THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA DETAILED DESIGN REPORT ON THE TELEVISION BROADCASTING NETWORK CONSTRUCTION PROJECT

VOLUME II

AUGUST 1979

JAPAN INTERNATIONAL COOPERATION AGENCY

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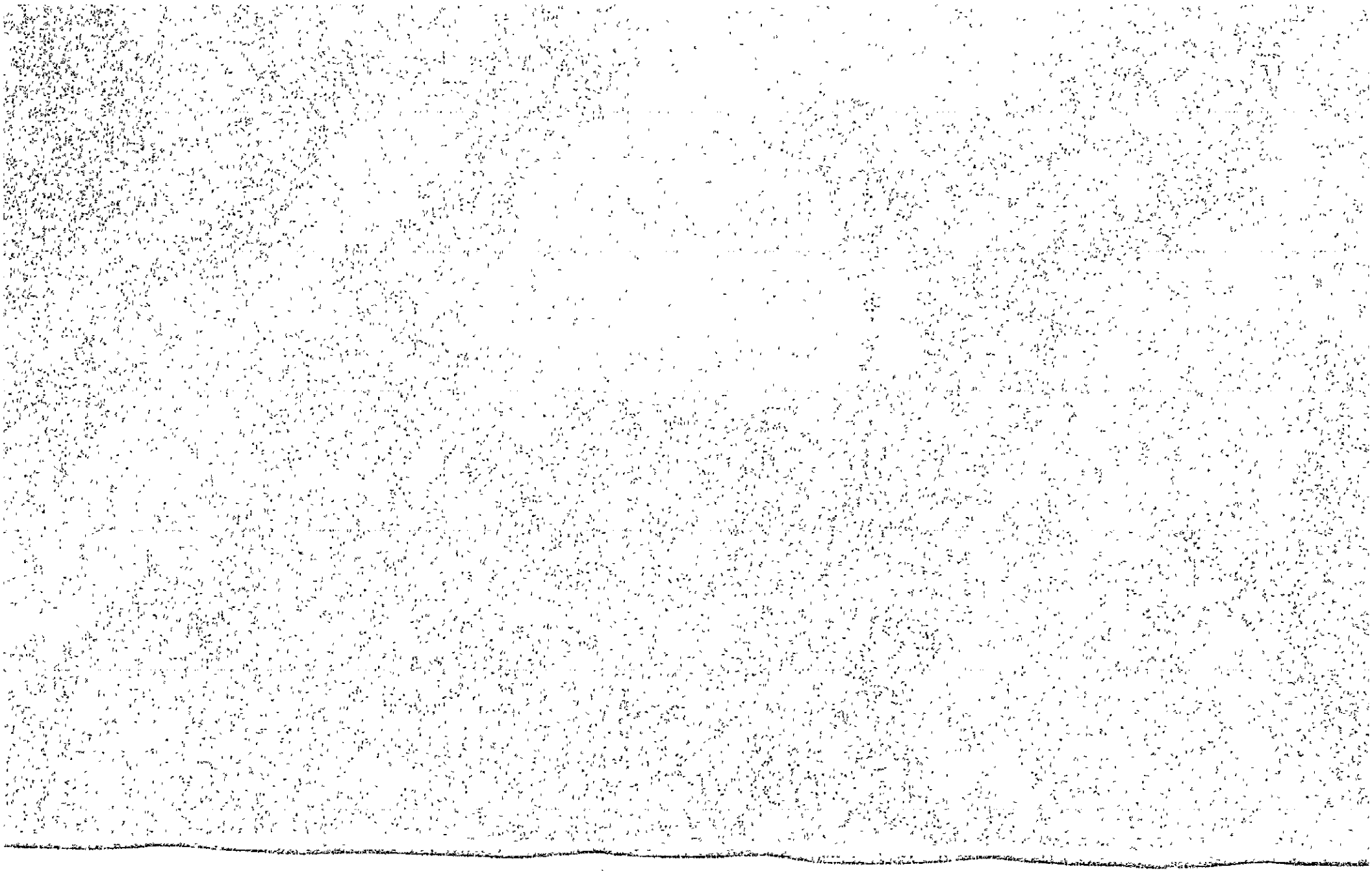
BROADCASTING EQUIPMENT

SECTION 6

TECHNICAL SPECIFICATIONS OF BROADCASTING EQUIPMENT



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SECTION 6

TECHNICAL SPECIFICATIONS OF BROADCASTING EQUIPMENT

6-1 SCOPE OF WORK

This specification stipulates the manufacture, installation, adjustment, and testing of television broadcasting equipment for the Television Broadcasting Network Construction Project of the Democratic Socialist Republic of Sri Lanka.

These broadcasting equipment are to be installed at the following sites under the responsibility of the contractor.

(1) Colombo Studio Center
(2) Mt. Pidurutalagala Transmitting Station
(3) Kokavil Transmitting Station
(4) Kandy Transmitting Station
(5) Madukanda Repeater Station

The contractor shall provide all items of equipment and materials set out in this specification and install, adjust, and deliver them on the turn-key basis as specified.

6-1-1 COLOMBO STUDIO CENTER

(1) Studios 1 and 2

Complete TV programmes shall be produceable by using those equipment to be installed at the respective studios and VTR and telecine to be connected by the master assignment switcher.

1) TV Cameras

Studio 1 shall be furnished with three colour TV cameras and Studio 2 with two colour TV cameras. Each studio shall allow future installation of one additional colour TV camera.

The camera control unit shall be installed in the master control room, and iris and total pedestal level adjustments and RGB gain fine adjustment shall be remotely controllable

on the camera remote control panels to be provided on the VE consoles in the respective studios (four panels in Studio 1 and three panels in Studio 2).

2) Video Control System

The video control system shall be of 3-mix type having the wipe and chroma-key functions. Each monitor switch rank shall have the function of backing up signal sending by cut switching. Remote control of two telecine systems, two VTR systems, and one FSS system shall be allowed.

3) Audio Control System

The audio control system shall have the function of mixing 14 inputs. Studio 1 shall be furnished with one echo machine which shall be usable for Studio 2 as well when necessary.
Studio 1 shall be furnished with a wireless microphone and a PD-FD wireless communication equipment.
Remote control of two tape recorders and two disc players shall be allowed.
Studio 2 shall be furnished with three microphone control boxes.

4) Monitoring System

Each studio shall be furnished with one ceiling speaker. The manufacture and installation of the monitor shelf for the subcontrol room shall also be accomplished by the contractor. Monitors other than those incorporated in consoles or on the monitor shelf and other than the ceiling speaker shall be mounted on carts.

5) Lighting System

Studio 1 shall be furnished with a suspension button system of manual control and Studio 2 with a pipe grid system.

6) Others

The tally circuit shall be controlled by video switching.

On-air lamp flashing and colour/monochrome selection shall be allowed.

A studio intercom system shall be provided. Talk-back by using the ceiling speaker shall be allowed.

(2) Dubbing Studio

Dubbing studio is a studio used for putting the language used on a VTR tape or film into another language and for processing both video and audio. Those items mentioned in item (1) "Studios 1 and 2" apply also to the dubbing studio except for the following items.

1) No TV camera shall be provided in the dubbing studio.

2) The video control system of the dubbing studio shall have no chroma-key function.

3) The audio control system of the dubbing studio shall have the function of mixing 8 inputs. Remote control of 2 tape recorders, 2 disc players, and 2 cinecorders (2 sets of 16mm magnetic recorder/reproducer) shall be allowed. These cinecorders shall be installed in the master control room.

4) No studio lighting equipment shall be provided in the dubbing studio.

5) One microphone control box shall be provided in the dubbing studio.

(3) VTR and Telecine

VTR and telecine equipment shall be installed in the master control room. These equipment can be operated at hand and when the switches is set to "Remote", remote control shall be allowed in Studio 1, Studio 2, or the dubbing studio or on the master control console.

With the VTR and telecine assignment system the video signal and the corresponding audio signal shall be assignable by a single operation and, at the same time, the tally circuit

and remote control circuit shall be formed.
For cassette VTR, 4 video tape recorders, 2 time base correctors, and 2 editing control units shall be installed. Two monitors for exclusive use shall also be provided.
Each telecine chain shall be furnished with one colour master monitor.

(4) Master Control System

Master control system shall control the video and audio signals received from programme sources inside and outside the Studio Center to send them out through the output line according to the required schedule.

On the master control console, a master assignment switcher shall be controlled by a button operation, then the video signal and the corresponding audio signal shall be selected at a time, and the related tally circuit shall be formed.

The master control console shall have the following functions.

1) Remote control of 2 telecine systems, 2 VTR systems, one FSS and one tape recorder.
2) Colour/monochrome selection of output line
3) Superimposition of digital time corder
4) Communication with each technical room in the studio center, transmitting station and OB van.

The manufacture and installation of the monitor shelf accommodate the picture monitor for monitoring the operating condition shall also be carried out by the contractor.
The audio monitor shall be mounted on a cart and installed near the control.

(5) Synchronizing System

Two sync signal generators shall be provided. The sync,

subcarrier, and driving pulses obtained from one of these sync signal generators shall be distributed to all equipment in the Studio Center. When the sync signal generator in service fails, the other sync signal generator shall be selectable manually to operate.

The signal from the OB van shall be converted through a frame synchronizer to a signal synchronized with signals produced in the Studio Center.

(6) Provision for future expansions

For those sections designated "future expansion" in the attached drawing, equipment and units need not be installed. However, proper space shall be kept with necessary wiring so as to allow future system expansion by only installing applicable equipment and units in these sections.

(7) Equalization

When there may be frequency response degradation in the wiring between subsystems, equalization shall be effected at the input of the subsystem.

(8) OB Van

1) Vehicle

The vehicle shall measure less than 2.46m wide, 3.8m high, and 9m long, have a total weight of less than 15 tons, and provide an upsetting angle of more than 30 dgreees when fully equipted.

2) TV Cameras

Two colour TV cameras shall be provided. Such space shall be provided that will allow another one colour TV camera and one ENG camera to be mounted.

3) Video Control System

The video control system shall be of 3-mix type with the function of wiping. One 2 inches 4-head VTR (for recording only) shall be provided. One monochrome FSS shall be provided.

4) Audio Control System

The audio control system shall have the function of mixing 8 inputs.

5) Power source

City power (230V, single phase) shall be used for the power supply and an engine generator shall be mounted. The starting battery of the engine generator shall have such a circuit that will allow charging by the dinamo of the vehicle.

6) One 20 inches colour TV receiver (with video and audio input terminals) shall be provided for demonstration's sake.

(9) ENG System

News gathering equipment and a high-mobility compact vehicle for mounting the news gathering equipment shall be provided. The vehicle shall be such that will allow a whip antenna for VHF communication to be mounted.

(10) Power Supply

The scope of work to be implemented by the contractor for the power supply in the Studio Center is as follows.

1) Installation and wiring of switchboard, IVR, isolation transformer, battery/charger, engine generator and associated equipment.

2) Wiring from distribution board of each equipment room to all broadcasting equipment to be installed in the room.

(The distribution board in each equipment room and wiring on the main power supply side shall be provided separately by the contractor.)

3) All wirings associated to studio lighting facilities of Studios 1 and 2.
(Wiring from the output of the isolation transformer to the main switch for lighting in the studio shall be provided separately by the contractor.)

(11) Clock System

A master clock shall be provided in the master control room and slave clocks at specified locations.

(12) Building Monitor System

A cable TV system shall be provided for receiving the programme signal from Mt. Pidurutalagala Transmitting Station and then distributing the signal in the Studio Center. No TV set shall be included.

(13) PABX System

A PABX system (10 outside lines and 100 extensions) shall be provided. The supply and wiring of telephone sets for use at terminals shall be included.

(14) Room to room intercom system

A room to room intercom system shall be provided between specified rooms.

(15) Radio Equipment

1) The receiving antenna system for the FPU (including a manual type rotating equipment) and the receiving antenna system for VHF communication equipment of the OB van shall be mounted on the steel tower on the roof of the Studio Center.

2) All antennas specified to be mounted at the Studio in the paragraphs on Mt. Pidurutalagala transmitting stations shall be mounted on the steel tower on the roof of the Studio Center.

3) At the Studio Center side, the terminal equipment of all radio equipment shall be installed in the radio room and the control equipment, voice-frequency terminal equipment, etc., associated with the radio equipment shall be installed in the master control room

6-1-2 Mt. PIDURUTALAGALA TRANSMITTING STATION

This transmitting station shall continuously be operated unattended and accommodate a 20kW TV transmitter system incorporating two 10kW TV transmitter to run in parallel operation, associated equipment such as input monitor, transmitting antenna, steel tower (not included in the scope of work to be implemented by the contractor), STL, TSL, power incoming panel and distribution board, engine generator for use in emergencies, and measuring equipment.

- Control and monitoring of this transmitting station shall be conducted at Colombo Studio Center by using remote control and monitoring equipment.

(1) TV Transmitter

A parallel operation system with 2 sets of 10kW TV transmitter shall be employed. Each transmitter shall be of low-power stage IF modulation type and shall fully employ solid-state circuitry excluding two vacuum tubes to be used for the vision and sound final-stage power amplifiers. The VSB filter, CIN diplexer, and high-voltage power

supply shall be mounted in the transmitter cubicle, and only the cooling blower shall be installed separately. The blower air duct, duct fan, and associated components of the transmitter cooling system shall all be provided by the contractor.

(2) Output coaxial equipment

The output coaxial equipment shall consist of an output combiner/selector panel, a forced air cooling test load, indoor coaxial feeders, etc.

The output combiner/selector panel shall consist of an output combiner (3dB coupler), a power divider (T transformer) a coaxial switch, and a U-link panel and shall provide the following functions.

1) To combine two transmitter output powers into one power (CIN diplexer output) and divide the CIN diplexer output into two powers to be fed to the upper and lower stages of the transmitting antenna.

2) To supply one transmitter output power whichever (CIN diplexer output) to the antenna or dummy antenna.

3) To combine two transmitter output powers into a power (CIN diplexer output) and feed the CIN diplexer output to the dummy antenna.

(3) Input/monitoring equipment

The input/monitoring equipment shall consist of an input equipment for applying the video and audio signals sent from the studio through the STL equipment to two TV transmitters at the rated levels, and a monitoring equipment for monitoring the vision and sound signals between transmitter input and output combiner/selector panel output.

The input/monitoring equipment shall be mounted on an input/monitoring bay. A 20 inches colour TV receiver shall be provided for use as an air monitor. The antenna for the air monitor shall be mounted on the steel tower.

(4) Parallel operation equipment

This equipment shall be used between the exciter units and power amplifiers of the two transmitters to switch and distribute the outputs of the two exciters to the two power amplifiers and shall be of exciter stand-by, power amplifier parallel operation type.

This equipment shall incorporate an exciter switcher and others and be mounted in the parallel operation bay. This equipment shall be installed between the two TV transmitters.

(5) Remote control and monitoring equipment

Mt. Pidurutalagala Transmitting Stacion is an unattended station of which remote control and monitoring shall be performed at Colombo Studio Center.
By installing a control bay on the Studio Center side and a controlled bay on the transmitting station side, control signals from the Studio Center shall be superimposed on the sound channel of a 7GHz STL.
The control items shall be as given in Table 6-1.

Table 6-1 Control Items

No.	Control Item	Remarks
1	STL-1 Used	
2	STL-2 Used	
3	EXC-A	
4	EXC-B	

(Continued)

No.	Control Item	Remarks
5	TX-A ON	
6	TX-A OFF	
7	TX-B ON	
8	TX-B OFF	
9	Alarm Reset	
10	TX-A Single Ope.	
11	TX-B Single Ope.	
12	Parallel Ope.	
13	Engine Generator	
14	Commercial Power	
15	Auto Status	
16	Remote Status	
17	Engine Generator Stop	
18	Engine Generator Start	

Monitoring of indications at the transmitting station shall be allowed at Colombo Studio Center by using of a 150MHz TSL. The remote control and monitoring equipment proper shall be installed in the radio room of the Studio Center and the control and display panel and telephone panel shall be mounted in a bay installed in the master control room of the Studio Center by extending wiring to the master control room.
The monitoring items shall be as given in Table 6-2.

Table 6-2 Monitoring Items

No.	Monitoring Item	Remarks
1	STL-1 Used	
2	STL-2 Used	
3	STL-1 Failed	
4	STL-2 Failed	

(Continued)

No.	Monitoring Item	Remarks
5	EXC-A or B Used	
6	V/A EXC-A Failed	
7	V/A EXC-B Failed	
8	TX-A FIL/LT ON	
9	TX-A HT ON	
10	TX-A OLR Ope.	OLR/NTR
11	TX-A O/P Failed	V/A Output Power
12	TX-B FIL/LT ON	
13	TX-B HT ON	
14	TX-B OLR Ope.	OLR/NTR
15	TX-B O/P Failed	V/A Output Power
16	Unbalance Power	
17	Ant Reflect	
18	TX-A Single Ope.	
19	TX-B Single Ope.	
20	Parallel Ope.	
21	Engine Generator Start	
22	Engine Generator Stop	
23	Commercial Power Used	
24	Engine Generator Used	
25	Commercial Power Failed	
26	Engine Generator Failed	
27	Manual Status	
28	Auto/Remote Status	
29	Control Failed	
30	Indicate Failed	
31	Alarm (Building)	Fire/Door Open
32	Alarm (Engine)	Shutter No Open

(6) 7GHz STL equipment

Equipment described herein comprise those equipment to be installed at Colombo Studio Center and P & T Office.

1) Colombo Studio Center - Mt. Pidurutalagala Transmitting Station

The sound and video signal from Colombo Studio Center to Mt. Pidurutalagala Transmitting Station shall be transmitted by a 7GHz 10W STL. The STL transmitter to be installed at the Studio Center side shall incorporate an exciter unit of stand-by type and a power amplifier unit of 5W x 2 parallel operation type, provide an output of 10W (by using TWT in the power amplifier unit), and be installed in the radio room of the Studio Center. For the transmitting antenna, one panel of 4mϕ parabolic antenna shall be mounted on the steel tower of the Studio Center and flexible waveguide filled with dry air by a dehydrator shall be used as the feeder.

The STL receiver to be installed at Mt. Pidurutalagala Transmitting Station shall employ space diversity in consideration of a transmission distance of about 100km and shall be installed in the transmitter room of the transmitting station. For the receiving antenna, 2 panels of 4mϕ parabolic antenna shall be mounted on the steel tower. For the feeder, flexible waveguide filled with dry air by a dehydrator shall be employed. The dehydrator for the VHF TV transmitting antenna shall be used also for this purpose.

2) Colombo Studio Center - P & T Office

When the Indo-Sri Lanka Microwave System is completed, programmes to Kokavil Transmitting Station will be transmitted by using this microwave system. Accordingly, a 7GHz 1W microwave relay equipment shall be installed

to allow programme transmission from Colombo Studio Center to P & T Office.

For the microwave relay equipment to be installed at the Studio Center side, a stand-by system incorporating two 7GHz 1W transmitters shall be installed. For the transmitting antenna, a 1.8mϕ parabolic antenna shall be provided. For the feeder, flexible waveguide filled with dry air by a dehydrator shall be provided. The dehydrator of the STL for programme transmission to Mt. Pidurutalagala Transmitting Station shall be used also for this purpose. The antenna shall be mounted on the 35m selfsupporting steel tower of the Studio Center.

For the microwave relay equipment to be installed at the P & T Office, a stand-by system incorporating two 7GHz microwave relay receivers shall be employed.
For the receiving antenna, a 1.8mϕ parabolic antenna shall be employed. For the feeder, flexible waveguide filled with dry air by a dehydrator shall be used.
The antenna shall be mounted on the existing steel tower of P & T.

(7) TSL equipment

This equipment shall be used for the exclusive link for sending monitoring signals of the remote control and monitoring equipment to the Studio Center. The transmitter to be installed at the transmitting station (stand-by system) shall use a 150MHz band, provide an output power of 10W, and be mounted in the test equipment bay in the transmitter room.
For the transmitting antenna, 2 stacks of 8-element Yagi antenna shall be employed mounted on the steel tower of the transmitting station.

The receiver on the Studio Center (stand-by system) shall be installed at the radio room. For the receiving

antenna, 2 stacks of 8-element Yagi antenna shall be mounted on the steel tower of the Studio Center.

(8) Transmitting antenna

For the transmitting antenna, a 4-dipole antenna of 4 stages and 4 faces shall be employed. The antenna shall be omni-directional in the horizontal directionality.

Two main feeders shall be employed: one for feeding power to the upper two stages (2 stages of 4 faces) and the other to the lower two stages. For the main feeder, two 3-1/8"(77D) flexible coaxial cables shall be employed filled with dry air by a dehydrator. The dehydrator used for the STL receiving antenna shall be used also for this purpose. All feeder lead-in fittings, feeder suspension fittings, and feeder fixing fittings, shall be provided by the contractor.

(9) Others

The power cables and conduits for aviation obstruction lights to be provided on the steel tower shall be provided and wires.

(10) Power facilities

City power of 400V/230V, 50Hz, 3 phases, 4 wires, 150 KVA

shall be supplied for the power to the transmitting station. In consideration of supply voltage variation, an indication voltage regulator of 125 KVA shall be provided and power to respective equipment shall be fed through a distribution board. One engine generator shall be provided to assure power supply in case the city power fails. For the engine generator, due consideration shall be given to engine output power degradation at high altitudes. The scope of work to be covered by the contractor for the power supply system in the transmitting station shall be as follows.

1) Installation, wiring and piping of incoming panel, IVR, PDB, engine generator, generator control panel, battery & charger, sub fuel tank, and test dummy.

2) Wiring with all TV equipment to be installed in the transmitter room.

6-1-3 KOKAVIL TRANSMITTING STATION

This transmitting station shall be operated continuously attended. This transmitting station shall accommodate a 20kW TV transmitter system incorporating two 10kW TV transmitters to operate in parallel running, associated equipment such as input monitoring equipment, microwave relay equipment, control console, clock for automatic starting, transmitting antenna, steel tower (not included in the scope of work to be covered by the contractor), incoming panel and distributing boards, engine generator, and measuring equipment.
Control and monitoring of the transmitting station shall be made manually on the control console.

(1) TV transmitter

A parallel operating TV transmitter system incorporating

two 10kW TV transmitters shall be employed. Each transmitter shall be of low-power stage IF modulation type and fully employ solid state circuitry except for two vacuum tubes for the vision and sound final-stage power amplifiers. The VSB filter, CIN diplexer, and high-voltage power supply shall be mounted in the transmitter cubicle and only the blower for cooling shall be installed separately. The blower air duct and duct fan and associated components of the transmitter cooling system shall all be provided.

(2) Output coaxial equipment

The output coaxial equipment shall be composed of an output combiner/selector panel, a forced air cooling test load, and indoor coaxial feeder.

The output combiner/selector panel shall incorporate an output combiner (3dB coupler), a power divider (T transformer), a coaxial switch, and a U-link panel and provide the following functions.

1) To combine two transmitter output powers into power (CIN diplexer output power) and still divide the power into two powers to be fed to the upper and lower stages of the transmitting antenna.

2) To supply one transmitter output power whichever (CIN diplexer output power) to the antenna or dummy antenna.

3) To combine two transmitter output powers into one output power (CIN diplexer output) and supply the output power to the dummy antenna.

(3) Input/monitoring equipment

The input/monitoring equipment shall consist of an input

equipment for applying the video and audio signals sent from the Madukanda Repeater Station through the microwave relay equipment to two TV transmitters at the rated levels, and a monitoring equipment for monitoring the vision and sound signals between transmitter input and output combiner/selector panel output. The input/monitoring equipment shall be mounted on an input/monitoring bay and control console. A 20 inches colour TV receiver shall be provided for use as an air monitor. The antenna for the air monitor shall be mounted on the steel tower.

(4) Control console

The control console shall be installed in front of the transmitter so as to facilitate monitoring of the transmitter operating condition.

The control console shall be furnished with, in addition to the monitoring equipment mentioned in the preceding paragraph, a control and display panel where the start/stop of the transmitter and coaxial switch operation shall be controllable and the operating condition of the transmitter shall be confirmable. Also, a clock for automatic starting of the transmitter shall be provided to allow automatic starting of the broadcasting transmitter.

(5) Parallel operation equipment

This equipment shall be used between the exciter units and power amplifiers of the two transmitters to switch and distribute the outputs of the two exciters to the two power amplifiers and shall be of exciter stand-by, power parallel amplifier operation type.

This equipment shall incorporate an exciter switcher and others and be mounted in the parallel operation bay. This equipment shall be installed between the two TV transmitters.

(6) 7GHz microwave relay equipment

The vision and sound signal from Madukanda Repeater Station shall be received by a 7GHz microwave relay receiver for use as the transmitter input. The receiver shall adopt space diversity, provide two receiver systems, and automatically select larger input signal of the two signals. Two 2.0mϕ parabolic antennas (each with a radome) shall be mounted on the steel tower of the transmitting station because of the adoption of space diversity. For the feeder, flexible waveguide filled with dry air by a dehydrator shall be used. The dehydrator for the TV transmitting antenna shall be used also for this purpose.

(7) Transmitting antenna

For the transmitting antenna, a 4-dipole antenna of 4 stages and 4 faces shall be employed. The antenna shall omnidirectional in the horizontal radiation pattern.

Two main feeders shall be employed: one for feeding power to the upper two stages (2 stages of 4 faces) and the other to the lower two stages. For the main feeder, two 3-1/8" (77D) flexible coaxial cables shall be employed filled with dry air by a dehydrator. The dehydrator used for the microwave relay equipment receiving antenna shall be used also for this purpose. All feeder lead-in fittings, feeder suspension fittings, and feeder fixing fittings shall be provided by the contractor.

(8) VHF radio Communication equipment and others

In order to secure wireless communication with Mannar Medium-Wave Transmitting Station, a 10W, 169.5MHz band transmitter receiver shall be installed at Kokavil transmitting station. For the antenna, a YAGI antenna shall be mounted on the steel tower.
The power cables and conduits for aviation obstruction lights to be provided on the steel tower shall be provided and wired.

(9) Power facilities

City power of 400V/230V, 50Hz, 3 phases, 4 wires, 200KVA shall be supplied for the power to the transmitting station. In concideration of supply voltage variation, an induction voltage regulator of 150KVA shall be provided and power to respective equipment shall be fed through a distribution board. One engine generator shall be provided to assure power supply in case the city power fails.
For fuel tanks, one outdoor tank of 2000ℓ (not included in the scope of work to be implemented by the contractor) and an indoor tank of 200ℓ shall be provided.

1) Installation, wiring and piping of incoming panel, IVR, PDB, engine generator, generator control panel, battery & charger, sub fuel tank, and test dummy.

2) Wiring with all TV equipment to be installed in the transmitter room.

6-1-4 KANDY TRANSMITTING STATION

This transmitting station shall be operated unattended to receive No.5 channel of radio wave from Mt. Pidurutalagala Transmitting Station, convert No.5 to No.10 channel, and rebroadcast them by a stand-by operating system incorporating two 50W TV transmitters. This transmitting station shall accommodate a transmitting and receiving antennas, a steel tower (not included in the scope of work to be implemented

by the contractor), transmitter, monitoring equipment, incoming panel and distribution board, engine generator for emergency use, and measuring equipment.

(1) Transmitter

Two 50W TV transmitters shall be employed to form a stand-by operating system. Each transmitter shall employ solid-state circuitry and of IF conversion type. When No.1 transmitter fails, No.2 transmitter shall be selected automatically to operate.

(2) Monitoring equipment

In order to monitor the qualities of the picture and sound at the transmitting station, an air monitor and a monitoring equipment to operate by using telephone line shall be installed at Kandy Medium-Wave Transmitting station.

This monitoring using telephone line shall be such that when there is a change in the operating condition of the equipment working at the transmitting station, the transmitting section of monitoring equipment installed at Kandy TV Transmitting Station shall operate to automatically call up the Kandy Medium-Wave Transmitting station, operate the receiver section, and display and record the operating condition. A total of 12 items shall be displayed and the time when the status change occurs, data of status change, etc., shall be printed out.

The monitoring items shall be as given in Table 6-3.

Table 6-3 Monitoring Items

1. TX No.1 Failed
2. TX No.2 Failed
3. Engine Generator Start
4. Engine Generator Stop
5. Engine Generator Used

(Continued)

6.	Engine Generator Failed
7.	Commercial Power Failed
8.	Alarm (Building)
9.	Spare
10.	do.
11.	do.
12.	do.

The power supply of this monitoring equipment shall be designed to provide power so as to allow data to be sent out even when power to the transmitting station fails.
A 20 inches colour TV receiver shall be installed for use as an air monitor in the transmitting station. The antenna for the air monitor shall be mounted on the steel tower.

(3) Transmitting antenna

For the transmitting antenna, a 2-dipole antenna of one face shall be provided for each of the four directions (A, B, C, and D). The antenna is omnidirectional. For the main feeder, 7/8" flexible coaxial cable shall be employed. Feeder lead-in fittings and feeder fixing fittings shall all be provided by the contractor.

(4) Receiving antenna

For the receiving antenna, a 12-element Yagi antenna (with a corner reflector) shall be mounted on the steel tower of the transmitter station for use as the horizontal stack.

(5) Others

The power cables and conduits for aviation obstruction lights

on the tower shall be provided and wired.

(6) Power facilities

For the power supply, city power of 230V, 50Hz, single phase, 5KVA shall be supplied to the transmitting station. In consideration of supply voltage variation, an automatic voltage regulator of 3KVA shall be provided and power to respective equipment shall be fed through a distribution board. One engine generator shall be provided to assure power supply in case the city power fails.
The engine generator control panel shall be mounted on the engine. For the engine fuel tank, an indoor tank of 300ℓ shall be provided and no outdoor tank will be provided.
The scope of work be covered by the contractor in connection with the power supply in the transmitting station is as follows.

1) Installation and related wiring, and piping of power receiving and distribution boards (incorporating AVR, and PDB), engine generator (with generator control panel), battery & charger, and fuel tank.

2) Wiring with all TV equipment to be installed in the transmitter room.

6-1-5 MADUKANDA REPEATER STATION

Madukanda Repeater Station shall be operated unattended. The input circuit of the microwave transmitter to Kokavil Station shall be designed to be able to select two input signals, the off-air receiving signal and signals dropped from Indo-SriLanka Microwave System.

This repeater station shall accommodate a VHF diversity receiver a microwave repeater equipment, a VHF diversity receiving antenna, a parabolic antenna, a power incoming panel, a distributing board, an engine generator for emergency use, a monitor TV receiver, and measuring equipment. For the steel tower for the transmitting and receiving antennas, the 60m selfsupporting steel tower of P & T shall be used in common.

(1) Microwave repeater equipment

For the transmitting equipment, two 5W microwave power amplifiers shall be used to obtain an output of 10W in the parallel running mode. The exciter section shall be of stand-by type. The input circuit shall automatically select either the Indo-Sri Lanka Microwave System or the signal from Mt. Pidurutalagala Transmitting Station by the presence/absence of the sync signal in the video signal. When the Indo-Sri Lanka Microwave System demodulator output signal is received, it shall be selected by priority. The cables for the input signal from the microwave system shall be laid to the Repeater Station.

(2) VHF Space diversity receiver

The space diversity receiver shall incorporate two receiving systems and automatically receive a larger input signal selected by the diversity switch.

(3) Transmitting antenna for microwave link

For the transmitting antenna, a 4.0mφ parabolic antenna shall be mounted at a position of 40 meters on the P & T's 60m selfsupporting steel tower. For the feeder,

flexible waveguide shall be used filled with dry air by a dehydrator.

(4) Antenna for VHF diversity receiver

For the receiving antenna, two 12-element Yagi antennas each being in horizontal stack shall be provided to achieve space diversity. The distance between the two antennas shall be about 100 meters. Accordingly, one antenna shall be mounted atop the P & T's 60m selfsupporting steel tower and the other antenna at a proper location in the neighbourhood by means of antenna supports. This antenna system shall incorporate a line amplifier to compensate for feeder loss.

(5) Power facilities

City power of 230V, 50Hz, single phase, 5KVA shall be supplied for use as the power supply.
In consideration of supply voltage variation, an automatic voltage regulator of 3KVA shall be provided and power to respective equipment shall be fed through a distribution board. An engine generator shall be provided for use in the event of city power failure.

A generator control panel shall be mounted on the engine generator. For the engine fuel tank, an indoor tank of 300ℓ shall be provided and no outdoor tank will be provided. The scope of work to be implemented by the contractor in connection with the power supply facilities in this repeater station is as follows.

1) Installation and related wiring and piping of power receiving and distribution boards (incorporating AVR and PDB), engine generator (with generator control panel), battery & charger, and fuel tank.

2) Wiring with all TV equipment to be installed in the transmitter room.

6-2 EQUIPMENT COMPOSITION LIST

6-2-1 COLOMBO STUDIO CENTER

(1) Studio 1

1) Colour Camera Chain

Item	Q'ty
One-inch 3-plumbicon camera	3
Remote control panel	4
Camera cable, 25m	4
Patching camera cable, 1.5m	4
Zoom lens, 10:1	3
Cam head	3
Camera pedestal	3
Standard accessories	3 sets

2) Video Control System

Item	Q'ty
Video switcher	1 set
Mixer/keyer amplifier	2
Waveform generator	1
Chromakey generator	1
Video distributing equipment	1 set
Sync distributing equipment	1 set
Cabinet rack & console	1 set

3) Audio Control System

Item	Q'ty
Audio mixing console	1
Tape recorder	2
Disc player (single)	2
Echo machine	1

Item	Q'ty
Microphone	
Dynamic microphone	2
Condenser microphone	11
Variable directional condenser microphone	2
Wireless microphone	4
Microphone stand	
Desk stand	4
Floor stand	7
Boom stand	1

4) Monitoring Equipment

Item	Q'ty
Picture monitor, 9 inches	1
Picture monitor, 12 inches	14
Colour picture monitor, 20 inches	2
Colour master monitor, 20 inches	2
Waveform monitor	1
Vectorscope	1
Audio monitor speaker	2
Ceiling speaker	1

5) Flying Spot Scanner

Item	Q'ty
Main body	1
Scroll	1
Dual card holder	1
Card holder	1 set

6) Lighting Control System

Item	Q'ty
Dimmer rack with main switch	1
Dimmer unit, 6kW	20
Patching & D/L switchboard	1
Control console	1

7) Manual Batten Suspension System

Item	Q'ty
Lighting batten	10
Back lighting batten	4
Horizontal lighting batten	4
Curtain batten	2
Curtain rail	1

8) Lighting Lamp Equipment

Item	Q'ty
2kW Solar spot light	20
1kW Solar spot light	25
1.6kW Quartz soft light	10
1.6kW Quartz broad light	25
1kW Follow spot light	2
800W Upper horizon light	96
800W Lower horizon light	96
Stand with caster	15
Extension cord	20
Wall pocket (30A x 2)	20
Telescopic hanger	45
Operation bar	2
Colour filter	300 sets
Stepladder	1
Y-branch cord	5

9) Operation Chair 7

(2) Studio 2

1) Colour Camera Chain

Item	Q'ty
One-inch 3-plumbicon camera	2
Remote control panel	3
Camera cable, 25m	3
Patching camera cable, 1.5m	3
Zoom lens, 10:1	2
Cam head	2
Camera pedestal	2
Standard accessories	2 sets

2) Video Control System

Item	Q'ty
Video switcher	1 set
Mixer/keyer amplifier	2
Waveform generator	1
Chromakey generator	1
Video distribution equipment	1 set
Sync distribution equipment	1 set
Cabinet rack & console	1 set

3) Audio Control System

Item	Q'ty
Audio mixing console	1
Tape recorder	2
Disc player (single)	2
Microphone	
Dynamic microphone	2
Condenser microphone	6
Variable directional condenser microphone	3

Item	Q'ty
Microphone stand	
Desk stand	4
Floor stand	4
Microphone control box	3

4) Monitoring Equipment

Item	Q'ty
Picture monitor, 9 inches	1
Picture monitor, 12 inches	13
Colour picture monitor, 20 inches	2
Colour master monitor, 20 inches	2
Waveform monitor	1
Vectorscope	1
Audio monitor speaker	2
Ceiling speaker	1

5) Flying Spot Scanner

Item	Q'ty
Main body	1
Scroll	1
Dual card holder	1
Card holder	1 set

6) Lighting Control System

Item	Q'ty
Control console	1
Dimmer unit, 6kW	6

7) Lighting Lamp Equipment

Item	Q'ty
2kW Solar spot light	10
1kW Solar spot light	15
1.6kW Quartz soft light	8
1.6kW Quartz broad light	16
800W Upper horizon light	48
Stand with caster	8
Extension cord	15
Wall pocket (30A x 2)	6
Grid pocket (30A x 2)	27
Telescopic hanger	50
Operation bar	2
Colour filter	150 sets
Stepladder	1
Y-Branch cord	5

8) Operation Chair 7

(3) Dubbing Room

1) Video Control System

Item	Q'ty
Video switcher	1 set
Mixer/keyer amplifier	2
Waveform generator	1
Video distributing equipment	1 set
Sync distributing equipment	1 set
Cabinet rack & console	1 set

2) Audio Control System

Item	Q'ty
Audio mixing console	1
Tape recorder	2
Disc player(single)	2
Cassette tape recorder	2
Microphone	
Dynamic microphone	1
Condenser microphone	3
Variable directional condenser microphone	2
Microphone stand	
Desk stand	3
Floor stand	2
Microphone control box	1

3) Monitoring Equipment

Item	Q'ty
Picture monitor, 12 inches	10
Colour picture monitor, 20 inches	1
Colour master monitor, 20 inches	1
Audio monitor speaker	2

4) Operation Chair 7

(4) Master Control

1) Master Assignment System

Item	Q'ty
Video switching system	1 set
Audio switching system	1 set

Item	Q'ty
Tally logic panel	1 set
Processing amplifier	2
Colour bar generator	1
Digital time coder	1
Cabinet rack & console	1 set
Black burst generator	1

2) Synchronizing Signal System

Item	Q'ty
Sync signal generator	2
Sync distribution equipment	1 set
Cabinet rack	1 set

3) Monitoring Equipment

Item	Q'ty
Picture monitor, 12 inches	12
Colour picture monitor, 20 inches	2
Waveform monitor	1
Colour TV receiver, 20 inches	1
Audio monitor speaker	1

4) Flying Spot Scanner

Item	Q'ty
Main body	1
Scroll	1
Dual card holder	1
Card holder	1 set

5) Frame Synchronizer 1

6) Audio Equipment

Item	Q'ty
Tape recorder	1
Cassette tape recorder	1

7) Operation Chair 9

8) Room to Room Intercom System 1 set

9) Clock System

Item	Q'ty
Master clock	1
Slave clock, 1 second step	14
Slave clock, 30 seconds step	33

10) Building Monitor System, 37 outlets (without TV set) 1 set

(5) VTR and Telecine

1) Two-inch 4-head VTR (Complete set) 2

2) Cassette VTR

Item	Q'ty
Cassette VTR	4
Time base corrector	2
Editing control unit	2
Colour master monitor, 20 inches	2
Waveform monitor	2
Vectorscope	2

Item	Q'ty
Monitor input select switch	2
Audio monitor speaker	2
VTR Bench	1 set

3) Colour Telecine Chain

Item	Q'ty
3-vidicon telecine camera	2
16mm Film projector	2
35mm Film projector	2
35mm Slide projector	2
Optical multiplexer	2
Channel base	2
Colour master monitor, 20 inches	2

4) Cinecorder (16mm Magnetic Film Sound Recorder/Reproducer) with Monitor 2

5) VTR & Telecine Assignment System

Item	Q'ty
Assignment switcher	1 set
Control panel	1
Colour picture monitor, 14 inches	1
Waveform monitor	1
Vectorscope	1
Audio monitor speaker	1

6) Test Film and Slide 1 set

7) Test Tape 1 set

(6) News Gathering System

1) Handy Colour Camera

Item	Q'ty
Camera with 1.5 inches viewfinder	2
Zoom lens, 10:1	2
Camera cable, 100m	2
Camera cable, 50m	4
Gun microphone	2
Battery focusing light	4
Battery and charger	2
AC Adapter	2

2) Cassette VTR (without Time Base Corrector) 2

3) Monitoring Equipment

Item	Q'ty
Colour picture monitor, 14 inches	2
Picture monitor, 9 inches	2
Waveform monitor	2
Audio monitor speaker	2

4) Carrying Van with VHF Radio Set 1

(7) OB Van

1) Colour Camera Chain

Item	Q'ty
One-inch, 3-plumbicon camera	2
Zoom lens, 22:1	2
Camera cable, 100m	4

Item	Q'ty
Camera cable, 50m	4
Camera cable, 25m	2
Cam head	2
Tripod & dolly	3
Standard accessories for outside use	3 sets

2) Video Control System

Item	Q'ty
Video switcher	1 set
Mixer/keyer amplifier	2
Waveform generator	1
Video & sync distribution equipment	1 set
Rack & console	1 set

3) Audio Control System

Item	Q'ty
Audio mixing console	1
Microphone	
Dynamic microphone	3
Condenser microphone	8
Moving coil microphone	3
Microphone stand	
Desk stand	2
Floor stand	4
Microphone extension cable with microphone branch box, 8 circuits, 50m	1
Intercommunication extension cable with branch box, 50m	1

4) Sync Signal Generator 2

5) TV Test Signal Generator 1

6) Monochrome Flying Spot Scanner 1

7) Monitoring Equipment

Item	Q'ty
Picture monitor, 9 inches	6
Colour picture monitor, 14 inches	3
Colour master monitor, 14 inches	1
Colour TV receiver, 20 inches with video input terminal	1
TV Demodulator	1
Vectorscope	1
Waveform monitor	1
Audio monitor speaker	4

8) Two-inch, 4-head VTR, for recording only 1

9) FPU with 150m TX Cable 1 set

10) VHF Communication Equipment 1 set

11) Vehicle

Item	Q'ty
Chassis & body with car cooler	1
Power distribution board	1
Engine generator, 30KVA	1
AVR, ±15%, 15KVA (load)	1
Receiving power cable, 50m	1
Cable drum	1 set
TV Receiving antenna with pole	1 set
Whip antenna for VHF	1
Clock	1
Air conditioner	1

(8) Power Supply

Item	Q'ty
Engine generator, 250KVA	1
IVR, 15%, 100KVA (load)	1
Transformer, 300KVA, for lighting isolation	1
Power distribution panel	1 set
Battery and charger	2 sets

(9) PABX System 1 set

(10) Measuring Equipment

Item	Q'ty
Oscilloscope with cart	4
Vectorscope with cart	2
TV Test signal generator	1
Audio distortion meter/oscillator	2
Video attenuator	2
Audio attenuator	2
Illumination meter	3
Colour meter	3
White balance adjustor for colour monitor	2
Projection stand for colour camera	2
LCR meter	1
Transistor checker	1
Megohm meter	1
Circuit tester	10
Hand tool set	10
Frequency counter	1

(11) Other Equipment and Materials

1) TV Receiver

Item	Q'ty
B/W TV Receiver, 20 inches	100
Colour TV Receiver, 20 inches	50

2) Cine Equipment

Item	Q'ty
16mm Cine camera	2
16mm Film viewer	1
16mm Film splicer	1
16mm Film projector	2
35mm Film splicer	1
35mm Film viewer	1

3) Recording Materials

Item	Q'ty
2-inch Video tape	10
3/4-inch Video cassette	20
16mm Magnetic film	10

4) VHF Communication Equipment with Antenna	1 set
5) Installation Materials	1 set
6) Spare Parts	1 lot

6-2-2 Mt. PIDURUTALAGALA TRANSMITTING STATION

(1) 20kW VHF TV Transmitter
(10kW x 2 sets parallel operation)

Item	Q'ty
10kW TV Transmitter	2

Item	Q'ty
Operational tube	
8F76R (V. PA)	2
7F71RA (A. PA)	2
Cooling blower with air filter	2
CIN Diplexer	2
High-voltage equipment	2
Standard accessories	1 set

(2) Output Power Combiner

Item	Q'ty
Coaxial switching equipment	1
Test load (16kW Ave.)	1
Indoor coaxial feeder	1
(comprising 90° elbow & coupling	
feeder hanger)	1
Monitoring facility	1 set

(3) Transmitter Input and Monitoring Equipment

Item	Q'ty
Video jack panel	1
Audio jack panel	1
Video distribution amplifier	2
Audio limitting amplifier	2
Visual demodulator	1
Aural demodulator	1
Waveform monitor	1
Picture monitor (9")	1
Audio monitor (comprising audio	
amplifier and loudspeaker)	1
Colour TV receiver for on-air	
monitor (20")	1
RF Connecting board	1

Item	Q'ty
Video monitor switcher	1
Audio monitor switcher	1
NFB Board	1
DC 24V Power supply	1
Cabinet rack	1

(4) Remote Control & Supervisory Equipment

Item	Q'ty
Studio site	
Control & indication panel	1
Telephone panel	1
Memory relay panel	1
Logic panel	1
Power supply panel	1
Cabinet rack	1
Transmitting site	
Control & indication panel	1
Telephone panel	1
Control relay panel	1
Logic panel	1
Power supply panel	1
Cabinet rack	1

(5) Transmitter Control Equipment

Item	Q'ty
Automatic control equipment	1
Visual auto-monitor	2
Aural auto-monitor	2
Parallel operating equipment comprising	1
(1) Exciter switching unit	1

Item	Q'ty
(2) Control panel	1
(3) Cabinet rack	1

(6) Antenna & Main Feeder

Item	Q'ty
4-Dipole antenna with supporting metal	4 stages, 4 faces
77D(3-1/8") Flexible coaxial cable	70m x 2
Dehydrator	1

(7) STL and TSL

1) Colombo - Pidurutalagala

a) Studio site

Item	Q'ty
STL transmitting equipment 10W (5W x 2)	1
4.0mφ Parabolic antenna	1
Flexible waveguide	50m
TSL Receiving equipment	2
8-Element 2-stack Yagi antenna	1
Receiving cable (1/2")	40m
Cabinet rack	2

b) Transmitting site

Item	Q'ty
STL Receiving equipment	2
4.0mφ Parabolic antenna	2
Flexible waveguide	50m + 65m
TSL transmitting equipment (10W)	2
8-Element 2-stack Yagi antenna	1
Transmitting cable (1/2")	85m
Cabinet rack	1

2) Colombo - P & T Office

a) Studio site

Item	Q'ty
Transmitting equipment	
1W Stand-by system	1
1.8 mφ Parabolic antenna	1
Flexible waveguide	50 m
Dehydrator	1

b) P & T Office site

Item	Q'ty
Receiving equipment stand-by system	1
1.8 mφ Parabolic antenna	1
Flexible waveguide	50 m
Dehydrator	1

(8) Air Monitor

Item	Q'ty
3-Element Yagi antenna	1
Receiving cable (1/2")	45m

(9) Power Facilities

Item	Q'ty
125KVA Induction voltage regulator with control panel	1
Power distribution board and incoming panel	3
125KVA Engine generator	1
E/G Control panel	1
Charger and battery	1
Fuel tank (200ℓ)	1
Test dummy	1

(10) Measuring Equipment

Item	Q'ty
AM Sideband analyzer with oscilloscope	1
TV Test signal generator	1
Synchroscope with scope mobile	1
VHF Sweep generator	1
Envelope delay measuring set	1
Oscillator	1
Vectorscope	1
Field strength meter	1
Frequency counter	1
FM Linear detector	1
Electronic voltmeter	1
Megohm meter	1
Audio distortion meter/oscillator	1
RF Pushbutton attenuator	1
150/50W Coaxial power meter	1
Circuit tester	3

Item	Q'ty
Cabinet rack	2
Measuring mobile	1
SHF Frequency meter	1

Studio site for STL

Item	Q'ty
VHF Sweep generator	1
SHF Power meter	1
SHF Frequency meter	1

(11) Installation materials 1 set

(12) Spare Parts 1 lot

6-2-3 KOKAVIL TRANSMITTING STATION

(1) 20kW VHF TV Transmitter
(10kW x 2 sets parallel operation)

Item	Q'ty
10kW TV transmitter	2
Operational tube	
8F76R (V. PA)	2
7F71RA (A. PA)	2
Cooling blower with air filter	2
CIN Diplexer	2
High voltage equipment	2
Atuomatic start clock	1
Standard accessories	1 set

(2) Output Power Combiner

Item	Q'ty
Coaxial switching equipment	1
Test load (16kW Ave.)	1
Indoor coaxial feeder (comprising 90° elbow & coupling feeder hanger)	1
Monitoring facility	1 set

(3) Transmitter Input and Monitoring Equipment

Item	Q'ty
Video jack panel	1
Audio jack panel	1
Video distribution amplifier	2
Audio limiting amplifier	2
Visual demodulator	1
Aural demodulator	1
Colour TV receiver for on-air monitor (20")	1
RF Connecting board	1
NFB Board	1
DC 24V power supply	1
Cabinet rack	1

(4) Control Console

Item	Q'ty
Waveform Monitor	1
Video monitor switcher	1
Audio monitor switcher	1
Picture monitor (9")	1
Audio monitor (comprising audio amplifier and loudspeaker)	1
Vectorscope	1
Console	1

(5) Transmitting Control Equipment

Item	Q'ty
Automatic control equipment	1
Parallel operating equipment comprising:	1
(1) Exciter switching unit	1
(2) Control panel	1
(3) Cabinet rack	1

(6) Antenna & Main Feeder

Item	Q'ty
4 Dipole antenna with supporting metal	4 stages, 4 faces
77D (3-1/8") flexible coaxial cable	125m x 2
Dehydrator	1

(7) Microwave Link

Madukanda - Kokavil

Item	Q'ty
Microwave receiving equipment	2
2mϕ Parabolic antenna with radome	2
Flexible waveguide	120m + 140m

(8) VHF Communication Equipment

Item	Q'ty
Communication equipment	1
8-Element 2-stack Yagi antenna	1
Cable (1/2")	100 m

(9) Air Monitor

Item	Q'ty
3-Element Yagi antenna	1
Receiving cable (1/2")	45m

(10) Power Facilities

Item	Q'ty
150KVA Induction voltage regulator with control panel	1
Power distribution board and incoming panel	3
150KVA Engine generator	1
E/G control panel	1
Charger and battery	1
Fuel tank (200ℓ)	1
Test dummy	1

(11) Measuring Equipment

Item	Q'ty
AM Sideband analyzer with oscilloscope	1
TV Test signal generator	1
Synchroscope with scope mobile	1
VHF Sweep generator	1
Envelope delay measuring set	1
Oscillator	1
Field strength meter	1
Frequency counter	1
Spactrum analyzer	1
FM linear detector	1
Electronic voltmeter	1
Megohm meter	1
Audio distortion meter/oscillator	1
VHF Admittance meter	1

Item	Q'ty
RF Pushbutton attenuator	1
150/50W Coaxial power meter	1
Circuit tester	
Cabinet rack	
Measuring mobile	1
SHF Frequency meter	

(12) Installation Materials 1 set

(13) Spare Parts 1 lot

6-2-4 KANDY TRANSMITTING STATION

(1) 50W VHF TV Translator
(Stand-by operation)

Item	Q'ty
50W TV Translator	2
Test Load (50W)	1
Coaxial switching panel	1
Input switching panel	1

(2) Monitoring Equipment

Item	Q'ty
Supervisory equipment (with telephone)	1
Monitoring equipment	1

(3) Antenna and Main Feeder

Item	Q'ty
2-Dipole antenna with supporting metal	1
Flexible coaxial cable (7/8")	50m

(4) Receiving Antenna

Item	Q'ty
12-Element Yagi antenna with corner reflector	2
Receiving cable (1/2")	35m

(5) Air Monitor

Item	Q'ty
3-Element Yagi antenna	1
Receiving cable (1/2")	20m
Colour TV receiver for on-air monitor (20")	2

(6) Power Facilities

Item	Q'ty
3KVA Automatic voltage regulator	1
Power distribution board	1
3KVA Engine & generator	1
E/G Control panel	1
Charger and battery	1
Fuel tank (300ℓ)	1
5KVA Insulation transformer	1

(7) Measuring Equipment

Item	Q'ty
Colour intermodulation measurement	1

Item	Q'ty
Oscilloscope (10MHz)	1
VHF Sweep generator	1
IF Signal generator	1
Electronic voltmeter	1
Circuit tester	1

(8) Installation Materials 1 set

(9) Spare Parts 1 lot

6-2-5 MADUKANDA REPEATOR STATION

(1) Off Air TV Receiver System

Item	Q'ty
VHF Diversity receiver	1
12-Element Yagi antenna	4
Receiving cable (1/2")	500m + 120m

(2) Microwave Link Transmitting System

Madukanda - Kokavil

Item	Q'ty
Microwave transmitter equipment	
10W (5W x 2)	1

Item	Q'ty
4.0mϕ Parabolic antenna with supporting metal	1
Flexible waveguide	110m
Dehydrator	1
Cabinet rack	2

(3) Monitoring Equipment

Item	Q'ty
Colour TV receiver (with video input terminal)	1

(4) Power Facilities

Item	Q'ty
3KVA Automatic voltage regulator	1
Power distribution board	1
3KVA Engine & generator	1
E/G Control panel	1
Charger and battery	1
Fuel tank (300ℓ)	1
5KVA Insulation transformer	1

(5) Measuring Equipment

Item	Q'ty
VHF Sweep generator	1
Synchroscope	1

Item	Q'ty
TV Test signal generator	1
Frequency counter	1
Electronic voltmeter	1
Megohm meter	1
Audio distortion meter/oscillator	1
SHF Power meter	1
SHF Frequency meter	1
Circuit tester	1
(6) Installation Materials	1 set
(7) Spare Parts	1 lot

6-3 GENERAL TECHNICAL REQUIREMENTS

6-3-1 TELEVISION STANDARD SYSTEM

(1) Standard system

The television standard system and colour system to be employed in this project are respectively CCIR System B and PAL System.

(2) Video signal

The input and output amplitudes of the subsystems and equipment composing the system shall be 1Vp-p (VBS) at the impedance of 75 ohms unless otherwise specified.

(3) Pulse signal

The amplitude of the pulse signal to used for driving studio equipment shall be 4Vp-p at the impedance of 75 ohms.

(4) Subcarrier

The amplitude of the subcarrier to be distributed to studio equipment shall be 2Vp-p at the impedance of 75 ohms.

(5) Audio signal

The input and output amplitudes of the subsystem and equipment composing the system shall be 0dBm at the impedance of 600 ohms unless otherwise specified for the microphone input and others.

6-3-2 APPLICABLE INDUSTRIAL STANDARD

The equipment, component parts, and materials to be supplied shall comply with the Japanese Industrial Standards (JIS).

6-3-3 POWER SUPPLY

The supplied city power is as follows: 400/230V, 50Hz,

3 phases, 4 wires for Colombo, Mt. Pidurutalagala and Kokavil; 230V, 50Hz, single phase for Kandy and Madukanda. All equipment to be supplied shall operate stably from a 3 phases, 4 wires 400V power or a single phase 230V power which may cause voltage variation of within ±10%.

6-3-4 AMBIENT CONDITIONS

All equipment to be supplied shall operate stably without any practical hindrance in a 0°∿45°C temperature range and at relative humidities of less than 95%.

6-3-5 STANDARDIZATION

Those equipment of an identical type shall be fablicated to consist of identical units, modules, and component parts and to have identical configuration. Also, consideration shall be given in design so that component units, modules, and parts can provide interchangeability as much as possible among different types of equipment as well.

6-3-6 COMPONENT PARTS

Such component parts as resistors, capacitors, and semiconductors to be employed shall be, in principle, those available in international markets. Supply of component units, modules, and other special component parts of the same type or equivalent shall be guaranteed for at least 10 years after the initial supply of these components.

6-3-7 WIRING

Wiring inside equipment or between equipment shall all be accomplished in good order not to cause interference between wires nor to hinder maintenance.

6-3-8 IDENTIFICATION MARKS

Operational component parts such as switches and indicating

components such as meters shall have marks to identify their functions on the components themselves or at their mounting locations.

All component parts shall have the description of their parts numbers corresponding to those given in relevant drawings on the component parts or at their mounting locations, unless such description is achievable.

6-3-9 FINISH COLOUR

The equipment shall be finished with "NHK Standard Colour No. 2 and/or 3", unless under unavoidable circumstances where the standard colour of the manufacturer may be employed with approval.

6-3-10 SAFETY

All items of equipment shall be designed and manufactured with due consideration for safety. In case there is any such portion that may invite hazard, a clear marking of warning must be provided properly.

6-3-11 INSPECTIONS

(1) Factory inspection

1) The following items of equipment shall undergo factory inspection for their total quantities to be supplied.

Video control system for studio
Audio control system for studio
Video control system for assignment
Audio control system for assignment
Colour camera chain
ENG Colour camera
Telecine colour camera
Film projector

Flying spot scanner
Two-inch 4-head VTR
Cassette VTR
Time base corrector
Tape recorder
Disc player
Cinecorder
FPU Equipment
Synchronizing signal generator
Lighting control system
OB Van vehicle
Engine generator
Transmitter
Microwave link equipment
Remote control/monitoring equipment
Transmitting antenna

2) Other items of equipment than mentioned above shall be checked for their external views and quantities. When, necessary, sampling inspection may be performed.

3) Inspection shall be conducted in the presence of the inspector. Those equipment rejected by the inspection shall not be shipped off.

4) Four copies of inspection data shall be submitted to Colombo Headquarters.

(2) Acceptance inspection

After completion of the installation, the inspector shall inspect equipment installed and works carried out by the contractor for compliance to the contract. Jadgement shall be made by data obtained by the factory inspection. However, when measurement is not achievable with test equipment available at the site, the inspector shall determine by the presence/absence of substantial hindrance.

6-3-12 INSTRUCTION MANUALS

For each equipment to be supplied to a station, three copies of instruction manual describing operation and troublshooting shall be supplied to the station. Every instruction manual must have been prepared comprehensible in consideration of convenience of routine work by the operator.

In addition to these instruction manuals, three copies of completed drawings and tables for the sake of operation and maintenance (including drawings of systems, subsystems, and equipments, parts lists, and other necessary data of all stations) shall be submitted to Colombo Headquarters.

6-4 PERFORMANCE SPECIFICATIONS OF STUDIO EQUIPMENT

6-4-1 VIDEO CONTROL SYSTEMS FOR STUDIOS

The following performance specifications shall apply to video control systems to be employed in Studios 1 and 2, the dubbing studio, and OB van. To be concrete, these specifications shall apply to all video signal routes to be formed between the input and output video jacks.

(1) Frequency response	within ±1dB, up to 8MHz
(2) Path length accuracy	less than 4 degrees
(3) Differential gain	less than 3% at 10 to 90% APL
(4) Differential phase	less than 2 degrees at 10 to 90% APL
(5) Square wave response	less than 2% for 50Hz
(6) Signal-to-noise ratio	
For hum noise:	more than 54dBp-p/p-p
For random noise:	more than 50dBp-p/rms
(7) Crosstalk	less than -50dB at 4.5MHz

6-4-2 AUDIO CONTROL SYSTEMS FOR STUDIOS

The following performance specifications shall apply to audio control systems to be employed in Studios 1 and 2, the dubbing studio, and OB van. To be concrete, these specifications shall apply to all audio signal routes to be formed between the input and output audio jacks.

(1) Input signal level	
Microphone:	with specified microphone output level
Line:	0dBm, 600 ohms
(2) Output signal level	0dBm, 600 ohms
(3) Indication of VU meter	-2 VU at 0dBm

(4)	Frequency response	within ±2dB, 50 to 15,000Hz
(5)	Harmonic distortion	less than 0.5% at 0dBm output less than 1% at 10dBm output
(6)	Signal-to-noise ratio	more than 50dB
(7)	Mixing loss	more than 40dB
(8)	Crosstalk	less than -60dB at 7,000Hz

6-4-3 VIDEO CONTROL SYSTEMS FOR ASSIGNMENT

The following performance specifications shall apply to all video signal routes to be formed between the input and output video jacks of each matrix in the master assignment system and VTR & telecine assignment system.

(1)	Frequency response	within ±1dB, up to 8MHz
(2)	Path length accuracy	less than 4 degrees
(3)	Differential gain	less than 3% at 10 to 90% APL
(4)	Differential phase	less than 2 degrees at 10 to 90% APL
(5)	Square wave response	less than 2% for 50Hz
(6)	Signal-to-noise ratio	
	For hum noise:	more than 54dBp-p/p-p
	For random noise:	more than 50dBp-p/rms
(7)	Crosstalk	less than -50dB at 4.5MHz

6-4-4 AUDIO CONTROL SYSTEMS FOR ASSIGNMENT

The following performance specifications shall apply to all audio signal routes to be formed between the input and output audio jacks of each matrix in the master assignment system and VTR & telecine assignment system.

(1)	Input signal level	0dBm, 600 ohms

(2)	Output signal level	0dBm, 600 ohms
(3)	Indication of VU meter	-2 VU at 0dBm
(4)	Frequency response	within ±2dB, 50 to 15,000Hz
(5)	Harmonic distortion	less than 0.5% at 0dBm output less than 1% at 10dBm output
(6)	Signal-to-noise ratio	more than 50dB
(7)	Crosstalk	less than -60dB at 7,000Hz

6-4-5 COLOUR CAMERA CHAINS

The following performance specifications shall apply to colour camera chains to be used in the studios and OB van.

(1)	Output signal	3 PAL signals (V or VS) 1 R.G.B. signal (V)

(2) Sensitivity

The performance specifications set out herein shall be met when operating cameras under the following conditions.

Illumination intensity:	2,000 lux
Colour temperature:	3,200°K
Reflection coefficient:	60% for white
Lens aperture:	F4.0

(3) Resolution

At center:	500 TV lines
At corners:	400 TV lines

(4) Scanning accuracy

Zone 1:	within ±0.5%
Zone 2:	within ±1.0%
Zone 3:	within ±2.0%

(5) Registration

Zone 1:	within ±0.1%
Zone 2:	within ±0.2%
Zone 3:	within ±0.4%

(6) Signal-to-noise ratio — more than 49dB on Y-channel for 5.5MHz frequency band

Note 1: Zone 1 is the inside of a circle with a diameter equal to 0.8 picture height.

Note 2: Zone 2 is the inside of a circle with a diameter equal to the picture width.

Note 3: Zone 3 is the outside of a circle with a diameter equal to the picture width.

Note 4: % means % of the picture height.

6-4-6 ENG COLOUR CAMERAS

The following specifications shall apply to colour cameras to be used for ENG (Electronic News Gathering).

(1) Output signal — 3 PAL signals (V or VS)
1 audio signal

(2) Sensitivity

The performance specifications set out herein shall be met when operating cameras under the following conditions.

Illumination intensity:	1,500 lux
Colour temperature:	3,200°K
Reflection coefficient:	60% for white
Lens aperture:	F2.0

(3) Resolution

At center:	500 TV lines
At corners:	400 TV lines

(4) Scanning accuracy

Zone 1:	within ±0.5%
Zone 2:	within ±1.0%
Zone 3:	within ±2.0%

(5) Registration

Zone 1:	within ±0.1%
Zone 2:	within ±0.3%
Zone 3:	within ±0.5%

(6) Signal-to-noise ratio — more than 48dB on Y-channel for 5.5MHz frequency band

Note 1: Zone 1 is the inside of a circle with a diameter equal to 0.8 picture height.

Note 2: Zone 2 is the inside of a circle with a diameter equal to the picture width.

Note 3: Zone 3 is the outside of a circle with a diameter equal to the picture width.

Note 4: "%" means % of the picture height.

6-4-7 TELECINE CAMERAS

The following performance specifications shall apply to colour telecine cameras.

(1) Output signal — 3 PAL signals (V or VS)

(2) Resolution

At center:	more than 500 TV lines
At corners:	more than 400 TV lines

(3) Signal-to-noise ratio — more than 48dBp-p/rms on Y-channel for 5.5MHz frequency band, at pick up tube current of 0.3μAp-p

(4) Gamma control — Adjustable in a 0.45 to 1.0 range

(5) Shading correction — Adjustable within ±20% for sawtooth and parabola shading

(6) Scanning accuracy

Zone 1:	within ±1%
Zone 2:	within ±2%

(7) Registration

Zone 1:	within ±0.2%
Zone 2:	within ±0.4%

where Zone 1 is the inside of an ellipse inscribed and Zone 2 the outside thereof.

(8) Automatic level control function shall be provided.

6-4-8 FILM PROJECTORS

The following performance specifications shall apply to 16mm and 35mm projectors to be used in the telecine chain.

(1) Film speed	25 frames/sec, both forward and reverse operation
(2) Loading capacity	
16mm:	1200m
35mm:	1800m
(3) Picture steadiness	0.2% of picture height, in both vertical and horizontal directions
(4) Uniformity of projected luminance	Minimum luminance shall be more than 80% of maximum luminance.
(5) Aduio reproducing system	Optical and magnetic
(6) Audio output level	0dBm, 600 ohms
(7) Indication of VU meter	-2 VU at 0dBm
(8) Frequency response	within ±3dB in 50 to 7,000Hz range

(9) Harmonic distortion	less than 5% at 5dB above the rated output
(10) Wow and flutter	less than 0.3% wrms
(11) Audio level fluctuation	less than 1dB at 1,000Hz

6-4-9 FLYING SPOT SCANNERS

The following performance specifications shall apply to flying spot scanners to be employed in the Studio Center.

(1) Loading capacity

Number of opaque cards:	100
Additional opaque holder:	1 at a time
Scroll:	1 at a time

(2) Output signal

Main channel for opaque:	1
Next preview for opaque:	1
Accessory channel:	1

(3) Resolution 500 TV lines at center

(4) Scanning accuracy

Zone 1:	within ±1.5%
Zone 2:	within ±2%

where zone 1 is the inside of an ellipse inscribed and Zone 2 the outside thereof.

(5) Signal-to-noise ratio more than 40dB on Y-channel for 5.5MHz frequency band

6-4-10 TWO-INCH, 4 HEAD VTR

The following performance specifications shall apply to two-inch, 4-head VTR.

(1)	Tape speed	15 inches per sec
(2)	Video frequency response	within ±0.5dB up to 4.5MHz
(3)	Video signal-to-noise ratio	more than 43dB
(4)	Differential gain	less than 4%
(5)	Differential phase	less than 4 degree
(6)	Audio frequency response	within ±2dB, 50 to 15,000Hz
(7)	Audio signal-to-noise ratio	more than 46dB
(8)	Audio distortion	less than 1% at rated output
(9)	Wow and flutter	less than 0.1% wrms
(10)	Starting time	less than 2 sec, in ready mode

6-4-11 CASSETTE VTR

The following performance specifications apply to 3/4-inch cassette VTR.

(1)	Tape speed	3.75 inches/sec
(2)	Input signal	
	Video:	1Vp-p (VS), adjustable ±6dB
	Audio:	-60dBm for microphone, 0dBm for line
(3)	Resolution	more than 260 TV lines at center
(4)	Video signal-to-noise ratio	more than 46dB
(5)	Audio frequency response	within ±3dB, 50 to 15,000Hz
(6)	Audio signal-to-noise ratio	more than 40dB
(7)	Harmonic distortion	less than 2.5%

6-4-12 TIME BASE CORRECTORS FOR CASSETTE VTR

The following performance specifications shall apply to time base corrector to be used upon playing cassette VTR.

(1) Frequency response	within ±0.3dB up to 5.8MHz, -3dB at 6.2MHz
(2) Signal-to-noise ratio	more than 50dB
(3) Differential gain	less than 2%
(4) Differential phase	less than 2 degrees
(5) Resultant time base correction	within ±4nsec

6-4-13 TAPE RECORDERS

The following performance specifications shall apply to floor type tape recorders.

(1) Recording system	AC bias system at 200kHz
(2) Tape speed	7.5 and 15 inches/sec
(3) Tape width	1/4 inche
(4) Frequency response	
7.5 inches/sec:	within ±2dB, 30 to 15,000Hz
15 inches/sec:	within ±2dB, 30 to 18,000Hz
(5) Wow and flutter	
7.5 inches/sec:	0.1% wrms
15 inches/sec:	0.05% wrms
(6) Signal-to-noise ratio	more than 50dB

6-4-14 DISC PLAYERS

The following performance specifications shall apply to floor type disc players.

(1)	Turntable speed	33 1/3, 45, 78 rpm
(2)	Flutter	less than 0.05%
(3)	Frequency response	within ±1.5dB, 50 to 16,000Hz
(4)	Signal-to-noise ratio	more than 50dB

6-4-15 CINECORDER

The following performance specifications shall apply to magnetic film recorder to be used for recording and reproducing movie sound by using 16mm magnetic film.

(1)	Type of film	16mm, single-perforated magnetic film
(2)	Film speed	25 frames/sec
(3)	Recording system	AC bias system at 100kHz
(4)	Frequency response	within ±2.5dB, 50 to 10,000kHz
(5)	Signal-to-noise ratio	more than 45dB
(6)	Wow and flutter	less than 0.2% wrms

6-4-16 FPU EQUIPMENT

The following performance specifications shall apply to the FPU equipment to be mounted on the OB van.

(1)	Frequency range	Single frequency in 6,420 to 7,125MHz range
(2)	Frequency stability	within 3×10^{-4}
(3)	Maximum frequency deviation	8MHz
(4)	Audio subcarrier	7.5MHz
(5)	Subcarrier frequency deviation	±140kHzp-p

(6)	Output power	1W
(7)	Noise figure	9dB or less
(8)	IF Frequency	130MHz
(9)	Overall video response	
	Frequency response:	within ±1dB, 60Hz to 5MHz
	DG:	less than 3%
	DP:	less than 2 degrees
(10)	Overall audio response	
	Frequency response:	within ±1dB, 50Hz to 12,000Hz
	Distortion:	less than 1% at 100% modulation

6-5 PERFORMANCE SPECIFICATIONS OF TRANSMITTING EQUIPMENT

6-5-1 Mt. PIDURUTALAGALA TRANSMITTING STATION

The following performance specifications shall apply to the equipment of Mt. Pidurutalagala Transmitting Station.

(1) TV Transmitters (2 x 10kW TV Transmitters)

1) Vision transmitter

Radio wave	A5C
Rated output	20kW (2 x 10kW) in sync peak value
Operating channel	CCIR Standard B, Band III Channel 5
Carrier frequency	175.25MHz
Carrier frequency stability	within ±150Hz
Output impedance	50Ω
Input level	
Sync signal	0.3V
Video signal	0.7V
Input impedance	75Ω

Frequency vs. amplitude response

Frequency (MHz)	Limit (dB)
-4.43	-30/-
-1.25	-20/-
-0.75	+0.5/-40
-0.5	+0.5/-0.5
0	+0.5/-0.5
+1.5	Reference
+3.0	+0.5/-1.0
+4.43	+0.5/-1.0
+5	+0.5/-2.5
+5.5 or more	-20/-

Group delay: Below 4.5MHz: ±50nS

4.5 ∿ 4.8MHz: ±100nS

Differential gain	within ±3% at 4.43MHz
Differential phase	within ±3° at 4.43MHz
Trainsient response	less than 2% K rating when measured by 2T pulse.
Bar response	less than 2% of maximum amplitude when measured with square wave of 50Hz and 15kHz
AM Noise	
Periodic noise:	less than -50dB (p-p)
Unwanted radiation	
Spurious radiation:	less than -60dB or less than 1mW relative to carrier power
Harmonic radiation:	do.

2) Sound transmitter

Radio wave	F3
Rated output	2kW
Operating channel	CCIR Standard B, Band III Channel 5
Carrier frequency stability	within ±150Hz
Output impedance	50Ω
Input level	-10∿+10dBm (±50kHz deviation) at 100% modulation
Input impedance	600Ω, balanced
Frequency response (at 50% modulation)	Deviation from ideal 50μS pre-emphasis curve be within ±0.5dB in 30∿15,000Hz range with reference to 1kHz
Distortion factor (at 100% modulation)	less than 1.0% in 100∿10,000Hz range less than 1.5% in 30∿15,000Hz range
FM Noise	less than -60dB at 100% modulation
AM Noise (at 100% modulation)	less than -40dB at carrier level

Unwanted radiation	Same as vision transmitter

General performance specifications

Power consumption	approx. 60kW (for black signal)
Power factor	95%
Power supply	400V/230V ± 10%, 3 phases, 4 wires, 50Hz
Ambient temperature	0 ∿ 45°C
Relative humidity	90%

(2) Transmitting antenna

Type and configuration	4-dipole antenna, 4 stages, 4 faces (2 upper stages plus 2 lower stages, 2-wire feeding system)
Operating frequency range	174 ∿ 181MHz (Channel 5) and 188 ∿ 195MHz (Channel 7)
Polarization	Horizontal
Input impedance	50Ω
Antenna gain	10.5dB (with reference to half-wavelength dipole)
VSWR	less than 1.07 in operating frequency range
Horizontal radiation pattern	Omnidirectional. See DWG. PD-003.
Vertical radiation pattern	See DWG. PD-004.
Beam tilt	None
Null fill	No.1 null: more than 10%
Maximum rated power	Video 20 kW (sync peak value) x 2 + aural 2kW (average) x 2 (1/2 of the above value in the case of only upper or lower stage)

Input terminal	3-1/8" (WX-77-D) EIA-J Flange (with anchor connector)
Allowable wind speed	54.0m/sec

(3) Main feeder

Type	3-1/8" (77D) Flexible coaxial cable
Characteristic impedance	50Ω
Attenuation	less than 0.6dB/100m at 195 MHz
Rated power	28 kW/195MHz in ambient temperature of 50°C
Cable length	70m x 2
Ambient temperature	0 ∿ 50°C
Relative humidity	95%

(4) STL

1) Colombo Studio Center - Mt. Pidurutalagala Transmitting Station Link

Frequency range	6,420 ∿ 7,125MHz
Output power	10W (parallel operation of 2 transmitters)
Frequency stability	within $\pm 1 \times 10^{-4}$
Video input/output level	1Vp-p (negative sync)
Video input/output impedance	75Ω
Frequency deviation	maximum 8MHz (p-p)
Noise figure	less than 5dB
Differential gain	within ±3%
Differential phase	within ±1°
Video signal-to-noise ratio	more than 55dBp-p/rms (Thermal noise weighted)

	more than 46dBp-p/rms (Hum noise)
Video frequency response	within ±0.5dB in 60Hz ∿ 5MHz range
2T Pulse response and overshoot distortion factor	K = less than 1%
IF Frequency	130MHz
Audio input/output level	0dBm
Audio input/output impedance	600Ω, balanced
Subcarrier frequency	7.5MHz
Subcarrier frequency deviation	±140kHz (p-p)
Audio signal-to-noise ratio	more than 55dB
Audio frequency response	less than 1dB in 50Hz ∿ 12.5kHz range
Audio distortion factor	less than 1% at 100% modulation
Power supply	AC 230V, single phase
Power consumption	
At transmitter side:	approx. 1KVA
At receiver side:	approx. 300VA
Ambient temperature	0 ∿ 45°C
Relative humidity	90%

2) Colombo Studio Center - P & T Office

Frequency range	6,420 ∿ 7,125MHz
Output	1W (Stand-by system)
Frequency stability	within ±1 x 10^{-4}

Video input/output level	1Vp-p (negative sync)
Video input/output impedance	75Ω
Frequency deviation	maximum 8MHz(p-p)
Noise figure	less than 5dB
Differential gain	less than ±3%
Differential phase	less than ±1°
Video signal-to-noise ratio	more than 55dBp-p/rms (Thermal noise weighted) more than 46dBp-p/rms (Hum noise)
Video frequency response	±0.5dB in 60Hz∿5MHz range
2T Pulse response and overshoot distortion factor	K = less than 1%
IF Frequency	130MHz
Audio input/output level	0dBm
Audio input/output impedance	600Ω, balanced
Subcarrier frequency	75MHz
Subcarrier frequency deviation	±140kHz (p-p)
Audio signal-to-noise ratio	more than 55dB
Audio frequency response	less than 1dB in 50Hz∿12.5kHz range
Audio distortion factor	less than 1% at 100% modulation
Power supply	AC 230V, single phase
Power consumption	
At transmitter side:	approx. 90VA
At receiver side:	approx. 60VA
Ambient temperature	0∿45°C
Relative humidity	90%

3) Antennas

a) Colombo Studio Center - Mt. Pidurutalagala Transmitting Station

STL Transmitting antenna and receiving antenna

Frequency range	6,420 ∿ 7,125MHz
Type of antenna	Parabolic antenna
Antenna diameter	4.0mϕ
Antenna gain	more than 45dB
VSWR	less than 1.2

b) Colombo Studio Center - P & T Office

Microwave link transmitting and receiving antennas

Frequency range	6,420 ∿ 7,125MHz
Type of antenna	Parabolic antenna
Antenna diameter	1.8mϕ
Antenna gain	more than 39dB
VSWR	less than 1.2

(5) Remote control and monitoring equipment

The following specifications shall apply to the control and monitoring functions of the transmitters.

1) Control

Control signal	To be superimposed on STL link
Type of transmission	SSB
Input/output impedance	600Ω
Carrier frequency	20kHz
Input level	-16dBm
Output level	-10dBm
Frequency response	Deviation: less than 4dB in 300Hz ∿ 3.4kHz

Signal-to-noise ratio	more than 40dB
Number of control items	32
Operation time	less than 1 sec
Transmission speed	50 bits/sec
Distortion factor	less than 3%

2) Monitoring (TSL Link)

Rated output	10W
Carrier frequency	148MHz
Frequency stability	within $\pm 5 \times 10^{-6}$
Modulation	Crystal controlled phase modulation
Number of channels	One Telephone channel
Number of monitoring items	32
Frequency deviation	maximum 5kHz
Spurious radiation	less than -80dB
Operating frequency range	0.3 ∿ 3.0kHz (aural and monitoring signals)
Input/output level	-10dBm
Impedance	600Ω, balanced
Monitoring signal frequency	2340 ± 30Hz
Operation time	less than 1 second
Transmission speed	50 bits/sec
Signal-to-noise ratio	more than 30dB
Ambient temperature	0 ∿ 45°C
Relative humidity	90%

(6) Power facilities

1) 125KVA Induction voltage regulator

Capacity (Line capacity)	125KVA
. Input voltage variation and number of phases	400V/230V ± 15%, 50Hz, 3 phases, 4 wires
Output voltage variation	400V/230V ± 2%

Voltage control method	Induction type
Overall efficiency	more than 90%
Insulation	more than 5MΩ
Application of test voltage	1.5KV for one minute
Construction	cubicle type
Ambient temperature	0 ∿ 45°C
Relative humidity	less than 90%

2) Engine generator

AC Generator

Output	125KVA
Voltage	400V/230V ± 2%
Number of phase	3 (4 wires)
Frequency	50Hz
Number of poles	4
Speed	1500rpm
Power factor	0.8
Excitation	Self-excitation

Diesel engine

Output	200 ps
Speed	1500rpm
Cooling	Radiator cooling
Starting method	Cell motor starting
Number of cylinders	6
Ambient temperature	0 ∿ 45°C
Relative humidity	less than 90%

6-5-2 KOKAVIL TRANSMITTING STATION

The following performance specifications shall apply to the equipment of Kokavil Transmitting Station.

(1) TV Transmitters (2 x 10kW Transmitters)

1) Vision transmitter

Radio wave	A5C
Rated output	20kW (2 x 10kW) in sync peak value
Operating channel	CCIR Standard B, Band III Channel 8
Carrier frequency	196.25MHz
Carrier frequency stability	within ±150Hz
Output impedance	50Ω
Input level	
Sync signal	0.3V
Video signal	0.7V
Input impedance	75Ω

Frequency vs. amplitude response

Frequency(MHz)	Limit (dB)
-4.43	-30/-
-1.25	-20/-
-0.75	+0.5/-40
-0.5	+0.5/-0.5
0	+0.5/-0.5
+1.5	Reference
+3.0	+0.5/-1.0
+4.43	+0.5/-1.0
+5	+0.5/-2.5
+5.5 or more	-20/-

Group delay	Below 4.5MHz: ±50nS 4.5∿4.8MHz: ±100nS
Differential gain	within ±3% at 4.43MHz
Differential phase	within ±3° at 4.43MHz
Transient response	less than 2% K rating when measured by 2T pulse
Bar response	less than 2% of maximum amplitude when measured with square wave of 50Hz and 15kHz

AM Noise

Periodic noise	less than -50dB (p-p)

Unwanted radiation

Spurious radiation:	less than -60dB or less than 1mW relative to carrier power
Harmonic radiation:	do.

2) Sound transmitter

Radio wave	F3
Rated output	2kW
Operating channel	CCIR Standard B, Band III Channel 8
Carrier frequency stability	within ±150Hz
Output impedance	50Ω
Input level	-10∿+10dBm (±50kHz deviation) at 100% modulation
Input impedance	600Ω, balanced
Frequency response (at 50% modulation)	Deviation from ideal 50μS preemphasis curve be within ±0.5dB in 30∿15,000Hz range with reference to 1kHz.
Distortion factor (at 100% modulation)	less than 1.0% in 100∿10,000Hz range less than 1.5% in 30∿15,000Hz range
FM Noise	less than -60dB at 100% modulation
AM Noise (at 100% modulation)	less than -40dB at carrier level
Unwanted radiation	Same as visual transmitter

General performance specifications

Power consumption	approx. 60kW (for black signal)
Power factor	95%
Power supply	400V/230V ± 10%, 3 phases, 4 wires, 50Hz

Ambient temperature	0∿45°C
Relative humidity	90%

(2) Transmitting antenna

Type and configuration	4-dipole antenna, 4 stages, 4 faces (2 upper stages plus 2 lower stages, 2-wire feeding system)
Operating frequency range	195∿202MHz (Channel 8) and 209∿216MHz (Channel 10)
Polarization	Horizontal
Input impedance	50Ω
Antenna gain	10.5dB (with reference to half-wavelength dipole)
VSWR	less than 1.07 in operating frequency range
Horizontal radiation pattern	Omnidirectional. See DWG. KO-003.
Vertical radiation pattern	See DWG. KO-004.
Beam tilt	None
Null fill	No.1 null: more than 10%
Maximum rated power	Video 20kW (sync peak value) x 2 + aural 2kW (average) x 2 (1/2 of the above value in the case of only upper or lower stage)
Input terminal	3-1/8" (WX-77-D) EIA-J Flange (with anchor connector)
Allowable wind speed	54.0m/sec

(3) Main feeder

Type	3-1/8" (77D) Flexible coaxial cable
Characteristic impedance	50Ω
Attenuation	less than 0.6dB/100m at 216 MHz
Rated power	26 KW/216 MHz in ambient temperature of 50°C
Cabne length	125m x 2
Ambient temperature	0∿50°C
Relative humidity	95%

(4) Power facilities

1) 150KVA Induction voltage regulator

Capacity (Line capacity)	150KVA
Input voltage variation	400V/230V ± 15%, 50Hz
Number of phases	3 (4 wires)
Output voltage variation	400V/230V ± 2%
Output control method	Induction type
Overall efficiency	more than 90%
Insulation	more than 5MΩ
Application of test voltage	1.5KV for a minute
Construction	Cubicle type
Ambient temperature	0∿45°C
Relative humidity	less than 90%

2) Engine generator

AC Generator	
Output	150KVA

Voltage	400V/230V ± 2%
Number of phase	3 (4 wires)
Frequency	50Hz
Number of poles	4
Speed	1500rpm
Power factor	0.8
Excitation	Self-excitation

Diesel engine

Output	200 ps
Speed	1500rpm
Cooling	Radiator cooling
Starting method	Cell motor starting
Number of cylinders	6
Ambient temperature	0 ∿ 45°C
Relative humidity	less than 90%

6-5-3 KANDY TRANSMITTING STATION

The following performance specifications shall apply to the equipment of Kandy Transmitting Station.

(1) Transmitter

Rated output	50W
Receiving channel	CCIR Standard B, Channel 5
Transmitting channel	CCIR Standard B, Channel 10
Colour system	PAL System
Intermediate frequencies	
Vision:	38.9MHz
Sound:	33.4MHz
Input/output impedance	50Ω

Input level	more than 54dBf
AGC range	Output level variation: within ±1dB for input level variation of ±10dB
Noise figure	less than 7dB
Intermodulation	more than 51dB in following conditions Visual carrier: -4dB Aural carrier: -10dB Colour subcarrier: -15dB
Spurious	less than -60dB
Differential gain	within ±7%
Differential phase	within ±5°
Group delay	within ±50nsec in -0.75∿+5MHz range
Frequency response	within ±0.75dB in -1.25∿5.75MHz range within ±0.5dB at +4.43MHz
Local oscillation frequency stability	within $\pm 5 \times 10^{-7}$
Ambient temperature	0∿+45°C
Relative humidity	90%

(2) Monitoring equipment

1) Transmitter

Signal transmitter output signal level (set by attenuator)	-15∿ 0dBm
Dial impulse speed	10 ± 0.8pps
Impulse make ratio	33 ± 3%
Minimum pose	850 ± 200ms

Time required for sending out selection signal after closing DC circuit	4 ± 1 seconds
Circuit hold time after completion of sending out selection signal (Response monitoring time)	40 ± 5 seconds
Interval of pose (for retransmission)	55 ± 5 seconds
Type of signal at input terminal	Make or brake contact (no voltage) by relay
Data sending method	Data can be send out for all items when there is signal at input terminal.
Self check function	Operation of this transmitter can be checked by separating it from the line.
Battery capacity	Operation shall be allowed for more than 11 minutes (data sending time of 6 minutes plus stand-by time of 5 minutes).

2) Receiver

Signal receiving level	-32 ∿ 0dBm
Data receiving (Alarm: Chime tone)	a) By receiving data, this receiver shall start operation, give alarm, and display the reception of data. b) Receivied data shall be printed out by codes on the printer.

Data to be printed out	Month, day, hour, minute, transmitter code No., and data shall all be printed out by codes.
Self check function	Operation of this receiver can be checked by separating it from the line.
Month/day/time setting	Month/day/time can be set as desired by switches.

(3) Transmitting antenna

Type and configuration	2-dipole antenna, one stages, 4 faces
Operating frequency range	209 ∿ 216MHz (Channel 10)
Polarization	Horizontal
Input impedance	50Ω
Antenna gain	1.8dB (with reference to half-wavelength dipole)
VSWR	less than 1.07 in operating frequency range
Horizontal radiation pattern	Omnidirectional. See DWG. KA-003.
Vertical radiation pattern	See DWG. KA-004.
Beam tilt	None
Null fill	None
Maximum rated power	50W
Input terminal	7/8" (20D) Flange
Allowable wind speed	54.0m/sec

(4) Main feeder

Type	7/8" Flexible coaxial cable

Characteristic impedance	50Ω
Attenuation	less than 2.5dB/100m at 216MHz
Rated power	1.1kW/216MHz in average at 50°C
Cable length	50m
Ambient temperature	0 ∿ 50°C
Relative humidity	95%

(5) Power facilities

1) 3KVA Automatic voltage regulator

Capacity	
(Line capacity)	3KVA
Input voltage variation	230V ± 15%, 50Hz
Number of phases	Single phase
Output voltage variation	230V ± 2%
Voltage control method	Static type
Overall efficiency	more than 90%
Insulation	more than 5MΩ
Application of test voltage	1.5KV for a minute
Ambient temperature	0 ∿ 45°C
Relative humidity	less than 90%

2) Engine generator

AC Generator	
Output	3KVA
Voltage	230V ± 2%
Number of phase	Single phase
Frequency	50Hz
Number of poles	4
Speed	1500rpm

Power factor	0.8
Excitation	Self-excitation

Diesel engine

Output	7.3 ps
Speed	1500rpm
Cooling	Radiator cooling
Starting method	Cell motor starting
Number of cylinders	2
Ambient temperature	0 ∿ 45°C
Relative humidity	90%

6-5-4 MADUKANDA REPEATER STATION

The following performance specifications shall apply to the equipment of Madukanda Repeater Station.

(1) VHF Diversity receiver

Radio wave	A5CF3
Operating channel	CCIR Standard B, Band III Channel 5
Carrier frequency	175.25MHz
Input level	more than 54dBf
Input impedance	50Ω
Video output impedance	75Ω
Video output level	1Vp-p (negative sync).
Noise figure	less than 7dB
Intermodulation	more than 51dB in following conditions
	Vision carrier: -4dB
	Sound carrier: -10dB
	Colour subcarrier: -15dB
Spurious Radiation	less than -60dB
AGC Range	±1dB for 10dB input variation
Differential gain	within ±5%
Differential phase	within ±5°

Signal-to-noise ratio	more than 50dB by video method
Group delay	±50nS in -0.75∿+5MHz
Frequency response	within ±0.75dB in -1.25MHz∿+5MHz range within ±0.5dB at +4.43MHz
Audio output level	+10dBm
Audio output impedance	600Ω, balanced
Audio signal-to-noise ratio	more than -45dB
Audio frequency response	within 1dB in 50Hz∿12.5kHz range
Audio distortion factor	less than 1% at 100% modulation
Ambient temperature	0∿+45°C
Relative humidity	90%

(2) Microwave Repeater Equipment (Madukanda Repeater Station - Kokavil Transmitting Station)

Frequency range	6,420∿7,125MHz
Output	10W (by 2 transmitters in parallel operation)
Frequency stability	within ±1 x 10^{-4}
Video input/output level	1Vp-p (negative sync)
Video input/output impedance	75Ω
Frequency deviation	maximum 8MHz(p-p)
Noise figure	less than 5dB
Differential gain	within ±3%
Differential phase	within ±1°
Video signal-to-noise ratio	more than 55dBp-p/rms (Thermal noise weighted)

	more than 46dBp-p/rms (Hum noise)
Video frequency response	within ±0.5dB in 60Hz ∿ 5MHz range
2T Pulse response and over-shoot distortion factor	less than K = 1%
Intermediate frequency	130MHz
Audio input/output level	0dBm
Audio input/output impedance	600Ω, balanced
Subcarrier frequency	7.5MHz
Subcarrier frequency deviation	±140kHz(p-p)
Audio signal-to-noise ratio	more than 55dB
Audio frequency response	within 1dB in 50Hz ∿ 12.5kHz range
Audio distortion factor	less than 1% at 100% modulation
Power supply	AC 230V, single phase
Power consumption	
At transmitting side:	approx. 1KVA
At receiving side:	approx. 300VA
Ambient temperature	0 ∿ +45°C
Relative humidity	90%

(3) Antenna

1) Antenna for diversity receiver

Frequency	174 ∿ 181MHz (Band III, Channel 5)
Type of antenna	12-Element Yagi antenna x 2 (space diversity)

2) Transmitting antenna for microwave link

Frequency range	6,420∿7,125MHz range
Type of antenna	Parabolic antenna
Antenna diameter	4.0mφ
Antenna gain	more than 45dB
VSWR	less than 1.2

3) Antenna for microwave link (to be installed at Kokavil Transmitting Station)

Frequency range	6,420∿7,125MHz range
Type of antenna	Parabolic antenna (with radome)
Antenna diameter	2.0mφ
Antenna gain	more than 38dB
VSWR	less than 1.2

(4) Power facilities

1) 3KVA Automatic voltage regulator

Capacity (Line capacity)	3KVA
Input voltage variation	230V ± 15%, 50Hz
Number of phases	Single phase
Output voltage variation	230V ± 2%
Voltage control method	Static type
Overall efficiency	more than 90%
Insulation	more than 5MΩ
Application of test voltage	1.5KV for a minute
Ambient temperature	0∿45°C
Relative humidity	90%

2) Engine generator

AC Generator

Output	3KVA
Voltage	230V ± 2%
Number of phase	Single phase
Frequency	50Hz
Number of poles	4
Speed	1500rpm
Power factor	0.8
Excitation	Self-excitation

Diesel engine

Output	7.3 ps
Speed	1500rpm
Cooling	Radiator cooling
Starting method	Cell motor starting
Number cylinders	2
Ambient temperature	0 ∿ 45°C
Relative humidity	90%