Team

B. P. Shah
Acting Director General
Radio Nepal,
Ministry of Communications,
His Majesty's Government
of Nepal.

Signed at Kathmandu
16th March 1981.

ANNEX TO THE MINUTES OF
Discussion signed on 16th March 1981.

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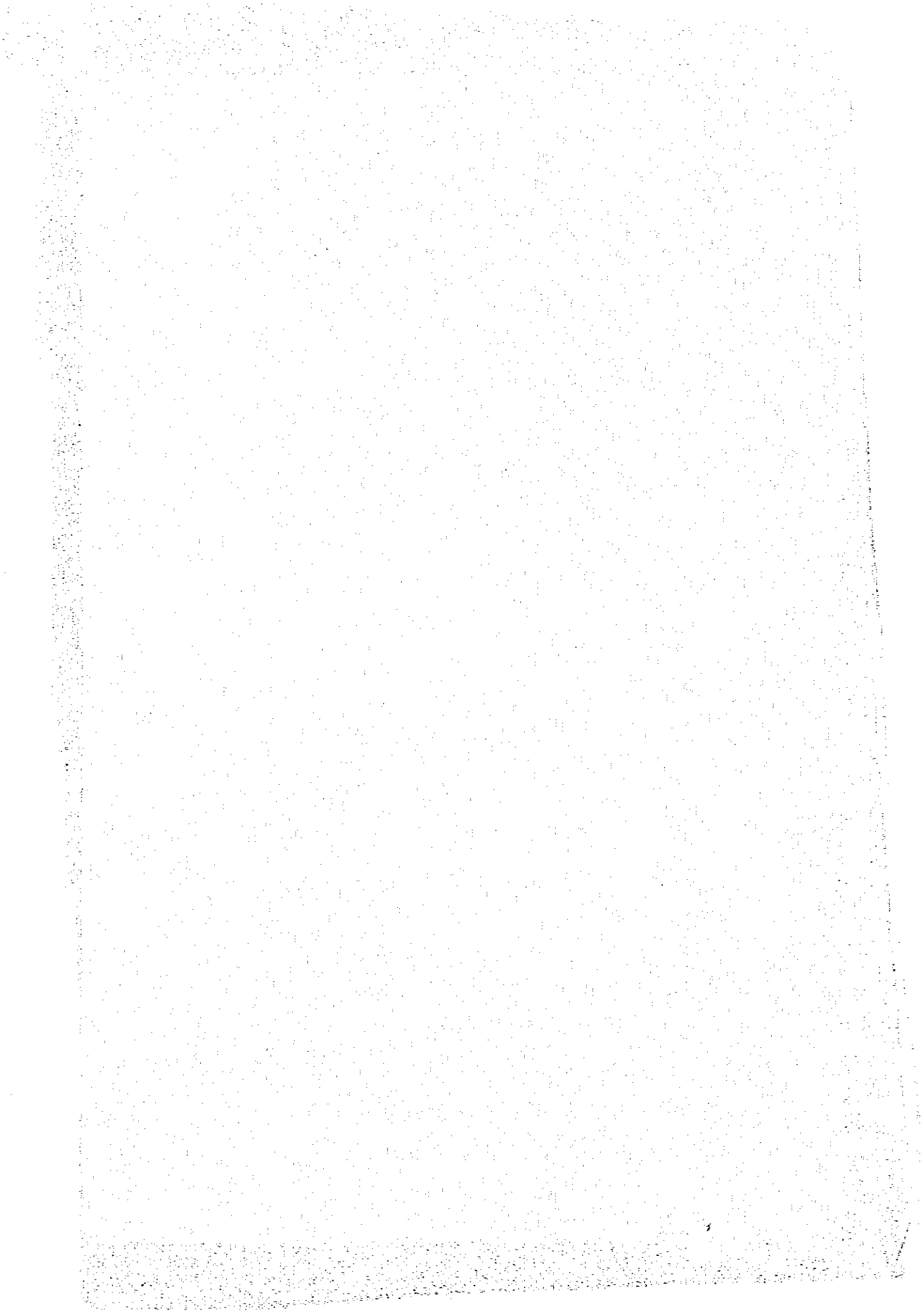
1) H.M.G. of Nepal will take necessary steps to acquire land for Kathmandu and Pokhara Transmitting Stations immediately.

2) H.M.G. Nepal will take immediate steps for pre-construction works, such as Electric Supply, Water Supply, Access Roads, Communication and Programme Lines, etc. as described in the preliminary Design Report (Page 17 of the Interim Report of the Preliminary Design Study - Infrastructure). The Nepalese side has noted that the Electric Supply Requirements will be as follows :

Kathmandu Studio Centre	200 KVA
Kathmandu Transmitting Station	600 KVA
Pokhara Transmitting Station	600 KVA

3) Radio Nepal has agreed to provide storage facilities in Kathmandu and Pokhara for the broadcasting equipments prior to installation.

2



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