Administration, Research, Engineering and Production. Prescribed number of permanent staff members of the division approved for 1992/93 is 143. And actual number of permanent staff of the division is 74. In order to cope with the possible increase in its workload, necessary number of staff members of the division in 1995/96 is estimated to be 262 which is 119 more than the present prescribed number of permanent staff members. The division is planning to operate and manage the facilities with its organizational structure as shown in Fig. 3-4.

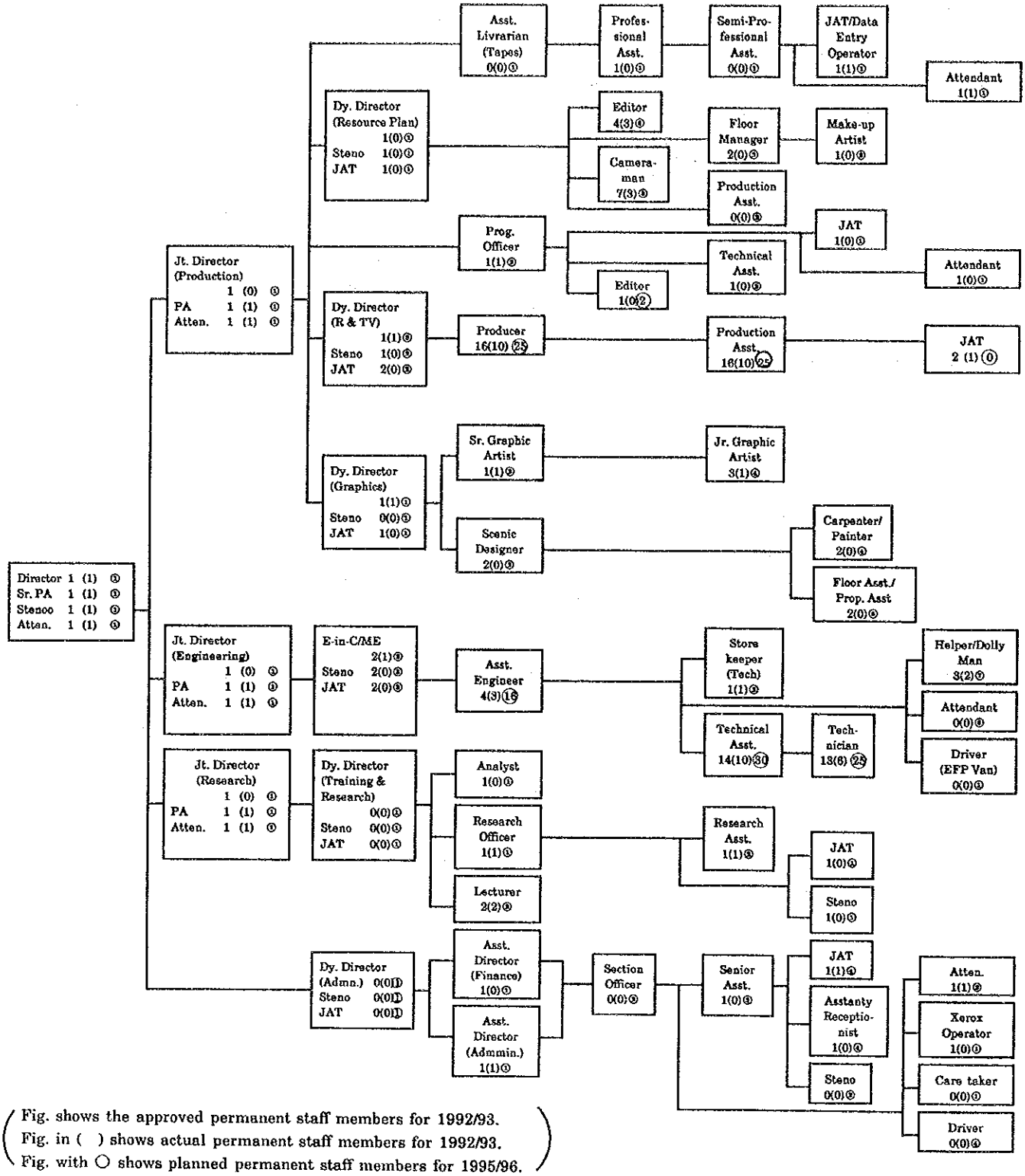


Fig. shows the approved permanent staff members for 1992/93.
Fig. in ( ) shows actual permanent staff members for 1992/93.
Fig. with ○ shows planned permanent staff members for 1995/96.

Fig. 3-4 Organization Chart of the Communication Division

3-3-2 Activity Plan

The main tasks that the communication division (which is responsible for the proposed facilities of the project) is to carry out are as described below.

1. To produce A/V teaching programmes for use in academic courses in cooperation with the schools of studies and take charge of them.

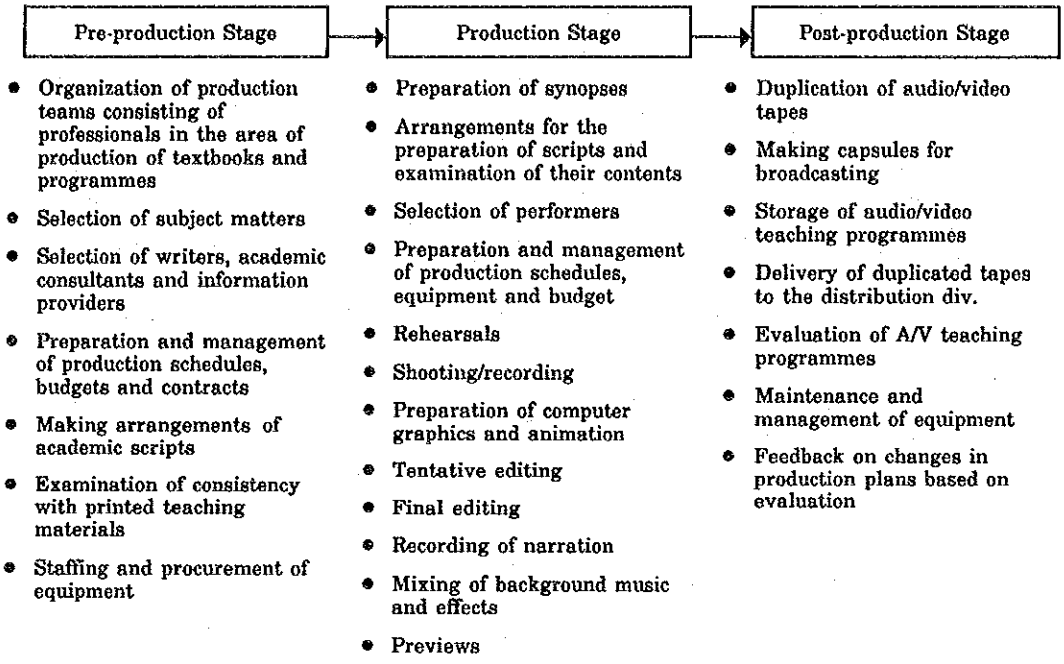
2. To modify its A/V teaching programmes for broadcasting.

3. To distribute A/V teaching programmes to the study centres and also to other Distance education institutions when necessary.

4. To work out and conduct training programmes for those who are engaged in the production of A/V teaching programmes at other state open universities and higher education institutions of distance education

5. To develop, research, study and evaluate A/V teaching programmes used in Distance education

Shown below are the details of the activities of the communication division according to each stage of the production process.



As of the end of March 1992, IGNOU had a collection of 325 video teaching programmes and 425 audio teaching programmes. IGNOU aims to establish a standard on the number of A/V teaching programmes to provide one video teaching programme and two audio teaching programmes per credit. As of April 1992, on the other hand, the total number of credits required for the total number of academic programmes was 882. IGNOU has a plan to open new academic programmes which will require 222 credits in total by 1994. Under such circumstances, the IGNOU's communication division is planning to produce an additional 600 video teaching programmes (30 minute duration each) and an additional 1,200 audio teaching programmes (15 minute duration each) by the end of 1996/97. The division's year-to-year production plan is as shown in the following table.

Table 3-17 Production Plan of Programmes

Year	1992~93	1993~94	1994~95	1995~96	1996~97	Total
Nos. of Video Programme	65	80	90	165	200	600
Nos. of Audio Programme	79	146	175	375	425	1,200

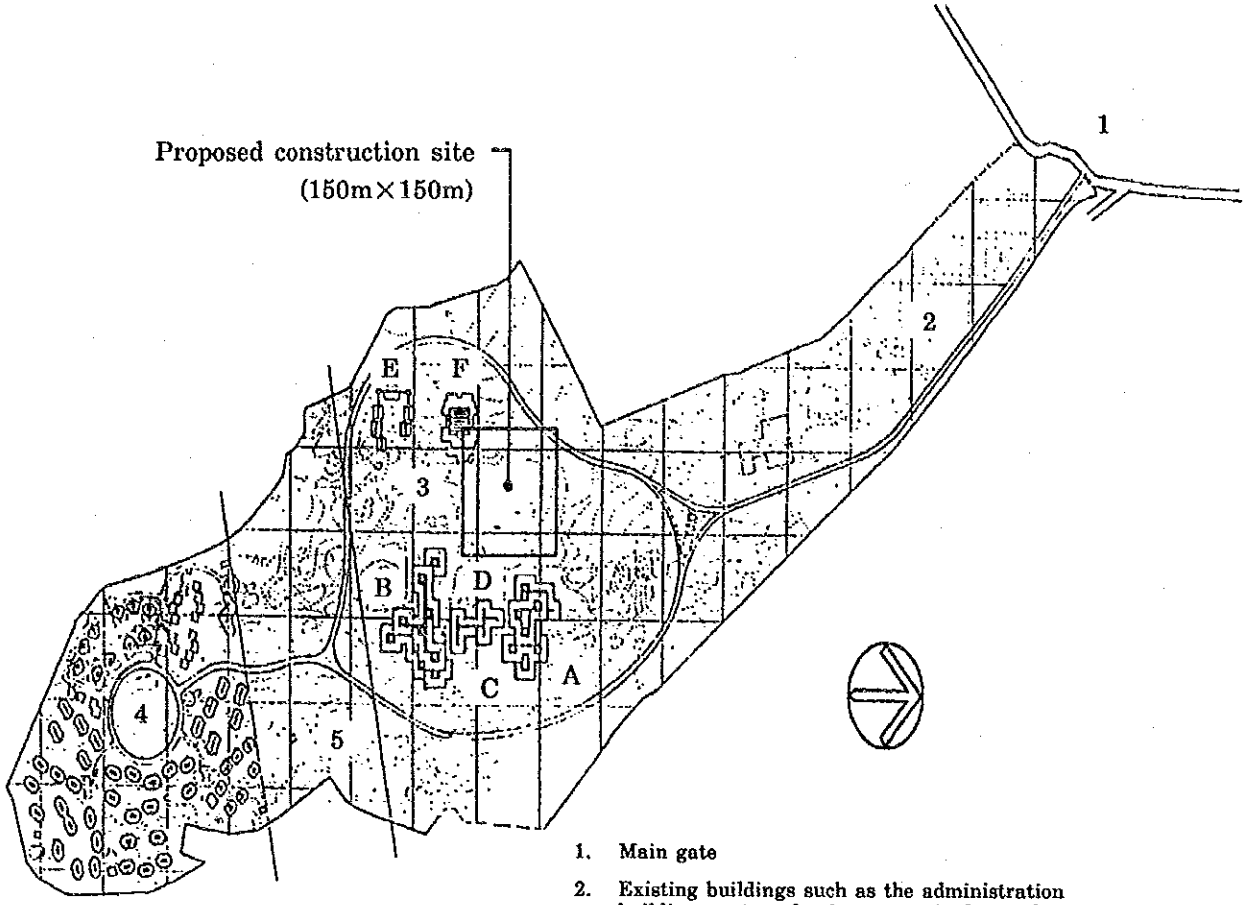
3-3-3 Location and Present State of the Project Site

(1) Location and present stage of the project site

The proposed construction site for this project is located on the IGNOU's new campus in Maidan Garhi in the southern part of the city of New Delhi. The master plan for the new campus has already been completed and detail design of some buildings is underway. Construction of roads in the campus has started. At present, the administration building and post-production centre are located near the main gate of the new campus. These buildings will be used for other purpose such as warehouses after the completion of the new campus project. Fig. 3-5 gives an outline of the IGNOU's new campus.

The new campus is about 1.9km long (east to west) and about 650 meters wide (south to north) with a land area of 60ha. The elevation of the campus ranges from 240 meters to 272 meters above sea level with the difference between the lowest level and the highest level being 32 meters. Access to the campus is only from the public highway which borders its northern end.

A square piece of land 150m by 150m is specified as the construction site for this project within the academic area in the centre of the new campus. The elevation of the construction site is 260 metres above sea level. A plaza is planned on the eastern side of the construction site, and the new computer centre and the administration building are planned beyond the plaza. The conference hall is planned on the northwestern side of the site.



1. Main gate
2. Existing buildings such as the administration building, post-production centre (to be used warehouse etc. after competition of the campus)
3. Academic area (A: Administration building, B: School of studies, C: Library, D: Computer centre, E: Guesthouse, F: Conference centre)
4. Housing area
5. Service Corridor (Higher-tension line)

Fig. 3-5 Proposed Construction Site

(2) The new campus construction schedule

Design work of the IGNOU's new campus is being implemented by Mr. Sharat Das, an Indian architect, and his office. Detail design of each building will be done based on the approved master plan and succeedingly construction of each building will start. The schedule for the new campus project is shown in the following table.

Table 3-18 Construction Schedule of the New Campus Project

Zone	Building	Total floor area	1992	1993	1994	1995	1996	1997	1998
Phase 1	Housing (269 units)	23,307 m²							
	Library, School of studies	13,003							
	Computer centre	1,310							
	Administration building	7,831							
	Guesthouse	2,990							
	Conference centre	5,115							
Phase 2	Housing (335 units)								
	Warehouse	19,214							
	Total	72,770							
Exterior work etc.	Main campus roads								
	Bridge								
	Substation								
	Water supply, Drainage, Power supply								

Budgets for Phase 1 work and for exterior work have already been approved, and the construction of the main campus roads was completed at the end of 1992. The Central Public Works Department (CPWD) is commissioned by IGNOU to take charge of construction management.

(3) Building permit

The following permits have already been obtained for the new campus project.

1. Conceptual approval on the campus master plan from the Delhi Urban Art Commission (DUAC)

   The permit to be issued based on the judgment according to the master plan of Delhi, year 2001 enacted by Delhi Development Authority.

2. Conceptual approval on development works from Municipal Corporation of Delhi (MCD)

   The permit to be issued based on judgment of roads, bridges, lamp posts, water supply/drainage facilities and substation according to the Building Byelaw of Delhi.

The next step is to obtain formal permit of each building. The Delhi Urban Art Commission issued a conceptual approval of Phase 1 of the housing area on August 24, 1992. As of September 1992, the Municipal Cooperation of Delhi was in the process of reviewing the application for formal permit of them.

In view of the progress of a series of reviews of its applications, IGNOU is planning to start the construction works in the housing area in the middle of 1993.

IGNOU will file an application for a conceptual approval of the buildings in the academic area with the Delhi Urban Art Commission as soon as the basic design of this project is completed. It will take about a month to obtain the approval. After receiving the approval, IGNOU will file an application for a formal permit of each building, along with detailed drawings, with the Municipal Corporation of Delhi. Regarding the proposed building of this project, Sharat Das and Associates will be responsible for obtaining the permit after the Japanese consultant prepares all necessary drawings. It usually takes three months to obtain a formal permit. It is planned to proceed the application procedure and the tender procedure simultaneously in order to shorten the entire process of the project.

(4) Infrastructure

The infrastructure construction work is to be carried out in accordance with the construction schedule of each building in the campus. Infrastructure for the proposed building of this project will be constructed under the following plan.

① Electricity

The new campus is to receive 11kV electricity from Delhi Electric Supply Undertaking. Substations are planned in the master plan to supply low-tension electricity (400V/230V) to each building.

Low-tension electricity supply to the proposed building of the project will be from the substation to be built on the western side of the proposed construction site. The Indian side is responsible for the construction of the substation. Power supply around the site is characterized by wide fluctuations in voltage (about ±10 percent) and frequent power failures, and therefore it will be necessary to install a voltage stabilizer and a generator in the substation.

② Telephone

According to the master plan, a PABX to cover all the facilities in the campus will be installed. However, since the proposed building of the project will be used before the completion of the entire new campus project, a small capacity PABX needs to be installed in the proposed building.

Since a telephone trunk line (COL = Central Office Line) of the telephone company (MTNL: Mahanagar Telephone Nigam Ltd.) is used at the IGNOU's existing facilities, it will not be a problem to have another MTNL telephone lines. The Indian side is responsible for

having telephone lines up to the boundary of the proposed construction site.

③ Water supply

IGNOU has applied to the municipal authorities for the installation of water mains to the campus, but the application has not yet been approved. As of the end of August 1992, IGNOU had created four wells on the campus, which can supply 16,000 gallons of water an hour. It is planned that water from the four wells will be stored in a water tank and then distributed to the proposed facilities with a pressure pump. The Indian side is responsible for the installation of a water treatment plant to improve the quality of the well water, as well as a water main to the proposed construction site.

④ Drainage

Waste water from ordinary facilities on the new campus is to be discharged into a pond to be constructed on the campus through a waste water treatment plant. Some of the waste water is to be used as irrigation water. Rainwater is to be discharged into the above-mentioned pond through open ditches to be constructed along the roads on the campus.

Other than those needed inside the proposed construction site, construction of facilities for treatment and discharge of waste water as well as rainwater is the Indian side's responsibility.

⑤ Trash

It is planned in the master plan for trash to be incinerated, buried in the ground, or treated on the campus.

⑥ Gas

Since no city gas service is available, propane gas is to be used. In the Delhi area, only one type of propane gas cylinder (capacity: 14.5kg) is available.

⑦ Ground condition

The ground of the project site consists of a weathered sandstone layer, which is about 1 meter deep, followed by a coarse sandstone layer. Therefore, direct foundation can be adopted for the proposed building.

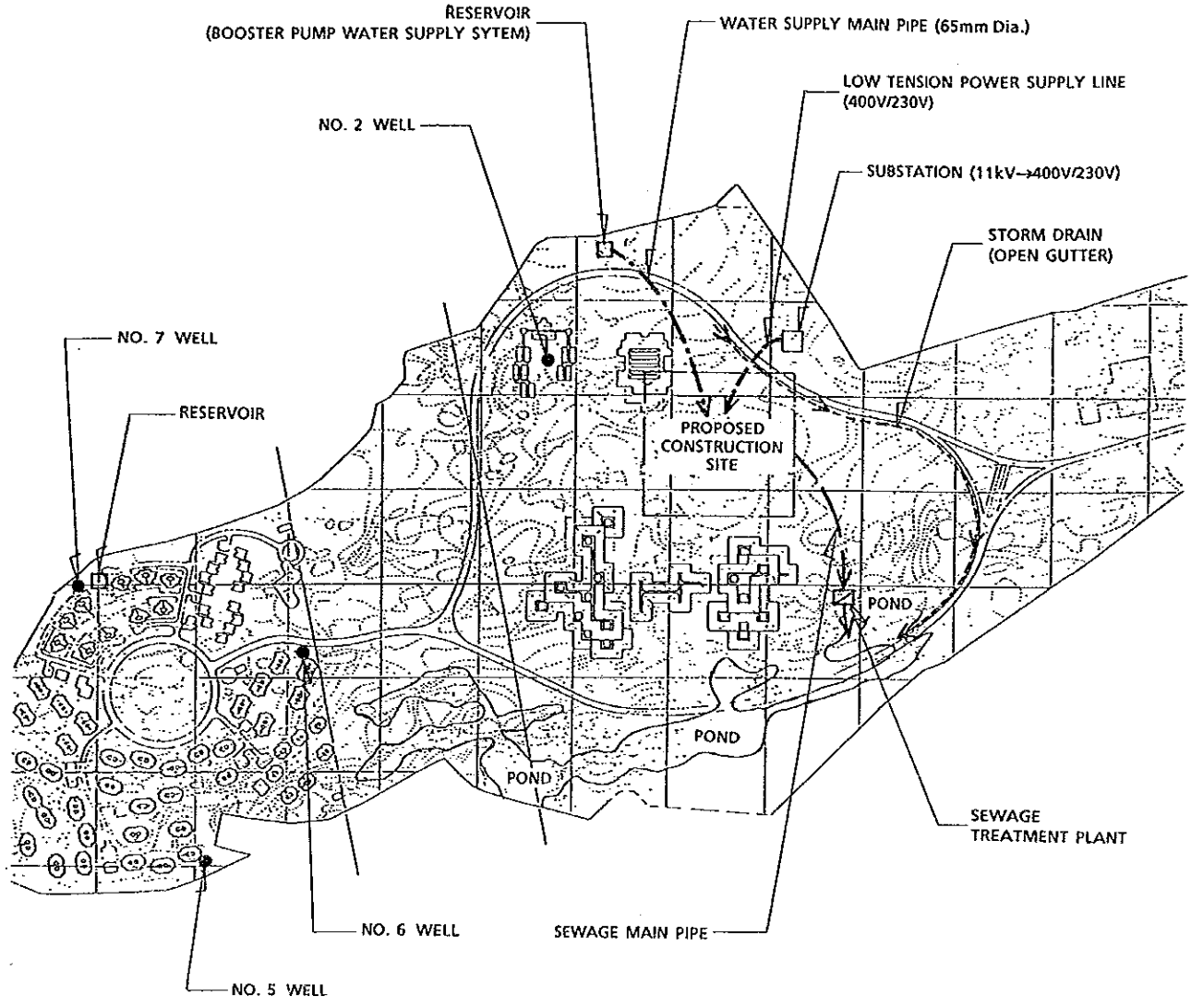


Fig. 3-6 Infrastructure Around the Proposed Construction Site

3-3-4 Outline of the Facilities and Equipment

In order to ensure the expected effects of the project, it is appropriate to include the following facilities and equipment in the project.

(1) Outline of the Facilities 4,779 m^2

Unit	Room
Production Unit	Video Studio 1 and 2, Control Room, VCR Room, Scenery Store and Workshop, Audio Studio 1 and 2, Control Room, Make-up Room, Dressing Room, Waiting Room, Rehearsal Room, Director's Room, Assistant Director's Room, Producer's Office, Engineer's Office
Engineering Unit	Single-Step Editing Room, A/B Roll Editing Room, Audio Editing Room, Viewing Room (large, small), Post-Production Room, Telecine Room, Central Apparatus Room, Maintenance Room, Duplication Room, Tape/Spare Parts Store, Tape Library, EFP Store, Graphic Workshop
Others	Director's Room, Secretariat Room, Meeting Room (large), Meeting Room (small), Reception Office, Viewing Room (large)
Common Space	A/V Plant Room, Elec. Room, Lavatory, Pantry, Corridor, Entrance Hall, Stairs

(2) Outline of the Equipment

Section	Equipment
Equipment for Video Studio	Video camera system, Teleprompter system, Video production switching system, Audio production system, Lighting equipment, Equipment for measurement of TV signal, video monitor system, Audio monitor system, Video cassette recorder, DAT recorder, etc.
Equipment for Audio Studio	Microphones, Monitor speakers, Headphone, Cough box, Audio mixer, DAT recorder, Sound effecter, Multi-track tape recorder, Video cassette recorder, etc.
Equipment for Post-production	DAT recorder, Video cassette recorder, etc.
Equipment for Video Editing	Video cassette recorder, etc.
Equipment for Audio Editing	Audio mixer, DAT recorder, Open-reel tape recorder, CD player, Sound effecter, etc.
Equipment for Central Apparatus Room	Synchronizing signal generator, TV signal generator, A/V signal distributor, etc.
Equipment for Duplication	Video cassette recorder (PAL, NTSC), Video cassette recorder (Duplicator, VHS), Color picture monitor, etc.
Equipment for EFP	Portable video cassette recorder (Dockable type, portable type), Portable DAT recorder, Portable video production switcher, etc.
Equipment for Viewing Room	Video cassette recorder, Monitor speaker, Public address system, etc.
Measuring Equipment	Oscilloscope, Vector/Waveform monitor, TV signal generator, Sweep generator, Alignment test tape set, Color master monitor, etc.
Equipment for Computer Graphics	Video cassette recorder, Color picture monitor, etc.
Others	Spare parts, AVR/UPS, Power tools for wood working, etc.

Note: Unless otherwise specified, all video cassette recorders are of Betacam SP format.

3-3-5 Maintenance and Operation Plan

(1) Maintenance and operation

1) Maintenance and operation of the Facilities

Due to the nature of the activities conducted in the proposed facilities as well as local climatic conditions, many rooms require air-conditioning. In designing the facilities, natural ventilation and natural lighting are utilized as much as possible in order to minimize the use of air-conditioning, and sufficient wall insulation is used to increase air-conditioning efficiency. Nevertheless, much electric power consumption is expected for operation of the facilities. On the other hand, utility and telephone charges are borne by the IGNOU's headquarter budget. And IGNOU has engineering staff responsible for maintaining and repairing its facilities and equipment. Therefore, no trouble is expected for future operation of the facilities.

On the other hand, it is expected that users' attention to the maintenance and operation of the facilities may wane as time passes. Therefore, it is important to ensure that all users are well informed of the functions of the facilities and equipment and are always reminded of the effective and efficient use of them in order to prevent serious facility/equipment breakdowns.

2) Maintenance and operation of the equipment

In India, maintenance contracts for audio-visual equipment with manufacturer's agents require annual payment of five to seven percent of the total cost of the equipment, which constitutes a heavy financial burden on the users. The on-call repair service is also

expensive. For these reasons, many users of this type of equipment such as Jamia Millia Islamia University and the Central Educational Technique Research Institute are conducting relatively high level maintenance including replacement of circuit boards and repair of them.

At the communication division, maintenance and repair of equipment is done in the engineering unit, and the engineer-in-charge is responsible for it. The unit's maintenance and repair work includes replacement of defective circuit boards or their repair for such precision devices as cameras and video cassette recorders. It can be said that the unit has a high engineering standard. In this way, daily maintenance and periodic inspection are conducted by technical staff such as technical assistants, assistant engineers and technicians headed by the engineer-in-charge.

In the communication division, besides daily checkup, periodic inspection and adjustment operations are planned as shown in the following table.

Table 3-19 Inspection and Adjustment of the Equipment

Type of Inspection / Equipment	Daily Inspection	Periodical Inspection/Adjustment
Equipment for Video Studio 1	Before operation	Once/2 weeks
Equipment for Video Studio 2	〃	Once/2 weeks
Equipment for Audio Studio 1	〃	Once/month
Equipment for Audio Studio 2	〃	Once/month
Equipment for Post-Production	〃	Once/month
Equipment for A/B Roll Editing	〃	Once/month
Equipment for Single-Step Editing	〃	(In case required)
Equipment for Audio Editing	〃	(In case required)
Equipment for Central Apparatus Room	〃	Once/month
Equipment for Duplication	〃	Once/month
Equipment for EPF	〃	(In case required)
Equipment for Viewing Room	〃	(In case required)
Equipment for Computer Graphics	〃	Once/month

Expendable supplies are divided broadly into expendable parts which must be replaced according to the length and frequency of use (such as electrical parts and batteries) and expendable materials which are consumed in the production of A/V teaching programmes (such as tapes and paper). Expendable parts are to be supplied properly under the project. Expendable supplies required under this project include the following.

① Expendable parts

- Circuit boards and electrical parts
- Lamps (those for studios and portable lamps)
- Batteries for portable devices
- Cables and connectors

② Expendable materials

- Video tapes
- Audio tapes
- Paper for preparing illustrations, etc.

(3) Estimation of operational costs

The communication division's operational costs consist of personnel expenses and expenses for maintenance and materials. The division's utility charges and property insurance premiums are to be borne by the IGNOU headquarters' budget. The following table shows the results of the estimation of the communication division's annual budget (based on 1992 prices) after the completion of the project.

Table 3-20 Estimation of Operational Cost of Communication Div.
(Based on 1992 Prices)

	Category	Operational Cost (Rs.)	Percentage(%)
Expenses of Communication Div.	Personnel expenses	11,800,000	69.8
	Expenses for maintenance and materials	5,100,000	
	Expendable parts	200,000	1.2
	Expendable materials	4,900,000	29.0
	Total	16,900,000	100
Expenses of IGNOU	Other expenses	3,228,000	
	Property insurance premiums	1,480,500	

Above costs are estimated based on following conditions.

1) Personnel expenses

Personnel expenses were estimated on the basis of the necessary staff members of 262 and the salary structure applicable at the time of the basic design study.

2) Maintenance and operation expenses

Maintenance and operation expenses are included in the division's budget and consist of expenses for expendable parts and expendable materials. Expenses for expendable parts cover replacement parts and cables, and expenses for expendable materials cover recording tapes for the production of A/V teaching programmes. Since a proper amount of expendable parts are to be supplied under this project, as mentioned above, expenses for the purchase of maintenance parts, which are not included in this project, were estimated on the basis of the data provided by the Indian side. On the other hand, expenses for expendable materials were estimated on the basis of the necessary number of video tapes and audio tapes, which was estimated on the basis of the division's A/V teaching programme production plan for 1996/97 (200 video teaching programmes, 425 audio teaching programmes and 265 duplications per each programme).

Expenses for expendable parts (cables, connector, etc.): Rs. 2 Lakhs

Expenses for expendable materials : Rs. 49 Lakhs
(video tapes, audio tapes, etc.)

Total: Rs. 51 Lakhs

3) Other expenses

① Electricity charges

○ Estimated power consumption

Calculating conditions

- Running cost of lights, air-conditioners and sanitary fixtures was calculated on the assumption that the proposed facilities will be used 240 days a year (20 days a month). Air Conditioners for the tape library and the tape/spare parts store will be run 24 hours a day and 12 months a year.
- Running cost of audio-visual equipment and studio lightings was calculated on the assumption that the audio-visual equipment and studio lightings will be used 215 days a year (a maintenance day per fortnight)
- 8.5 working hours per day

Table 3-21 Power Consumption

Category	Charges	Power Consumption
Lightings	80kW	80kW×8.5hrs./day×240days/year×0.5=81,600kwh/year
Air-conditioners	850kW (Summer, 700kW)	700kW×9hrs./day×20days/month×7months/year×0.7 =617,400kWh/year (business hours) 15kW×24hrs./day×30days/month×7months/year×0.5 =37,800kWh/year (24 hrs a day)
	(Winter, 450kW)	450kW×9hrs./day×20days/month×5months/year×0.6 =243,000kWh/year (business hours) 20kW×24hrs./day×30days/month×5months/year×0.4 =28,800kWh/year (24 hrs a day)
Sanitary fixtures, etc.	30kW	30kW×8.5hrs./day×240days/year×0.3=18,360kWh/year
Equipment (A/V devices)	80kW	80kW×8.5hrs./day×215days/year×0.5=73,100kWh/year
Equipment (Studio lightings)	380kW	380kW×600hrs./year×0.5=114,000kWh/year
Total	1,420kW	1,214,060 kWh/year

○ Calculation of electricity charges

- Basic charge (demand charge: 1,100kVA×60Rs/kVA·month×12months /year = Rs. 7.92 Lakhs/year
- Electricity charges (energy charges): 1,214,060kWh/year× 1.7Rs/kW = 2,063,902 Rs./year = Rs. 20.64 Lakhs/year

Total: Rs 7.92 Lakhs + Rs 20.64 Lakhs/year = Rs 28.56 Lakhs

② Telephone charge

Local calls: Up to 100 calls a day (less than 3 minute duration each)
100 calls × 20days/month × 12months/year × Rs1.1 = Rs 0.264 Lakhs/year

Trunk calls: Up to 20 calls a day (approx. 180 second duration each)
20 calls × 20days/month × 12months/year × 180seconds × 0.8Rs./2 seconds = Rs. 3.456 Lahks

Total: Rs 3.72 Lakhs/year

4) Property insurance premiums

IGNOU purchases the property insurance to cover damages and thefts of property. Expenses for the purchase of expendable parts for equipment such as circuit boards are also covered by the insurance. The total amount of the property insurance premiums was estimated on the basis of the data provided by the Indian side.

Table 3-22 Property Insurance Premiums

Category	Assessed Price (Rs.)	Total Assessed Prices (Rs.)	Premium Rate	Amount (Rs.)
Equipment donated by Japan	75,000,000 (Result)	235,000,000	0.63% (Result)	1,480,500
Equipment donated by ODA (Britain)	20,000,000 (Result)			
Equipment for the Project	140,000,000 (Assumption)			

Note: Results are of year 1992/93.

CHAPTER 4 BASIC DESIGN

CHAPTER 4 BASIC DESIGN

4-1 Design Policy

Objective of the project is to construct a production facility of A/V teaching programmes for the communication division of Indira Gandhi National Open University (IGNOU). In the planning of the basic design of the proposed facility and equipment, special attention was paid to function, economics and safety, and strategies for the following conditions:

(1) Strategy for the nature conditions

Delhi city is located at latitude 28° 57' N. and longitude 77° 12' E, and its climate is typical of semi-arid regions, consisting of a rainy season and a dry season. The monthly rainfall exceeds 200mm in July and August, while the rest of a year sees a much lower precipitation. Thus, the annual average rainfall is around 786.9mm. The temperature difference between the hot and cold seasons is large. An average temperature in May and June exceeds 30°C, the maximum temperature reaching up to 45°C. By contrast, the monthly average temperature between December and February is around 15°C, the minimum temperature falling to 4°C.

Table 4-1 Weather of Delhi City

Temperature (°C)	Max. average (month)	33.8	(Jun.)
	Min. average (month)	14.2	(Jan.)
	Maximum	45	
	Minimum	3.9	
Humidity (%)	In the month of max. temp. (month)	41	(Jun.)
	In the month of min. temp. (month)	58	(Jan.)
	Max. average (month)	75	(Aug.)
	Min. average (month)	30	(May)
Rainfall (m/m)	Max. average (month)	248.1	(Aug.)
	Min. average (month)	4.9	(Nov.)
	Annual average	786.9	

Strategies to these nature conditions are listed below:

- To protect the A/V equipment installed in the proposed facility, a considerable part of the rooms need to be air-conditioned. For the purpose of saving running costs of the facility, heat insulation shall be sufficiently provided for in walls and roofs.

- To protect the installed equipment from dust, the exterior windows shall be a high performance dust-proof type.

- The annual rainfall is relatively small, but it occasionally rains in torrents. Thus, the proposed building is designed to have pitched roofs as is employed in the other buildings in the campus. The roof pitch shall be 22.5°, which is the same as other buildings.

(2) Strategies for social conditions

New Delhi, where the proposed construction site is located, forms the metropolitan region, the capital of India. The Delhi municipality has been concerned with upholding the beauty of the city. Therefore, the Delhi Urban Arts Commission strictly screens applications for building permits before approving it. As this project will be executed as part of the IGNOU campus master plan, it is a design policy to harmonize the building design with the master plan.

(3) Strategy for local construction situations

India has a complete regime of detailed building codes and it is mandatory to obtain a building permit for building plans before building construction. Thus, it is a design policy to follow the local relevant regulations etc. so as to obtain the building permit smoothly.

(4) Strategy for utilization of local builders, building equipment and materials

India restricts the import of products of the same type that can be locally manufactured. And the local activity of foreign firms is also limited. The local construction industry has reached a certain level making it possible for local builders to construct buildings that do not need advanced technology. Thus, in the implementation of the project, it is a policy to utilize local builders, building equipment, and materials except for specific equipment and materials which require a high degree of precision.

(5) Design strategy for administrative and maintenance capabilities of the implementation organization

Under IGNOU's internal rules, maintenance and operation expenses including those for building maintenance, are under the account of the headquarters' budget. Thus, these expenses will not directly affect the working budget of the communication division. However, the proposed production facility for A/V teaching programmes requires larger amounts of electric power due to air-conditioning compared with normal buildings. Thus, to avoid the resulting pressure on the headquarters' budget, it is important to plan a reduction of running cost for the proposed facility. In an attempt to reduce the maintenance expenses as well as running cost, it is a design strategy to utilize natural energy, such as ventilation and natural illumination, to enhance the building's heat insulation, and to adopt durable construction materials.

(6) Overall strategy for the basic design of the facility and equipment

Putting together the above-mentioned considerations, the overall strategies are summarized as follows:

- The proposed facility shall be designed to match the various activities of the communication division as well as equipment installed in the facility.
- Efforts shall be made to reduce running costs and maintenance expenses of the facility and equipment.
- The proposed facility shall be designed to conform to specific features of the proposed construction site.

(7) Strategy for implementing the project

Upon implementing the project, utmost attention shall be paid to minimize the period while the communication division's activities will be interrupted. Though the principle of Japan's grant aid project is to be completed within one fiscal year, it is difficult for this project when considering the local construction situation as well as necessary time for adjusting installed equipment. Consequently, it is concluded that the project shall be implemented in two phases as described below.

Phase	Scope of works	Remarks
1	(1) Construction of facilities and installation of equipment mainly necessary for production of video programmes	It is possible to continue production activities using existing facilities.
2	(1) Construction of facilities and installation of equipment mainly necessary for production of audio programmes (2) Shifting and installation of existing equipment	Production activities of audio programmes will be interrupted after phase 1 is completed until installation of existing equipment is completed.

4-2 Study of Design Conditions

(1) Facility configuration

This project comprises of the following functions:

- Production related facilities

Studio	Video studio (with a control room), audio studio (with a control room)
Rooms for performers	Make-up room, waiting room, rehearsal room
Art-related rooms	Scenery store, property store, staff room, graphic workshop

- Technical and related facilities

Editing and dubbing rooms ...	Editing room, post-production room, duplication room
Equipment related rooms	Central apparatus room, maintenance room, tape/spare parts store, EFP store, A/C plant room

- Administrative facility

Offices	Directors' offices, producers' rooms, engineers' office, meeting rooms
Data related rooms	Tape library, preview room

(2) Determination of the size of facilities

Size of facilities are determined based on the personnel assignment plan of each facility and the activity plan in consideration of the contents of the request made by the Indian side.

Upon determination, the Japanese Building Design Standard as well as materials prepared by the Indian side are utilized as reference.

1) Space for offices

In establishing its new campus, IGNOU has standardized the unit floor area necessary for individual categories of personnel throughout various departments as follows:

Table 4-2 Unit Floor Area for Different Categories of Personnel in IGNOU Master Plan

Rank	Unit area (m^2/person)	Remarks
Director	16	
Jt. Director	16	
Dy. Director	12	
Asst. Director	8	Engineer, Producer are included in this rank
Assistant	6	
Steno, JAT	4	

Above-mentioned standards are employed upon determining area of offices.

2) Floor area required for video studios

The floor area required for a video studio is determined by the image size of a video camera (which corresponds to the film size of a still camera), the focal distance of lenses, and a distance between the subject and the camera. TV camera is of 2/3 inch CCD (image size: horizontal 8.8mm × vertical 6.6mm), with a zoom lens which covers from telephoto to wide-angle range. When a camera is directed to a subject at a given distance, the field of vision, which is called a frame, is given by the following equation:

$$\text{Frame} = \frac{\text{Image size} \times \text{Distance}}{\text{Focal distance}}$$

When assuming that a camera with a zoom lens of 14 magnifications (8.5 - 119mm) is placed for shooting at a position of 8 meters away from a background setting, the frame size is 60cm - 8.3m horizontal by 44cm - 6.4m vertical. The standard angle of view for a normal video camera lens (as seen by the naked eye) is about 42° horizontal by 32° vertical. And maximum wide angle is about 54° horizontal and 42° vertical.

In view of the above considerations, the floor area of a studio to produce a drama programme is examined below. A suitable floor area should be enough to allow three different settings to take place at one time.

A case of linguistics programme production is assumed.

A set : The A set assumes a talk scene in front of a shop. In front of the back panels, a grocery store and a haberdashery set is erected at a size of 5,500mm wide × 500mm deep × 2,500mm high. Five performers talk in front of the set. A lecturer interrupts the talk at intervals to elaborate on the main point.

B set : The B set assumes a scene in a house. Five performers sit down at a table (900mm deep × 1,200mm wide × 750mm high). To create an atmosphere for the scene, a cabinet is placed in the set. At the right of the stage, greenery is placed to decorate the setting.

C set : The C set assumes a scene in a bedroom. A single bed (900mm deep × 2,000mm wide) and a writing desk are placed there. Regarding the daily life acted by a performer, a lecturer make comments.

As shown in Figure 4-1, the distance necessary to shoot the entire A set in a frame is 9.4m if the lens is adjusted to the widest-range, and 12.5m if the lens is adjusted to a normal range. Also, when the

shooting is done in the B and C sets, the maximum distance to draw back the camera is 7m from the cyclorama. Thus, including a space for the camera and the cameraman, an effective area comes to 10.5m wide × 16.5m long = 173.25m^2.

As the effective area of a studio is generally 80% of the floor area (Japanese Building Design Standard), the dimension of the floor area (12m wide × 18m long = 216m^2), shown in the figure, is judged appropriate to secure the necessary area for a small-scale drama production.

Also, as shown in Figure 4-2, the ceiling height of 10m is deemed necessary considering the 6m cyclorama height and necessary space for grid pipes, catwalk etc.

Next, the floor area required for a studio producing lecture and talk programmes is examined. A suitable area would allow space for two different settings to take place at the same time.

A case of lecture style programme production is assumed.

D set : The D set assumes a lesson programme where a lecturer and two students play. A desk for the lecturer (700mm deep × 1,500mm wide) and two desks for students (700mm deep × 1,200mm wide each) are placed in the set.

E set : A lecturer gives a lecture using a blackboard. A desk for the lecturer (700mm deep × 1,500mm wide) as well as the blackboard (900mm high × 1,500mm wide) are placed. Greenery is placed to decorate the set.

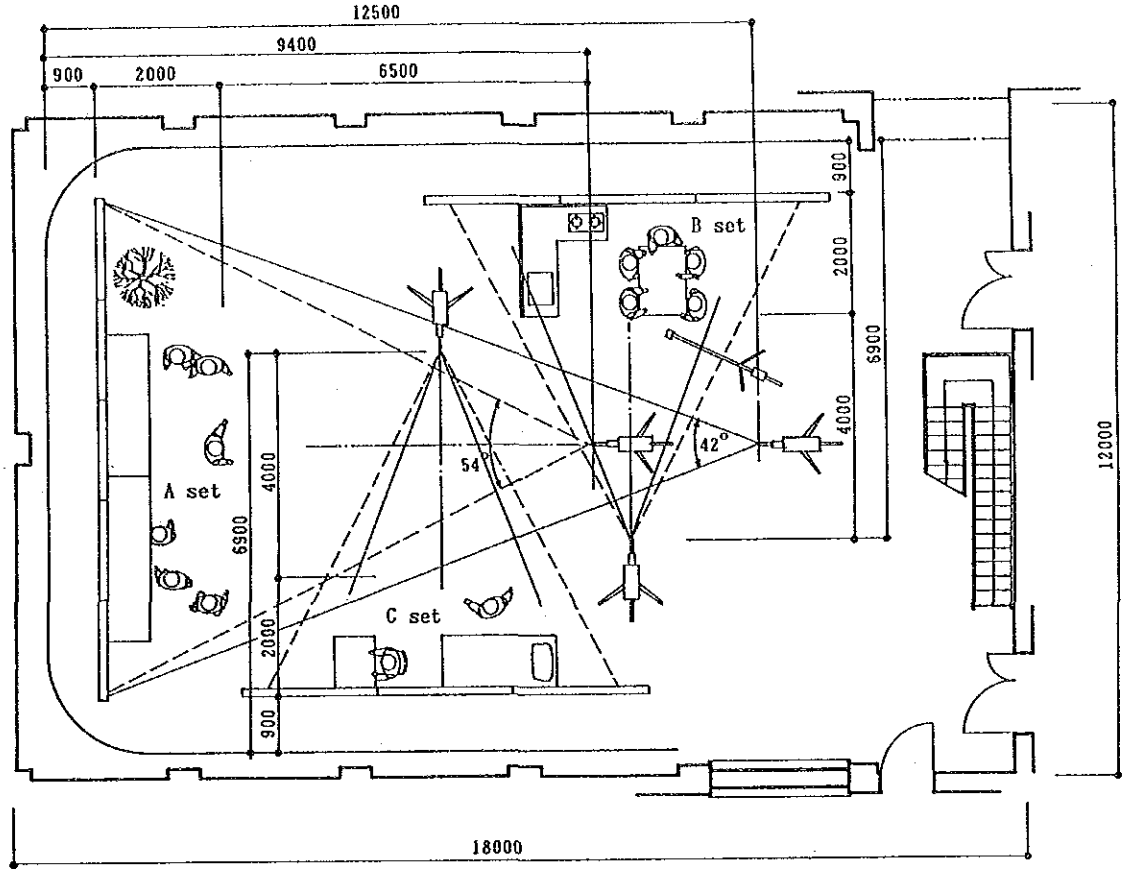


Fig. 4-1 A Case of Small-scale Drama Production in Video Studio 1

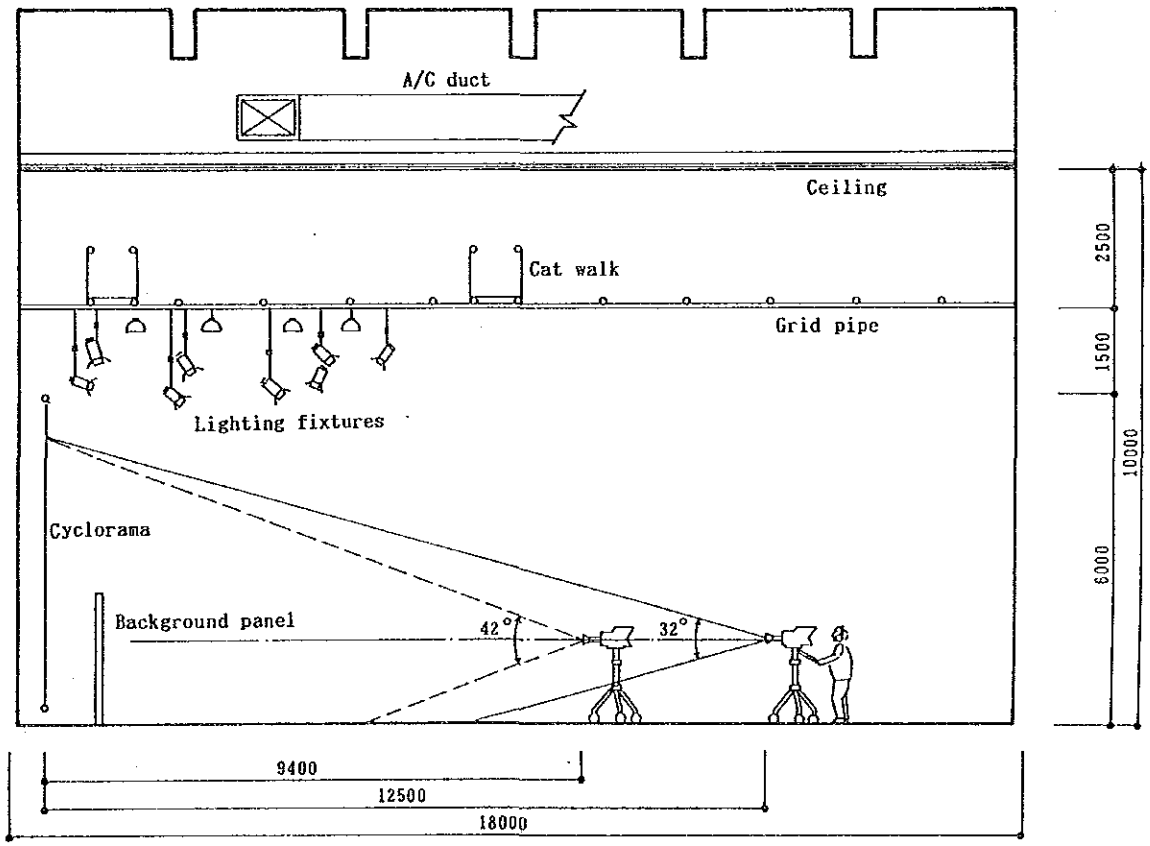


Fig. 4-2 Section of Video Studio 1

As shown in Fig. 4-3, the distance necessary to shoot the entire D set in a frame is 7.4m if the lens is adjusted to the widest-range, and 10,0m if the lens is adjusted to a normal range. Also, when the shooting is done in the E set, maximum distance to draw back the camera is 7.4m from the cyclorama. Thus, including a space for the camera and the cameraman, an effective area comes to 10.5m wide × 13.5m long = 141.75m^2. This is 78.5% of the floor area. Therefore, the floor area of 180m^2 (12m wide × 15m long) is judged reasonable. Also, as shown in Fig. 4-4, the ceiling height of 9m is deemed necessary in consideration of the 5m cyclorama height and necessary space for grid pipes, catwalk etc.

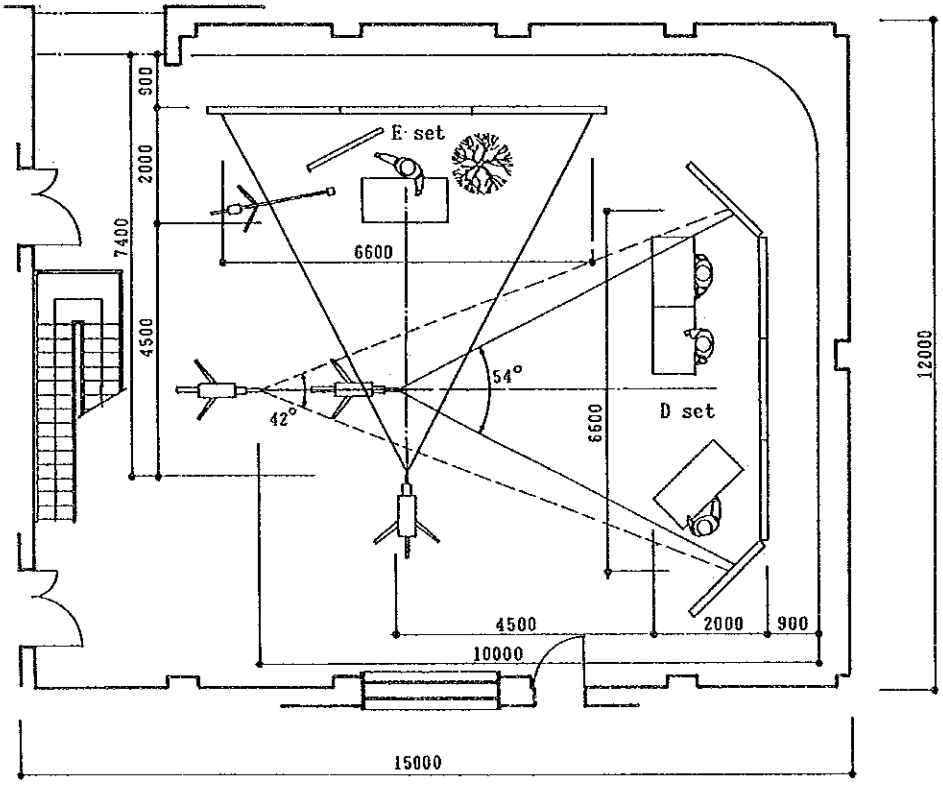


Fig. 4-3 A Case of Lecture Programme Production in Video Studio 2

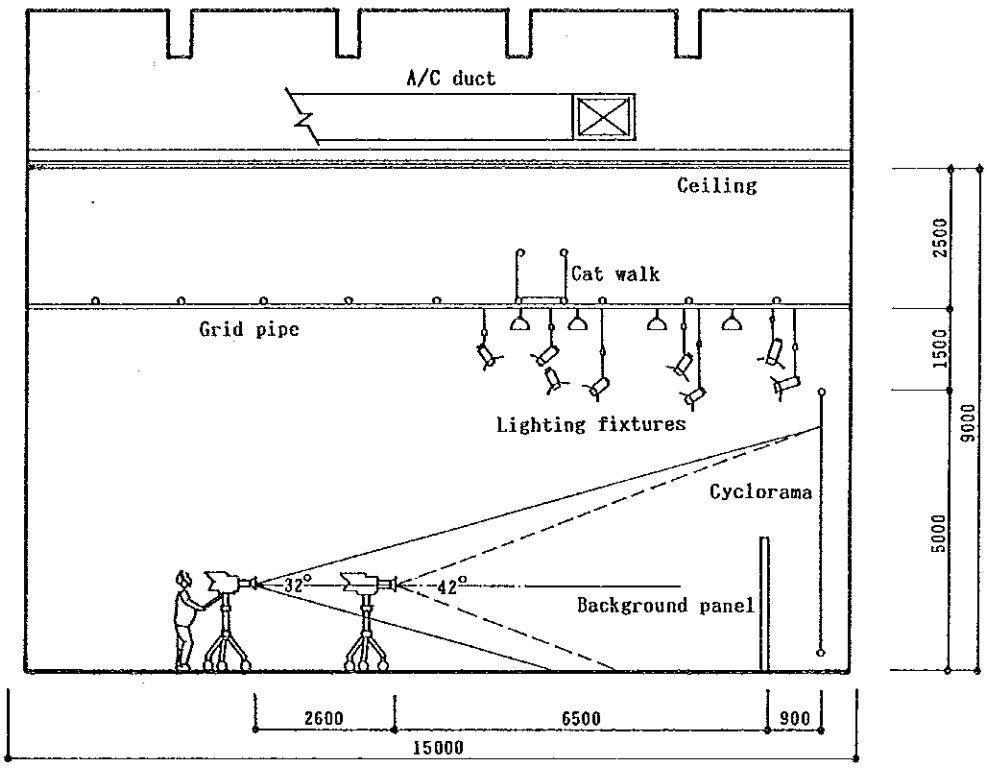


Fig. 4-4 Section of Video Studio 2

3) Audio studio

The audio studio is used chiefly to produce talk, conversation and lecture programmes. According to the Japanese Building Design Standard, the audio studio area required to make talk and conversation programmes is normally 20~50m^2. Assuming from the programmes produced by IGNOU, three or four performers, including a moderator, need to be accommodated in a studio, and a per-capita area must be about 10m^2 due to acoustic and working considerations, thus two audio studios of 30m^2 and 40m^2 are planned.

4) Tape store

Considering easy control and freedom of utilization, a tape/spare parts store is planned to combine a tape store and a spare parts store.

Following tapes shall be stored.

- 1,500 pieces of Betacam SP tapes (for use to produce 200 pieces of master tapes annually)
  Equivalent to 150 corrugated cardboard boxes
- 1,500 pieces of U-matic tapes (for use of 1-year single-step editing)
  Equivalent to 150 corrugated cardboard boxes
- 9,000 pieces of VHS tapes (enough for 2-month duplication)
  Equivalent to 180 corrugated cardboard boxes
- 2,000 pieces of DAT tapes (for use to produce 425 pieces of master tapes annually)
  equivalent to 200 corrugated cardboard boxes
- 100 pieces of open-reel audio tapes (for use of editing and sounds-effects)
  Equivalent to 10 corrugated cardboard boxes
- 19,000 pieces of audio cassette tapes (enough for 2-month reprints)
  Equivalent to 190 corrugated cardboard boxes
- 20 pieces of MTR open-reel tapes (multi-track tapes)
  Equivalent to 2 corrugated cardboard boxes

To store a total of 882 corrugated cardboard boxes as listed above, 15 units of 4-tiered racks of 180cm wide × 45cm deep will be necessary. The spare parts being stored are listed below:

- Spare parts for equipment under the former Japanese grant aid
  80 corrugated cardboard boxes (44 × 32 × 31cm each)

- Existing spare parts other than the above.
  20 corrugated cardboard boxes (44 × 32 × 31cm each)

- Spare parts under this project
  120 corrugated cardboard boxes (44 × 32 × 31cm each)

To store a total of 220 corrugated cardboard boxes with the contents as listed above, 18 units of the same type of racks as for tape storing shall be needed. Thus, a tape/spare parts storage of 85m^2 is planned to arrange a total of 33 units of racks with passage space in between. Air conditioning system of this room shall suits 24 hour continuous running in consideration of long term storage of tapes.

5) Tape library

The library area is planned to house the following tape collection stored on shelves:

- Master tapes (1500 video tapes and 3000 audio tapes).
- A duplication of each master tape for viewing.
- 1000 video tapes and 2000 audio tapes collected as gifts or purchased.

To store a total of 4,000 video tapes and 8,000 audio tapes, 78 units of five-tiered shelves, 92cm wide by 30cm deep each, shall be necessary. Thus, a space of 60m^2 for arrangement of the shelves, and additional space of 25m^2 for administrative staff as well as for viewing, totaling 85m^2 tape library is planned. Air conditioning system of this room shall suits 24 hour continuous running in consideration of long term storage of tapes.

6) Meeting room

The meeting rooms are planned chiefly to hold meetings on programme production. Assuming that a five-hour meeting is necessary for each production of 200 video tapes and 425 audio tapes, the total annual meeting hours come to 3,125 hours {(200+425) tapes × 5 hours}.
By contrast, as annual availability of a meeting room is 1,807.5 hours {7.5 hours/day × (365 day - 124 days)}, the required number of meeting rooms is 3,125/1,807.5 = 1.73. Thus, two meeting rooms are planned.

7) Scenery store

A scene panel used for programme production has a dimension of 4~7 feet wide by 6~10 feet long. The number of scene panels used per year is estimated as follows:

Table 4-3 Necessary Number of Scene Panels

Type of Programme	No. of programmes produced annually	No. of panels needed per programme	No. of panels needed annually
Lecture, talk etc.	180	3~5	540~900
Drama	20	8~10	160~200
Total	200		700~1,100

Assuming the need to provide storage space of the panels for three-months, the scenery store area is planned as follows:

Panel storage : 100m^2 (700×1/4×15cm (each panel's thickness)=26m)
Greenery storage : 20m^2
Furniture storage : 20m^2
Workshop : 20m^2
Paint storage : 20m^2

The scenery store with a floor area of 324m^2 is planned to accommodate above functions as well as passage space.

8) Planned area of the facilities

Table 4-4 Planned Area of the Facilties

Room name	No. Assigned staff	Remarks	Area (m^2)
<Production unit>			
Video studio 1			216.0
Control room, Audio control room, VTR room, Dimmer room, Tech. store		According to equipment layout	120.0
Video studio 2			180.0
Control room, Audio control room, VTR room, Dimmer room, Tech. store		According to equipment layout	120.0
Audio studio 1			40.0
Audio control room, Ante room		According to equipment layout	36.0
Audio studio 2			30.0
Audio control room, Ante room		According to equipment layout	30.0
Scenery store and Workshop, Staff room			324.0
Make-up room, Dressing room (2 rooms each)		According to usage of the room	42.0
Waiting room (2 rooms)		According to usage of the room	36.0
Rehearsal room			72.0
Jt. Director's office (Production)	1	According to IGNOU's standard	16.0
Dy. Director's office (3 rooms)	1 each	According to IGNOU's standard	36.0
Producers' room	32		273.0
Presentation unit office	5	$2\times8m^2$/person+$2\times6m^2$/person+$1\times4m^2$/person $=32m^2$	36.0
<Engineering unit>			
Single step editing room (5 rooms)		According to equipment layout	60.0
A/B roll editing room (4 rooms)		According to equipment layout	72.0
Audio editing room (3 rooms)		According to equipment layout	54.0
Viewing room (3 rooms)		According to equipment layout	54.0
Post-production room		According to equipment layout	93.0
Telecine room		According to equipment layout	18.0

Table 4-4 Planned Area of the Facilities (Continued)

Room name	No. of Assigned staff	Remarks	Area (m^2)
Central apparatus room		According to equipment layout	21.0
Maintenance room	6	According to equipment layout	75.0
Duplication room		According to equipment layout	72.0
Tape/spare parts store		According to equipment layout	85.5
Tape library	2	According to equipment layout	85.5
EFP store		According to equipment layout	54.0
Dy. Director's office (Graphics)		According to IGNOU's standard	12.0
Graphic workshop	8	According to equipment layout	54.0
Engineer-in-charge room (3 rooms)	1 each	According to IGNOU's standard	36.0
Jt. Directors' office (Engineering)	1	According to IGNOU's standard	16.0
Asst. Engineers' office	12	$12 \times 1/3 \times 8m^2$/person $= 32m^2$	36.0
Tech. Assistants' office	27	$27 \times 1/2 \times 4m^2$/person $= 54m^2$	54.0
Staff office	18	$18 \times 1/4 \times 6m^2$/person $= 27m^2$	27.0
Locker room		According to equipment layout	21.0
<Others>			
Director's office		According to IGNOU's standard	16.0
Secretariat room		According to IGNOU's standard	16.0
Meeting room (large)		Capacity of $20 \times 2m^2$/person $= 40m^2$	36.0
Meeting room (small, 2 rooms)		According to room usage	36.0
Reception office	4	$4 \times 4m^2$/person $= 16m^2$	18.0
Viewing room (large)		Capacity of 75 $\times 1m^2$/person $= 75m^2$	72.0

4-3 Basic Designing

4-3-1 Layout Plan

(1) Main approach

The proposed construction site for the project is specifically determined in the IGNOU's campus master plan. The relation between the proposed building of this project and other buildings which will be constructed by the Indian side is shown below.

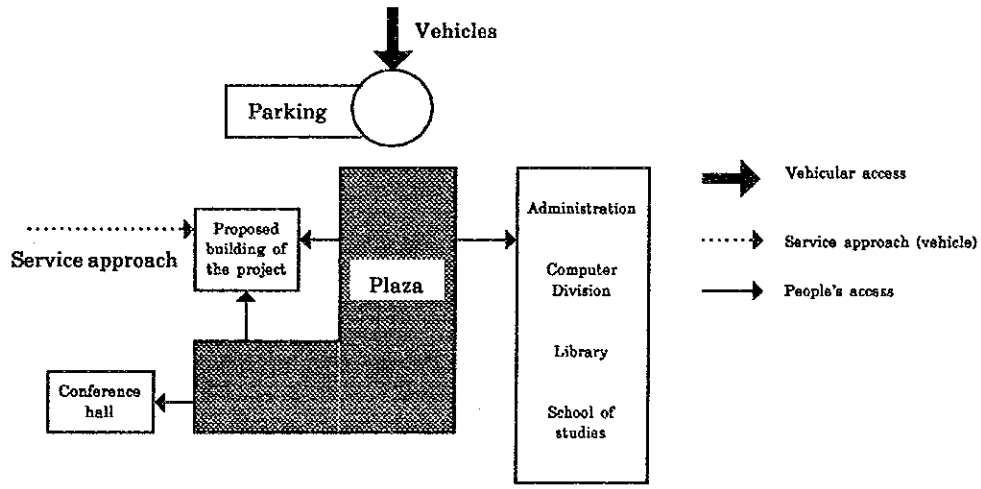


Fig. 4-5 Building Relations of the Master Plan

As shown in Fig. 4-5, the master plan is designed not to allow vehicles to approach buildings directly. People are required to approach buildings on foot through the plaza. Thus, the main approach to the proposed building of this project is planned to allow access by walking from the plaza in two different directions. However, as the building is the facility for production of A/V teaching programmes, and transport of tapes and stage sets etc. by vehicles is essential, a service approach for vehicles is planned on the opposite side of the plaza as shown in figure 4-5.

(2) Floor planning

The floor planning is based on the following criteria:

- To adjust the building to accomodate approaches as designed in the master plan, and to harmonize the building with the surrounding context.
- To reflect A/V programme production in functional zoning as well as layout of rooms.
- To avoid confusion of flow lines for different categories of users such as performers, stage set delivery, technical staff etc.
- To isolate the studio from sources of noise so as to ensure its acoustic performance.
- To enable easy building maintenance, to secure space for future expansion, and provide a courtyard that can be utilized as an outdoor studio.

According to these policies, production facilities are laid out on the ground floor of the building and the first floor is allocated for staff offices. Thus, the conceptual zoning is determined, as shown in Fig. 4-6 below, for planning of room layouts.

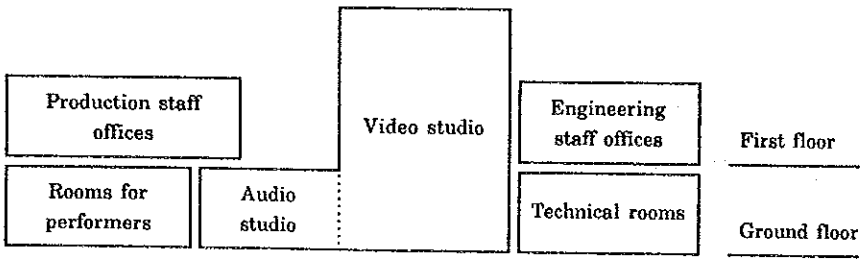


Fig. 4-6 Conceptual Zoning of the Building

(3) Section planning

The section planning is made based on the following criteria:

- To determine reasonable floor heights considering space for air conditioning ducts, electrical wiring, piping system, girder heights and the ceiling height required.
- To pay attention to utilization of natural ventilation and illumination for individual rooms.
- To make the outside appearance of the building harmonize with the master plan.

4-3-2 Structural Planning

Outline of the building and its structural system is shown below.

(1) Outline of the building

Number of stories : Two storeys (video studios: one storey above ground)

Floor height : Ground floor 4.5m; first floor 4.5m (video studio: 13.0m)

Basic span : 6.0m × 6.0m

Structure : Rahmen rigid frame structure of reinforced concrete

(2) Foundation system

According to the soil survey data provided by the Indian side, the construction site has a layer of weathered sandstone upto a depth of 0.7 ~1.0m below the existing ground level followed by a layer of coarse sandstone. As the proposed building of the project is two-storied, it is

proper to adopt a direct foundation taking the layer of coarse sandstone as the supporting layer after removing the weathered sandstone at the top. The permissible design bearing capacity of the soil is expected to be $Ra=40.0t/m^2$. Underground water is not observed down to the survey depth of 9.0m.

(3) Super-structure system

Considering construction workability, economics and local features etc., reinforced concrete rigid frame system shall be adopted. The wall shall be brick walls, except for a staircase which has a reinforced concrete wall, and shall not bear a horizontal force in structural calculations.

Also, part of the first floor roof is planned to bear additional loads imposed by future expansions to be executed by the Indian side.

(4) Load and External force

1) Dead load

The dead load shall be calculated from the weight of structural components and finishing materials etc.

2) Live load

Live loads for individual rooms are estimated according to the Table 1 "Imposed floor loads for different occupancies" of Section 1 Loads, Part VI "Structural Design" of the National Building Code of India 1983.

Live loads for major rooms are given below:

Table 4-5 Live Load

Room	Load (kg/m²)
Video studio Audio studio	300
Control room Editing room	400
Rehearsal room Waiting room Office	250
Tape / spare parts store	1,200
Mechanical room	500
Toilet	200

3) Seismic load

As Northern India lies on the Europe-Asia earthquake belt, Delhi City and surrounding areas are prone to earthquakes. Thus, a proper earthquake-proof building design is mandatory. The seismic load is computed in accordance with Item 5, Section 1, Part VI of the National Building Code of India 1983.

- Base share (V)

$$V = K \cdot C \cdot \alpha_h \cdot W$$

K : Factor of structure framing system (1.0)
C : Coefficient depending upon building fundamental time period (1.0)
α_h : Design seismic coefficient (0.075)
W : Dead load plus live load for seismic design

$$\alpha_h = \beta \cdot I \cdot \alpha_o$$

β : Factor of foundation system (1.0)
I : Factor of importance (1.5)
α_o : Foundation seismic factor (0.05)

$$\alpha_h = 1.0 \times 1.5 \times 0.05 = 0.075$$

Thus,

$$V = 1.0 \times 1.0 \times 0.075 \times W = 0.075W$$

4-3-3 Electrical Planning

(1) Power supply system

The low voltage power of 3-phase 4wire 50Hz 400V/230V, which is transformed from 3-phase 3wire 50Hz 11kV ring circuit of the infra-campus at a substation constructed by the Indian side will be supplied to the proposed building of the project. Also, to stabilize the voltage of a distribution circuit, an induction type automatic voltage regulator (IVR) will be installed in the substation.

As electric power consumption of the proposed building is estimated at about 1,200kVA, a transformer of comparable capacity should be installed by the Indian side. The scope of the Japanese side work will cover primary busducts of the IVR being installed in the substation and further distribution network, while the scope of the Indian side work should cover a secondary low-tension switch board of the transformer as well as a window cooler being installed in the IVR room.

(2) Generator equipment

As a countermeasure against power failure, a diesel engine generator will be installed in the substation which will be built by the Indian side. Major loads on the generator include security lighting, fire extinguishing system, water supply pump, and part of the A/V programme production equipment. To handle these loads, the generator capacity shall be about 200kVA.

(3) Main distribution system

The main cable line will be installed to extend between the IVR's secondary low-tension distribution board in the substation and the distribution and power panels in the proposed building of the project.

The exclusive main lines to the A/V programme production equipment are installed.

(4) Motor control system

Motor control system includes power supply and control of air conditioning and plumbing equipment.

(5) Lighting system

The lighting system used will essentially be fluorescent lamps. Ceiling-recessed type lighting fixtures will be used in offices, editing rooms, control rooms, and corridors, etc. Ceiling surface or pipe-pendant type lighting fixtures will be installed in stores and machine rooms etc. By contrast, in the control room, louvered lighting fixtures will be installed to prevent a shine caused by the lighting fixture on a TV picture or window, and down lights will be provided over control consoles.

Referring to the relevant Indian standards, the target illumination is determined as listed below.

Room	Target illumination (lux)	Room	Target illumination (lux)
Video studio	100	Graphic workshop	300
Audio studio	300	Meeting room	200
Video Control room	300	Mechanical room	150
Post-production room	300	Entrance hall	150
Editing room	300	Corridor	70
Scenery store	150	Tape library	300
Store	100		

(6) Socket outlet

Socket outlets for small-size electric appliances are installed accordingly. The socket outlets shall be 250V 5A 2P + E (with earthing pole) and 250V 15A 2P + E (with earthing pole) which are most commonly used in India.

(7) Telephone system

The telephone exchange room (MDF room) on the first floor will have a main distribution frame (MDF), to which the trunk line is connected. About 15 telephone trunk lines (COL-Central Office Line) must be provided in the proposed building considering facsimile and direct dialing lines, etc. Extension lines will be installed one for each editing room, production equipment related room and single office, and in common rooms at the rate of one for every two officials. The E-PABX used will be of an attendant console type, and it has a back-up power supply (about 3-hour capacity). The E-PABX should have the capacity to handle about 20 trunk lines and 150 extensions. The trunk cable installation work (up to the main distribution frame (MDF), including applications for relevant permits), should be done by the Indian side.

(8) Master antenna TV system

The master antenna TV system is such that a TV antenna will be installed on the rooftop, and that television outlets will be provided in positions such as offices, producer's room, waiting rooms, director's room, technical related rooms, control room etc. The community receiving system allows video signals to be sent out from the central apparatus room so that video tapes can be televised in any part of the building. Regarding the broadcast by satellite, the community receiving system will have a input terminal. Both video cassette recorders and satellite broadcast

receiving system (such as antenna, convertor, tuner and amplifier) are excluded from this project.

(9) Automatic fire alarm system

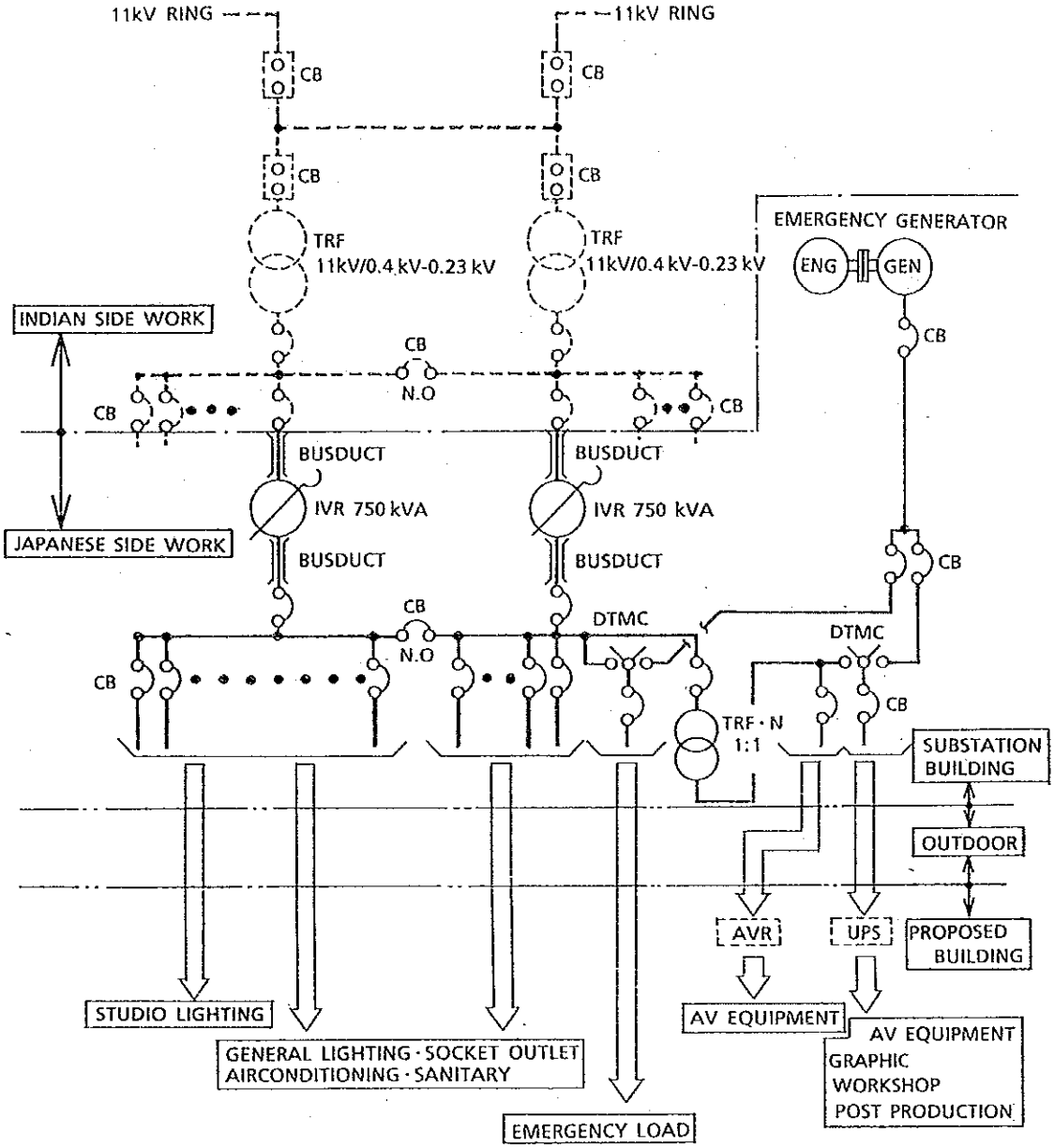
A control panel will be installed in a ground-floor reception office, while sensors are provided in important points of the building. The devices will be installed in accordance with the Building Code of India 1983, relevant Indian standards and the fire department's guidances.

(10) Lightning protection system

The lightning protection system will be installed in accordance with the Building code of India and relevant Indian standards.

(11) Piping and wiring ducts for A/V signal cable

Piping and wiring ducts for A/V signal cable will be installed in accordance with requirements of production equipment of A/V teaching programmes.



CB	:	CIRCUIT BREAKER
TRF	:	TRANSFORMER
N.O	:	NORMAL OPEN
IVR	:	INDUCTION TYPE VOLTAGE REGULATOR
DTMC	:	DOUBLE THROW MAGNETIC CONDACTOR
TRF·N	:	TRANSFORMER FOR NOISE REDUCTION
AVR	:	AUTOMATIC VOLTAGE REGULATOR (STATIC TYPE)
UPS	:	UNINTERRUPTIBLE POWER SUPPLY SOURCE (STATIC TYPE)

Fig. 4-7 Diagram of Electrical Power Supply

4-3-4 Air Conditioning and Ventilation Planning

The air conditioning system is planned in consideration of easy maintenance, reduction of the system-induced noise that may be transmitted to the studio, as well as reduction of maintenance expenses by segmenting the air conditioning system.

(1) Design conditions: Temperature and humidity

a. Ambient conditions

- Air-conditioned season

  Dry-bulb temperature DB 41.6°C (31.0~45.0)
  Wet-bulb temperature WB 27.8°C
  Relative humidity RH 36.0%
  (Source: 1989 Fundamentals Handbook Weather Data, ASHRAE)

b. Desired room conditions

- Studio

  Dry-bulb temperature DB 26.0°C
  (Humidity is uncontrolled)

- Offices

  Dry-bulb temperature DB 26.0°C
  (Humidity is uncontrolled)

- Tape library, tape/spare parts store

  Dry-bulb temperature DB 15.0°C ~ 25°C
  Relative humidity RH 40% ~ 60%

  * As a general rule, the building will not be heated.

(2) Heat source system

Considering the building's load characterics, easy maintenance and operation, water-cooled packaged type air conditioners are used for each air conditioning zone.

(3) Air conditioning system

The building is divided into two air conditioning zones, a studio zone and an office zone. Single duct system from water-cooled packaged type air conditioners will be adopted for each air conditioning zone. And an independent 24 hour operational air conditioning system will be employed for the tape library and the tape/spare parts store.

a. Studio zone (including its related rooms)
   Water cooled packaged type air conditioner + single duct system

b. Office zone
   Water cooled packaged type air conditioner + single duct system

c. Tape library, tape/spare parts store (independent 24 hour operational system)
   Idenpendent water cooled packaged type air conditioner + single duct system

d. As a rule, the following rooms are not air-conditioned.
   Mechanical room, electrical room, pantry, toilet and common space, such as corridor.

For noise control (especially for the studio zone), noise absorbing apparatus will be provided in the building where appropriate.

(4) Piping system

Air conditioning piping for condenser water as well as plumbing piping to the heat source equipment and water-cooled packaged type air conditioners will be provided.

(5) Ventilation system

Mechanical ventilation system will be provided for both intake and exhaust in the mechanical and electrical rooms, and for exhaust alone in the

toilet, pantry and scenery store. Also, air exhaust system to draw out hot air is provided in the upper part of the studio.

(6) Automatic control system

A central monitor board is installed in the reception office to control the start, stop and monitor etc. of individual installations.

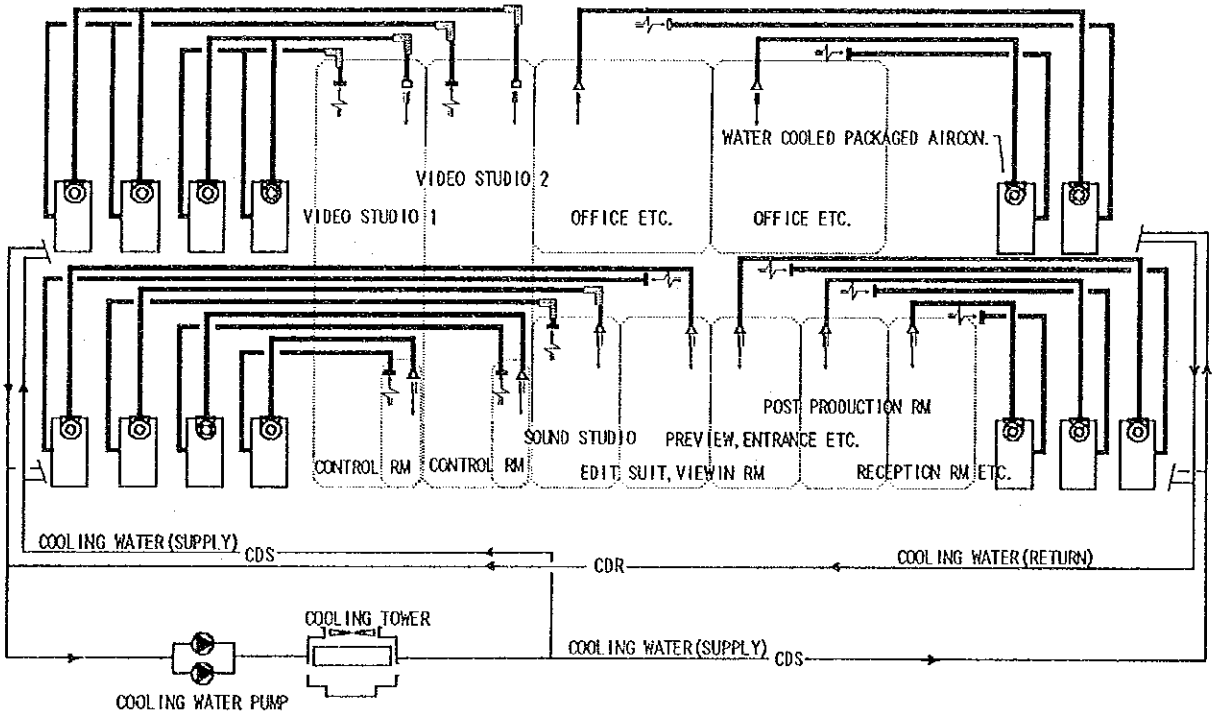


Fig. 4-8 Diagram of Air Conditioning

4-3-5 Plumbing Planning

(1) Water supply systems

The main water supply pipes installed in the campus will be branched into the building where water is stored in an underground reservoir and water will be supplied to necessary areas by the pressurized water supply pump unit. The water is treated with water softener before supply.

(2) Drainage and vent system

The drainage system is divided into three sub-systems: soil, waste and storm-water drain (including condensed water drain from the air conditioning system). Soil and waste water are combined in the building before discharged into the main drain pipe buried within the campus. Storm-water is discharged into the open channel which will be built along the road in the campus.

(3) Sanitary fixtures system

The sanitary fixtures to match the local customs, such as water closets, urinals and wash basins, will be provided.

(4) Fire extinguishing system

Indoor fire extinguishing system will be provided under guidance of the local fire department.

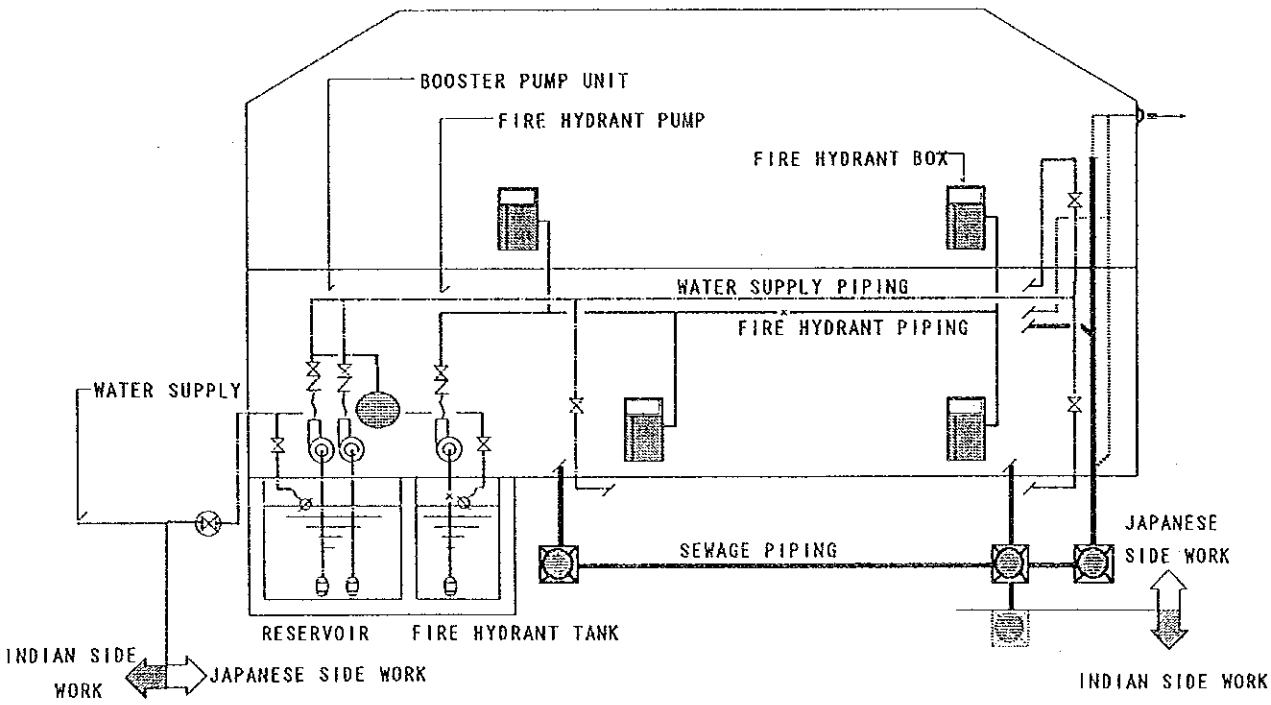


Fig. 4-9 Diagram of Water Supply and Drainage

4-3-6 Acoustic Design of Studio and Control Room etc.

Given conditions for acoustic design are as follows;

(1) Environmental noise conditions

The construction site of the project, which lies in the academic area of the IGNOU campus, is at a distance of about 1km from the public road and thus free from traffic noise which occurs outside the campus. While the construction site adjoins a campus road on the west side at about 50m away from the proposed building, there will be thin traffic, and thus noise from the campus road needs not be considered. Also, the campus is located at a distance of about 10km from the airport and thus away from the flight route, there is no aircraft noise hazard. Therefore, there is no need of considering special measures such as sound insulation against the outside noise.

(2) Anti-noise design

The design target against the air conditioning-induced noise is as follows.

Table 4-6 Target NC Value against A/C

Rooms	NC value
Audio studio Control room	20
Video studio Control room	25
Announce booth	15
Editing room Rehearsal room	30
Viewing room	25
Post production room	30

The audio studio will have a floating structure and will be installed with sound-proof doors and windows.

(3) Interior acoustic design

The target of the average absorption coefficient, which is related to the reverberation design, shall be 0.3~0.4 at 500Hz for audio studios and 0.35~0.45 for video studios. The frequency characteristics of the average acoustic absorption coefficient should remain preferably flat. Also, the control rooms shall be designed considering its indoor acoustic conditions. Leading particulars of acoustic-related rooms including studios are as follows:

Table 4-7 Particulars of Acoustic-related Rooms

Rooms	Length (m)	Width (m)	Height (m)	Area (m^2)	Surface area (m^2)	Volume (m^3)	Reverberation time (sec.) (500Hz)
Audio studio 1	7.5	5.0	3.0	38	150	113	0.25~0.35
Audio studio 2	6.0	4.5	2.4	27	104	65	0.20~0.30
Video studio 1	16.5	10.5	9.5	173	860	1,646	0.50~0.70
Video studio 2	13.5	10.5	9.5	142	740	1,347	0.50~0.70
Announce booth	4.0	3.0	2.4	12	58	29	0.15~0.25

Note: dimensions are subject to change due to detail design

4-3-7 Building Materials Plan

The building materials selected for the project should have the necessary properties for required functions and match the local climate and construction practices. Thus, enhanced durability, easy maintenance and economic aspects of the building will be assured.

(1) Major structural components

Table 4-8 Building Material (Part 1)

Portion	Materials	Remarks
Column, beam, slab, foundation	Reinforced concrete	Commonly used local material with satisfactory results. In site mixing requires careful supervision.
Wall	Brick	Commonly used locally. Specification for use is regulated in detail.

(2) Exterior finish materials

Table 4-8 Building Material (Part 2)

Portion	Materials	Remarks
Roof	Manglore tile on asphalt waterproofing	Follow the master plan
Wall	Chuniya brick	Ditto
Windows	Aluminum windows	Locally made aluminum window will be selected. Air-tightness shall be the criteria upon selection.

(3) Interior finish materials

Table 4-8 Building Material (Part 3)

Rooms	Floor	Wall	Ceiling	Remarks
Video studio	Vinyl sheet on double layer concrete slab	Expand metal on glass wool	Glass wool on gypsum board	Smooth floor surface for moving shot. Sound insulation and sound absorption need to be assured.
Audio studio	Carpet on floating floor	Perforated plywood on glass wool	Acoustic ceiling	Sound insulation, vibration proof and sound absorption are critical.
Control room	Free access floor	Perforated plywood on glass wool	Acoustic ceiling	Flexible wiring under the floor and sound absorption are required.
Post-production room, Telecine room, A/B roll editing room	Free access floor	Paint	Acoustic ceiling	Flexible wiring under the floor to be assured.

Table 4-8 Building Material (Part 3)

Rooms	Floor	Wall	Ceiling	Remarks
Maintenance room, Duplication room, Tape library, Offices, Corridors	Terrazzo tile	Paint	Acoustic ceiling	Durability and economics are the criteria for selection
Toilet	Ceramic tile	Ceramic tile	Paint	Durability and waterproofing property are the criteria

4-3-8 Equipment Plan

The equipment used are grouped as shown below and their details are shown in Table 4-10 Equipment List.

1. Equipment for video studio
2. Equipment for audio studio
3. Equipment for post-production
4. Equipment for A/B roll editing and single-step editing
5. Equipment for audio editing
6. Equipment for central apparatus room
7. Equipment for duplication
8. Equipment for EFP (Electrical field production)
9. Equipment for viewing room
10. Measuring equipment and instruments
11. Equipment for computer graphics
12. Others

In selecting items and deciding on their quantity, the planning is made in consideration of the following points:

① In light of the objectives and nature of this project, items of urgently needed equipment which rank high in the priorities are generally selected so that they will be used most effectively.

② Regarding items of equipment for common use between different divisions, it is necessary to avoid duplication of the same equipment so long as each division's business schedule is not hindered, thus allowing the equipment to be used most efficiently.

③ Considering India's maintenance system and capabilities etc., care will be taken to see that the equipment being installed operates in good order.

④ Out of the existing equipment used in the communication division (studio, post-production centre etc.), those usable items should be transferred into the proposed building for re-use under this project.

⑤ The availability of spare parts, such as electrical components and circuit boards, are a major consideration.

⑥ Equipment specification is determined as suitable for the scope and purpose of related facilities.

Furthermore, major equipment such as video cassette recorders is selected from Japanese-made items for the following reasons:

① Regarding audio-visual equipment, reliability of Japanese products is high and it has high worldwide market share. Especially in Asia, its market share for business use (for broadcasting stations) is estimated to be about 90%.

② Most of the existing equipment, including those supplied under British aid, is of Japanese made (or products made under licence from Japanese makers).

③ Some Japanese manufacturers are manufacturing specific lines of related equipment in India in a joint venture with Indian counterparts. Thus, spare parts and technical support service are locally available.

Judging from the investigation of operating conditions, existing equipment and existing facilities, the items of equipment being supplied under this project shall not be so complicated that they cannot be used in good order in the future to achieve their objectives effectively.

The grades of video and audio equipment are generally divided into 4 classes, such as ① Broadcasting use, ② Semi-broadcasting use, ③ Professional use and ④ Home use, as shown below. Among them, the equipment for ① and ② corresponds to broadcasting standards. The equipment for the project should be put in class ② since the developed programmes are planned to be sent out, and the copies will be on sale.

Class	Propose	Video tape format	Price · Performance
① Broadcasting use	Production and sending out of programmes	Type C, D2, D3	Extremely high
② Semi-broadcasting use	Production and on air programmes and production of commercial basis packages	Betacam SP	Lower than ①
③ Professional use	Production of programmes not oriented broadcasting and sales	U-matic, S-VHS	Lower than ②
④ Home use	Recording and Playback at home	VHS, Beta, 8mm	Low

Here are four groups of the major equipment with respect to their grades (functions and specifications etc.):

① Video camera

In view of the teaching materials to be produced, it is advisable to record a high-quality picture image as can be done on video tape. Thus, the video camera selected is for a high-quality picture of the type used in a broadcasting station etc., using 2/3 inch CCD, of a RGB 3-chips system, and with a horizontal resolution of 700 lines.

② Video cassette recorder

The video cassette recorder selected needs to have a high-quality picture and high performance. Also, it must be easy to operate and durable. Betacam SP format which has been accepted as a world wide standard by the broadcast.

③ Video production switcher

In the studio operations, the video production switcher is used for switching pictures shot by different cameras, so only a desired picture is recorded. The number of inputs is set at 20 based on the equipment configuration listed below:

Equipment	No. of Input
Video camera	3
Video cassette recorder	2
Video cassette recorder (extra)	2
Caption scanner	1
Video typewriter	1
Digital video effecter	1
White/Black burst	2
Back-ground color	2
Test signal	2
Extra	4
Total	20

④ Audio mixer

In the video studio, an audio mixer to handle sounds corresponds with a video switcher to handle pictures. Thus, the grade of the audio mixer applies correspondingly to that of the video production switcher. Also, an audio mixer of the same type will be used to maintain the operational interchangeability with the one used in the video studio. However, the number of inputs are 16 for the video studio, and 12 for the audio studio, as listed below:

Video studio

Equipment	No. of Input
Microphone	6
Video cassette recorder	2
Video cassette recorder (extra)	2
CD player	1
DAT recorder	2
Sound effecter	1
Test signal	1
Extra	1
Total	16

Audio studio 1, 2

Equipment	No. of Input
Microphone	6
CD player	2
DAT recorder	2
Sound effecter	1
Extra	1
Total	12

Applications and functions of major equipment is shown in the table below.

Table 4-9 Major Equipment: Use Applications and Functions

Equipment	Applications and Functions etc.
• Video camera system	Used in the studio for video recording. This system is composed of a camera, camera control unit, motorized zoom lens, servo control unit, view finder, cam head, and camera pedestal, etc.
• Teleprompter system	A visual prompter for displaying a script to performers such as a lecturer or announcer in front of a camera. Through a half-mirror placed in front of the camera lens, the performer can monitor the script taken by another camera.
• Video production switcher	This is used to switch inputs from video cameras and video cassette recorders. It also functions to synthesize two or more pictures or to superimpose a word on the pictures.
• Digital video effecter	The effecter is used to provide a picture with special video effects such as mix, wipe and mosaic. The input signals received by the video switcher are digitized and electrically processed.
• Tally system	This system is used to show to performers and staff in the studio which device is on. Usually, the system works in such a way that lamps and LEDs placed on the video camera or picture monitor etc. illuminate automatically when it is selected by the video switcher in the control room.
• Audio mixing system	The audio mixing system is used to switch inputs from audio devices, such as microphones, tape recorders and record players, as well as to control the sound level and to perform mixing etc.
• Reverberation unit	This equipment is used to give the artificial effect of reverberation to sound sources. It makes the sound reverberate or audible as if it were coming from long way off.
• Waveform monitor	This equipment is used for display and measurement of waveform with respect to its amplitude, as well as the phase, pulse width and frequency characteristics etc. of video signals.
• Vectorscope	This instrument displays, in vectors, phase and amplitude of demodulated chrominance signal of a color image. Used to check color balance, etc.
• Lighting control system	This system is used to control intensity of stage-lighting elements as desired. The system is composed of a dimmer unit installed with the power distributor (master control board), and a lighting controller attached to the console panel in the control room to do fine adjustment to match a given scene.
• Suspension system	This system is used to control the height of lighting equipment. It includes some rows of lamps fixed to the batons and individual pantograph type lights. The system is electrically driven by winches placed on the grid pipes of the ceiling, and controlled on the operation panel in the studio.

Table 4-9 Major Equipment: Use Applications and Functions (Continued)

Equipment	Applications and Functions etc.
• Intercom equipment	Intercom is used as a telephone system to allow the staff members in the studio and in the control room to talk with one another.
• DAT recorder	A digital-audio tape recorder for use with mini cassette tape. Used just like a conventional cassette tape recorder. Using synchronizing signals, however, it can be synchronized with a VCR, and externally started and stopped. It is also capable of a high-accuracy editing and is easy to systematize with the VCR.
• Cough box	This is a switch box which enable performers in the studio to control the input levels (on/off, level controls) of a microphone at hand. It is used to cut off coughs and unexpected noise.
• Sound effecter	This is used to provide sound source with very special effects. As audio signals are electrically processed, it is possible to make a specific voice clear, or change voice quality as desired.
• Multi-track tape recorder	This is used to record and playback sound sources on multiple tracks simulateneously or individually. It allows separate recordings, such as ensembles and chorus, to be synthesized together for playback.
• Synchronizing signal generator	This equipment provides synchronizing signals to enable synchronization among video devices installed in the video studio, audio studio, and post-production rooms etc.
• TV signal generator	This is used like the synchronizing signal generator. It provides such a test signal as a color-bar test signal for the measurement of electrical characteristic of TV equipment installed in respective rooms.
• Sweep generator	This is used for the measurement of frequency characteristic of video signals, thereby enabling the adjustment of circuits (electronic sub-assembly), etc.
• AVR/UPS (Automatic voltage regulator / Uniterruptable power system)	These devices are used to supply a constant voltage to the equipment, so that the equipment can keep high-operational accuracy. An uninterruptable power system has an internal battery which can supply power for about 10 minutes after a power failure, thus protecting data stored in the memories of respective computerized equipment.

Main equipment for the project is listed below. The diagram of the main system is shown in the Fig. 4-10-1~6.

Table 4-10 Equipment List

No.	Equipment	Q'ty	Unit
	1. Equipment for Video Studio		
	(Video studio 1)		
A-1	Video camera system	3	set
	• 3-CCD camera (With camera control unit)	(3)	unit
	• Motorized zoom lens (8.5~119mm, ×14)	(3)	unit
	• View finder (B/W, 5-inch)	(3)	unit
	• Cam head (Pan: 360°, tilt: 90°)	(3)	set
	• Camera pedestal (680~1500mm)	(3)	unit
	• Camera cables	(3)	set
A-2	Teleprompter system (Half mirror box type, with B/W video camera, manual zoom lens, B/W picture monitor)	1	set
A-3	Video production switching system	1	set
	• Production switcher (Input: 20, Output: 1, PAL)	(1)	unit
	• Digital video effecter (1-dimensional, 2-dimensional, attractive 3-demensional effect)	(1)	unit
	• Video distributor (1-input: 4-outputs / unit with amp.)	(1)	set
A-4	Tally system (Interlocking for video switcher, lamp / LED type)	1	set
A-5	Audio production system	1	set
	• Audio mixer (Input: 16, Output: 2)	(1)	unit
	• CD player (For 8 or 12cm disk)	(1)	unit
	• DAT recorder (Digital / Analogue inputs and outputs)	(2)	unit
	• Microphones(Condenser / dynamic type, uni-directional / omni-directional type)	(1)	set
	• Microphone stands(Boom type, floor type, tablestand type)	(1)	set
	• Connecting cables	(1)	set
	• Reverberation unit (18 bit, digital type, delay time adjustable)	(1)	set
A-6	Lighting equipment	1	set
	• Lanterns (Spot light, flood light)	(1)	set
	• Lighting control system (90-circuit, with remote controller)	(1)	set
	• Suspension system(Motorized baton type, pantograph type)	(1)	set

Table 4-10 Equipment List (Continued)

No.	Equipment	Q'ty	Unit
	• Bulbs (Halogen lamp, tungsten lamp)	(1)	set
A-7	Video cassette recorder (1/2-inch Betacam SP, PAL)	2	unit
A-8	Measuring equipment for video signal	1	set
	• Waveform monitor(×5 indication, for VE console, VTR rack)	(2)	unit
	• Vectorscope (2-output indication simulcasts, for VE console, VTR rack)	(2)	unit
A-9	Video monitor system	1	set
	• B/W picture monitor (12-inch, for PD/switcher console)	(9)	unit
	• Color master monitor (20-inch, for PD/switcher console)	(1)	unit
	• Color master monitor (14-inch, for VE console)	(1)	unit
	• Color picture monitor (20-inch, for PD/switcher console, audio mixing console)	(2)	unit
	• Color picture monitor (14-inch, for PD/switcher console)	(3)	unit
	• B/W picture monitor (12-inch, for audio mixing console)	(3)	unit
	• Color picture monitor (20-inch, for studio floor)	(2)	unit
	• Color picture monitor (9-inch, for VCR rack)	(2)	unit
A-10	Audio monitor system	1	set
	• Wall mounted speaker (2-way bass-reflex type, power handling capacity: 60W)	(1)	unit
	• Power amp. (Output power level: 50W+50W)	(1)	unit
	• Monitor speaker with amp. (2-way bass-reflex type, power handling capacity: 60W, for studio floor)	(1)	unit
	• Monitor speaker (main) (for audio mixing console, power handling capacity: 150W)	(2)	unit
	• Monitor speaker (sub) (for audio mixing console, power handling capacity: 60W)	(2)	unit
	• Power amp. (main) (for audio mixing console, output power level: 300W+300W)	(1)	unit
	• Power amp. (sub) (for audio mixing console, output power level: 50W+50W)	(1)	unit
	• Monitor speaker (for PD/switcher console, power handling capacity: 150W)	(2)	unit
	• Power amp. (for PD/switcher console, output power level: 300W+300W)	(1)	unit
A-11	Intercom equipment (Intercom unit: 4-line type with headphones)	1	set

Table 4-10 Equipment List (Continued)

No.	Equipment	Q'ty	Unit
A-12	Console	1	set
	• PD/switcher console (W2050×D1350×H1100)	(1)	set
	• VE console (W950×D1350×H1100)	(1)	set
	• Audio mixing console (W1450×D1350×H1100)	(1)	set
	• Monitor shelf for PD/switcher console (W3750×D780×H2400)	(1)	set
	• Monitor shelf for audio mixing console (W1250×D780×H2400)	(1)	set
	• Carriage for studio floor monitor (W700×D600×H1850)	(2)	unit
	• System rack (W570×D700×H2050)	(1)	set
	(Video studio 2)		
A-13	DAT recorder (Digital / Analogue inputs and outputs)	2	unit
A-14	Lighting equipment	1	set
	• Lanterns (Spot light, flood light)	(1)	set
	• Suspension system(Motorized baton type, pantograph type)	(1)	set
	• Bulbs (Halogen lamp, tungsten lamp)	(1)	set
A-15	Video cassette recorder (1/2-inch Betacam SP, PAL)	2	unit
	2. Equipment for Audio Studio		
	(Audio studio 1)		
B-1	Equipment for studio	1	set
	• Microphones (Condenser / Dynamic type, uni-directional/ omni-directional type)	(1)	set
	• Microphone stands(Boom type, floor type, tablestand type)	(1)	set
	• Connecting cables	(1)	set
	• Monitor speaker (2-way bass-reflex type, power handling capacity: 60W)	(2)	unit
	• Power amp. (Output power level: 50W+50W)	(1)	unit
	• Color picture monitor (20-inch)	(1)	unit
	• Headphone box (4-input)	(1)	unit
	• Headphone (Dynamic type, stereo)	(1)	set
	• Cough box (Mic. input level control, with CUE lamp)	(1)	unit
	• Announcer table (W1000×D600×H770, wooden)	(1)	unit

Table 4-10 Equipment List (Continued)

No.	Equipment	Q'ty	Unit
B-2	Equipment for control room	1	set
	• Audio mixer (Input: 12, Output: 2)	(1)	
	• Multi-track tape recorder (1/2-inch, 8 tracks, desktop type)	(1)	unit
	• CD player (For 8 or 12cm disk)	(1)	unit
	• Synchronizer (SMPTE timecode synchronizing)	(1)	unit
	• DAT recorder (Digital / Analogue inputs and outputs)	(2)	unit
	• Sound effecter (Digital reverberator, digital delay line, graphic equalizer)	(1)	set
	• Monitor speaker (main)(Power handling capacity: 300W)	(2)	unit
	• Monitor speaker (sub) (2-way bass-reflex type, power handling capacity: 60W)	(2)	unit
	• Power amp. (main)(Output power level: 300W+300W)	(1)	unit
	• Power amp. (sub)(Output power level: 50W+50W)	(1)	unit
	• Color picture monitor (20-inch)	(2)	unit
	• Video cassette recorder (1/2-inch Betacam SP)	(1)	unit
	• Audio mixing console (W2500×D1350×H1100)	(1)	set
	• Audio / Video rack (W570×D700×H2050)	(1)	set
	(Audio studio 2)		
B-3	Equipment for studio	1	set
	• Microphones (Condenser / Dynamic type, uni-directional/ omni-directional type)	(1)	set
	• Microphone stands(Boom type, floor type, tablestand type)	(1)	set
	• Connecting cables	(1)	set
	• Monitor speaker (2-way bass-reflex type, power handling capacity: 60W)	(2)	unit
	• Power amp. (Output power level: 50W+50W)	(1)	unit
	• Headphone box (4-input)	(1)	unit
	• Headphone (Dynamic type, stereo)	(1)	set
	• Cough box (Mic. input level control, with CUE lamp)	(1)	unit
	• Announcer table (W1000×D600×H770, wooden)	(1)	unit
B-4	Equipment for control room	1	set
	• Audio mixer (Input: 12, Output: 2)	(1)	unit
	• CD player (For 8 or 12cm disk)	(1)	set
	• DAT recorder (Digital / Analogue inputs and outputs)	(2)	unit

Table 4-10 Equipment List (Continued)

No.	Equipment	Q'ty	Unit
	• Sound effecter (Digital reverbrator, digital delay line, graphic equalizer)	(1)	unit
	• Monitor speaker (main) (Power handling capacity: 300W)	(2)	unit
	• Monitor speaker (sub) (2-way bass-reflex type, power handling capacity: 60W)	(2)	unit
	• Power amp. (main)(Output power level: 300W+300W)	(1)	unit
	• Power amp. (sub)(Output power level: 50W+50W)	(1)	unit
	• Audio mixing console (W2500×D1350×H1100)	(1)	set
	• Audio rack (W570×D700×H2050)	(1)	set
	3. Equipment for Post-Production		
C-1	DAT recorder (Digital / Analogue inputs and outputs)	2	unit
C-2	Video cassette recorder (1/2-inch Betacam SP, PAL)	3	unit
	4. Equipment for A/B Roll Editing, Single-Step Editing		
D-1	Video cassette recorder (1/2-inch Betacam SP, PAL)	4	unit
D-2	Video cassette player (1/2-inch Betacam SP, PAL)	8	unit
	5. Equipment for Audio Editing		
E-1	Equipment for audio editing room 1	1	set
	• Audio mixer (Input: 8, Output: 2)	(1)	unit
	• DAT recorder (Digital / Analogue inputs and outputs)	(2)	unit
	• Open-reel tape recorder (1/4-inch, 2-track)	(1)	unit
	• Audio cassette tape deck (4-track, 2-channel, 3-head)	(1)	unit
	• CD player (For 8 or 12cm disk)	(1)	unit
	• Sound effecter (Digital reverberator, digital delay line, graphic equalizer)	(1)	set
	• Monitor speaker (2-way bass-reflex type, power handling capacity: 60W)	(2)	unit
	• Power amp. (Output power level: 50W+50W)	(1)	unit
	• Audio rack (W570×D700×H2050)	(1)	set
E-2	Equipment for audio editing room 2	2	set
	• DAT recorder (Digital / Analogue inputs and outputs)	(4)	unit
	• Monitor speaker (2-way bass-reflex type, power handling capacity: 60W)	(4)	unit
	• Power amp. (Output power level: 50W+50W)	(2)	unit
	• Audio cassette tape deck (4-track, 2-channel, 3-head)	(2)	unit

Table 4-10 Equipment List (Continued)

No.	Equipment	Q'ty	Unit
	6. Equipment for Central Apparatus Room		
F-1	Signal generation and distribution system	1	set
	• Synchronizing signal generator (Single clock, digital type, 12bit signal)	(1)	unit
	• TV signal generator (Single clock, digital type, 12-bit signal)	(1)	unit
	• A/V signal distributor (1-input, 4-outputs / unit, with amp.)	(1)	set
	• System rack (W570×D700×H2050)	(1)	set
	7. Equipment for Duplication		
G-1	Duplication system	1	set
	• Video cassette recorder (1/2-inch Betacam SP, PAL)	(1)	unit
	• Video cassette recorder (1/2-inch Betacam SP, NTSC)	(1)	unit
	• Video cassette recorder (1/2-inch VHS, PAL)	(30)	unit
	• Color picture monitor (14-inch)	(7)	unit
	• Video signal distributor (1-input, 4-outputs / unit, with amp.)	(1)	set
	• Audio signal distributor (1-input, 4-outputs / unit, with amp.)	(1)	set
	• Video / audio signal selector (6-lines)	(1)	unit
	• System rack (W570×D700×H2050)	(1)	set
	8. Equipment for EFP (Electronic Field Production)		
H-1	Potable equipment	1	set
	• Video cassette recorder (1/2-inch Betacam SP, PAL, dockable recorder unit)	(3)	unit
	• Video cassette recorder (1/2-inch Betacam SP, PAL, portable recorder / player)	(2)	unit
	• DAT recorder (Digital / Analogue inputs and outputs, with speaker)	(2)	unit
	• Video switcher (Video signal input: 6, with synchronizing signal generator)	(1)	unit
	• Engine generator (Output power: 5kVA)	(2)	unit

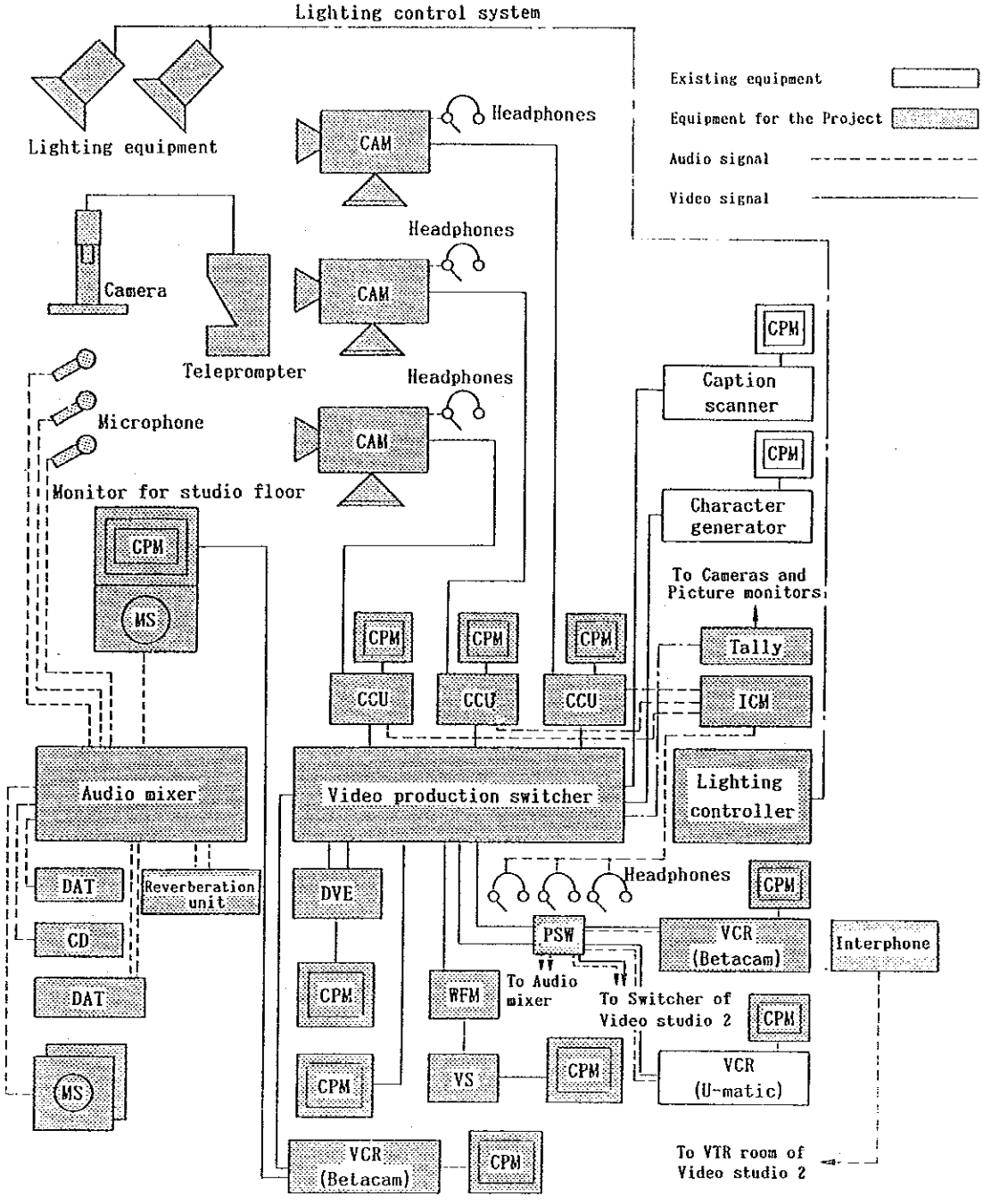
Table 4-10 Equipment List (Continued)

No.	Equipment	Q'ty	Unit
	9. Equipment for Viewing Room		
I-1	Video playback system	1	set
	• Video cassette player (1/2-inch Betacam SP, PAL)	(1)	unit
	• Video cassette recorder (1/2-inch, VHS)	(4)	unit
	• Power amp. (Output power level: 60W+60W)	(1)	unit
	• Monitor speaker (2-way bass-reflex type, power handling capacity: 80W)	(2)	unit
	• Color picture monitor (20-inch)	(1)	unit
I-2	Public address system	1	set
	• Microphone (Dynamic type)	(1)	set
	• Microphone stands (Floor type, tablestand type)	(1)	set
	• Connecting cables	(1)	set
	• Mixing amp. (Microphone inputs: 4, output power level: 60W+60W)	(1)	unit
	• Audio speaker system (2-way bass-reflex type, power handling capacity: 80W)	(2)	unit
	10. Measuring Equipment and Instruments		
J-1	Measuring equipment	1	set
	• Oscilloscope (Auto set-up type)	(2)	unit
	• Vector / waveform monitor (Simultaneously displayed on signal CRT for vector and waveform)	(1)	unit
	• TV signal generator (Single clock, digital type, 12-bit signal)	(1)	unit
	• Illumination meter (Digital type)	(2)	unit
	• Color meter (Digital type)	(2)	unit
	• Sweep generator (Frequency: 10KHz~10MHz)	(2)	unit
	• Alignment test tape for video cassette recorder (For 1/2-inch Betacam SP)	(1)	set
	• Alignment test tape for audio tape recorder (For multi-track, open-reel, DAT)	(1)	set
	• Head alignment jigs	(5)	set
	• Color master monitor (20-inch)	(1)	unit
	• Color master monitor (14-inch)	(1)	unit
	• Test chart set (Gray scale, resolution chart, registration chart)	(1)	set

Table 4-10 Equipment List (Continued)

No.	Equipment	Q'ty	Unit
	11. Equipment for Computer Graphics		
K-1	Video cassette recorder system	2	set
	⊙ Video cassette recorder (1/2-inch Betacam SP, PAL)	(2)	unit
	● Color picture monitor (20-inch)	(2)	unit
	12. Others		
L-1	Spare parts (Circuit board, magnetic head, etc.)	1	set
L-2	AVR/UPS (Electronic type, back-up time: 10 minutes)	1	set
L-3	Installation materials (Cables, Connectors, etc.)	1	set
L-4	Power tools for wood working(Band saw, circular saw, jigsaw, etc.)	1	set
L-5	Interphones (Telephone receiver type)	1	set
L-6	Rack system for tapes (Sliding type)	1	set

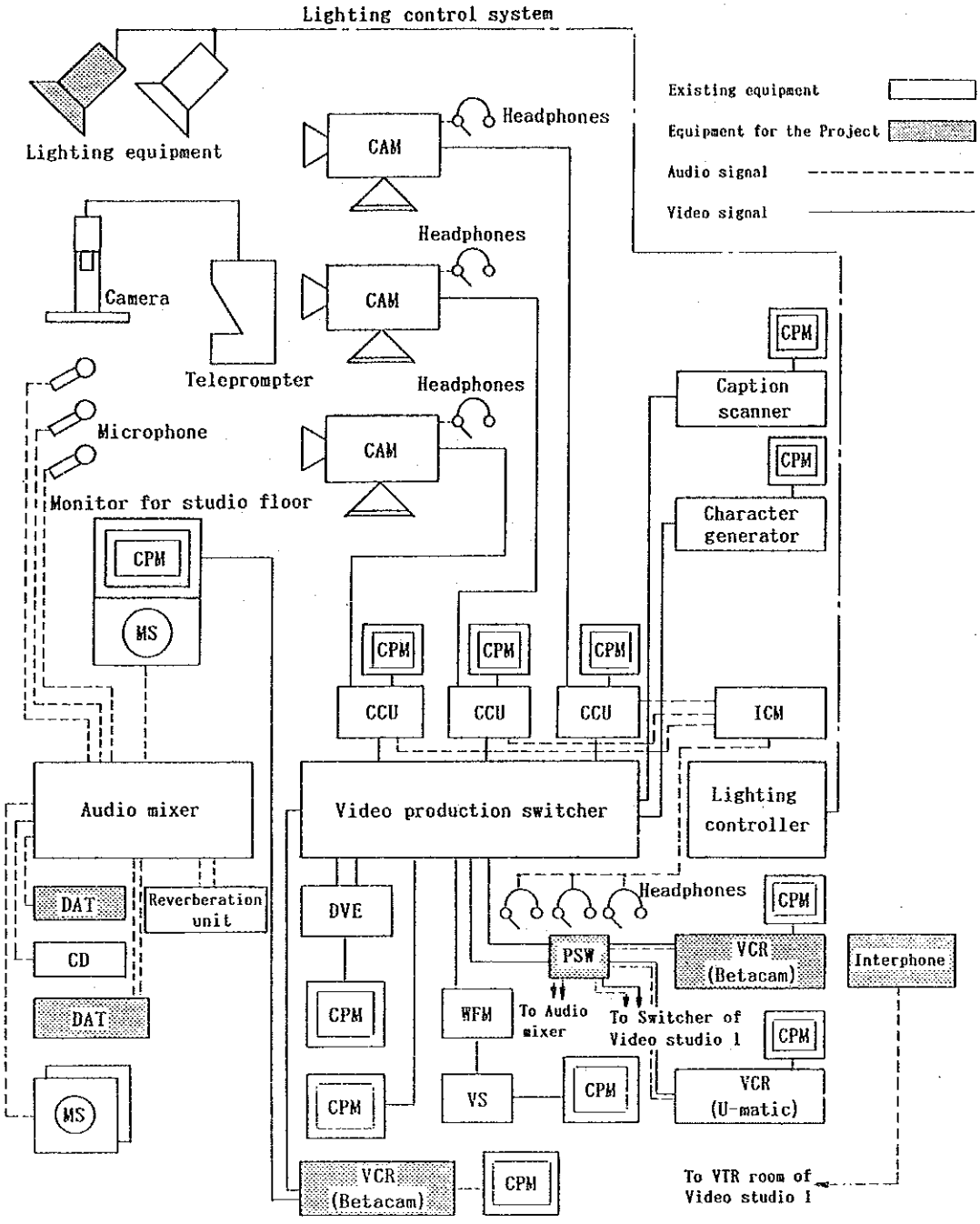
Note: The number in ( ) shows breakdown quantity of each item.



Symbols

VCR : Video cassette recorder	CPM : Color picture monitor
ICM : Intercom	CCU : Camera control unit
WFM : Waveform monitor	VS : Vectorscope
DVE : Digital video effecter	DAT : Digital audio tape recorder
CD : Compact disk player	CAM : Video camera
MS : Monitor speaker	PSW : Panel type AV signal selector

Fig. 4-10-1 Diagram of Equipment for Video Studio 1



Symbols

VCR : Video cassette recorder	CPM : Color picture monitor
ICM : Intercom	CCU : Camera control unit
WFM : Waveform monitor	VS : Vectorscope
DVE : Digital video effecter	DAT : Digital audio tape recorder
CD : Compact disk player	CAM : Video camera
MS : Monitor speaker	PSW : Panel type AV signal selector

Fig. 4-10-2 Diagram of Equipment for Video Studio 2

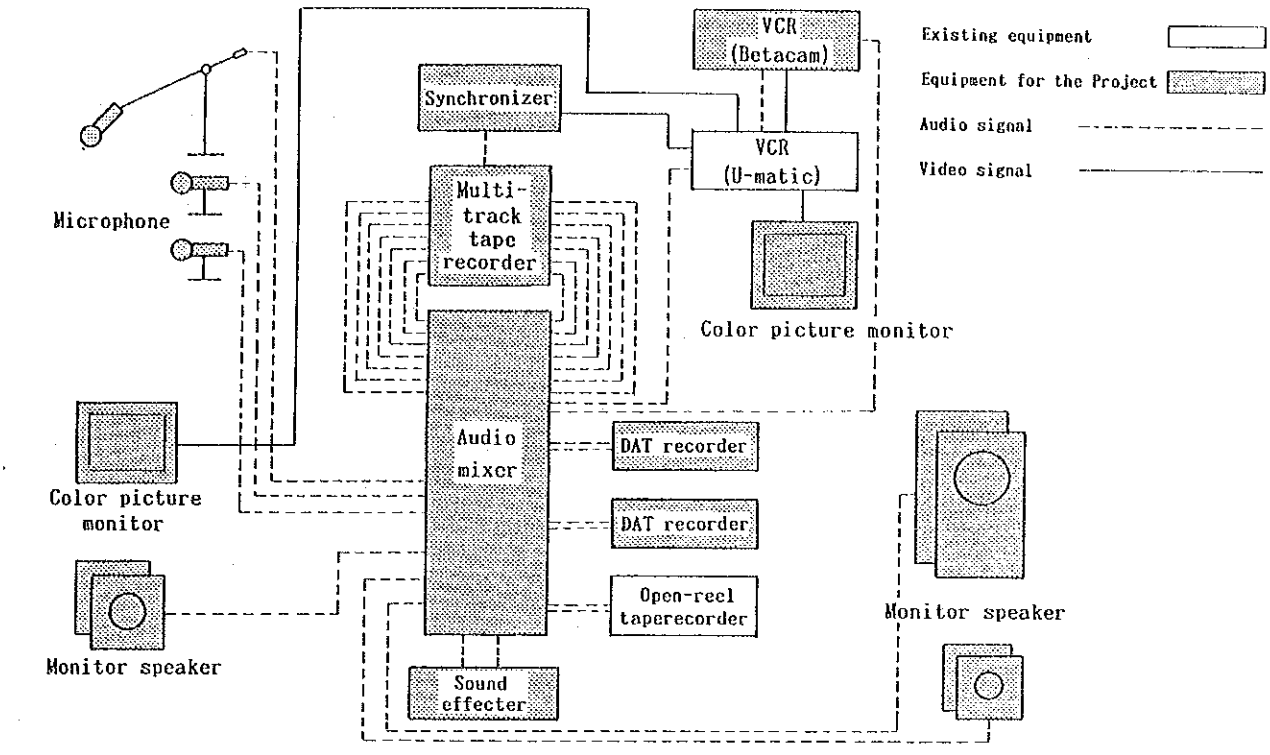


Fig. 4-10-3 Diagram of Equipment for Audio Studio 1

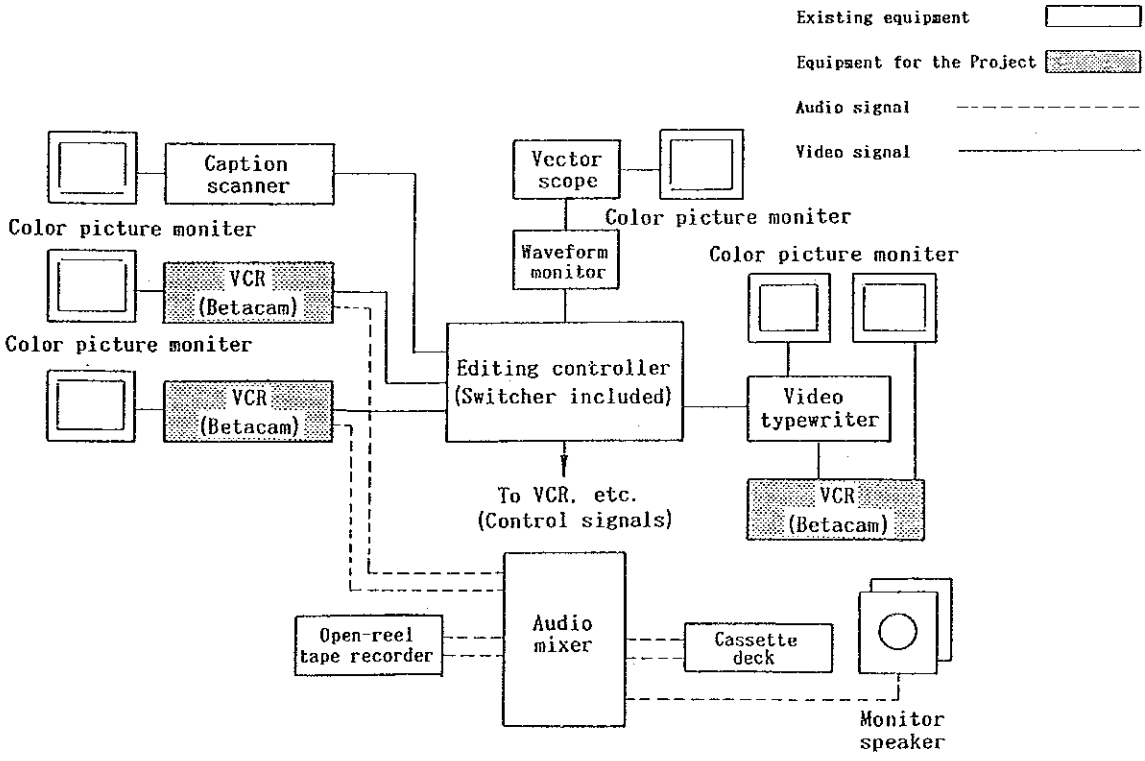
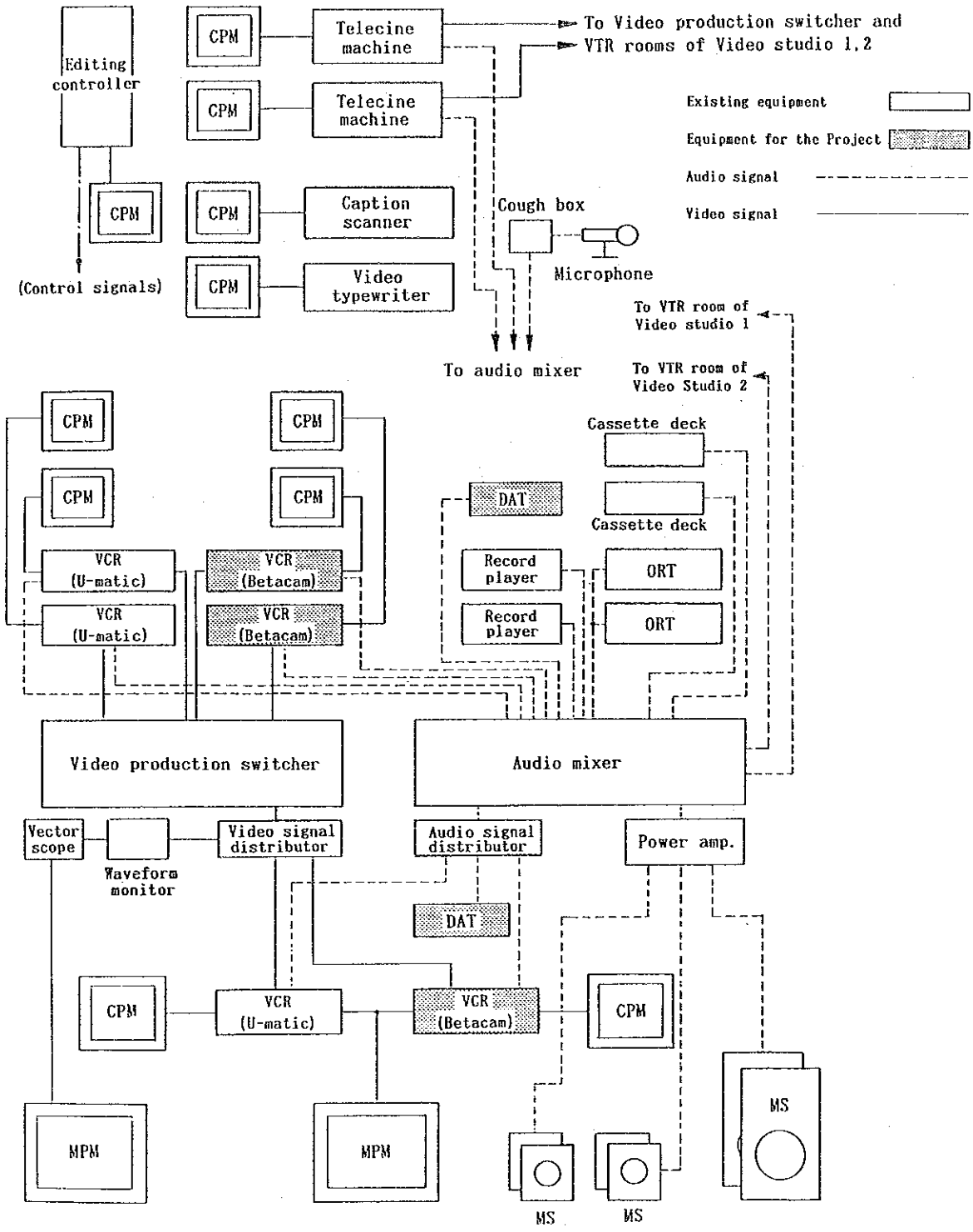


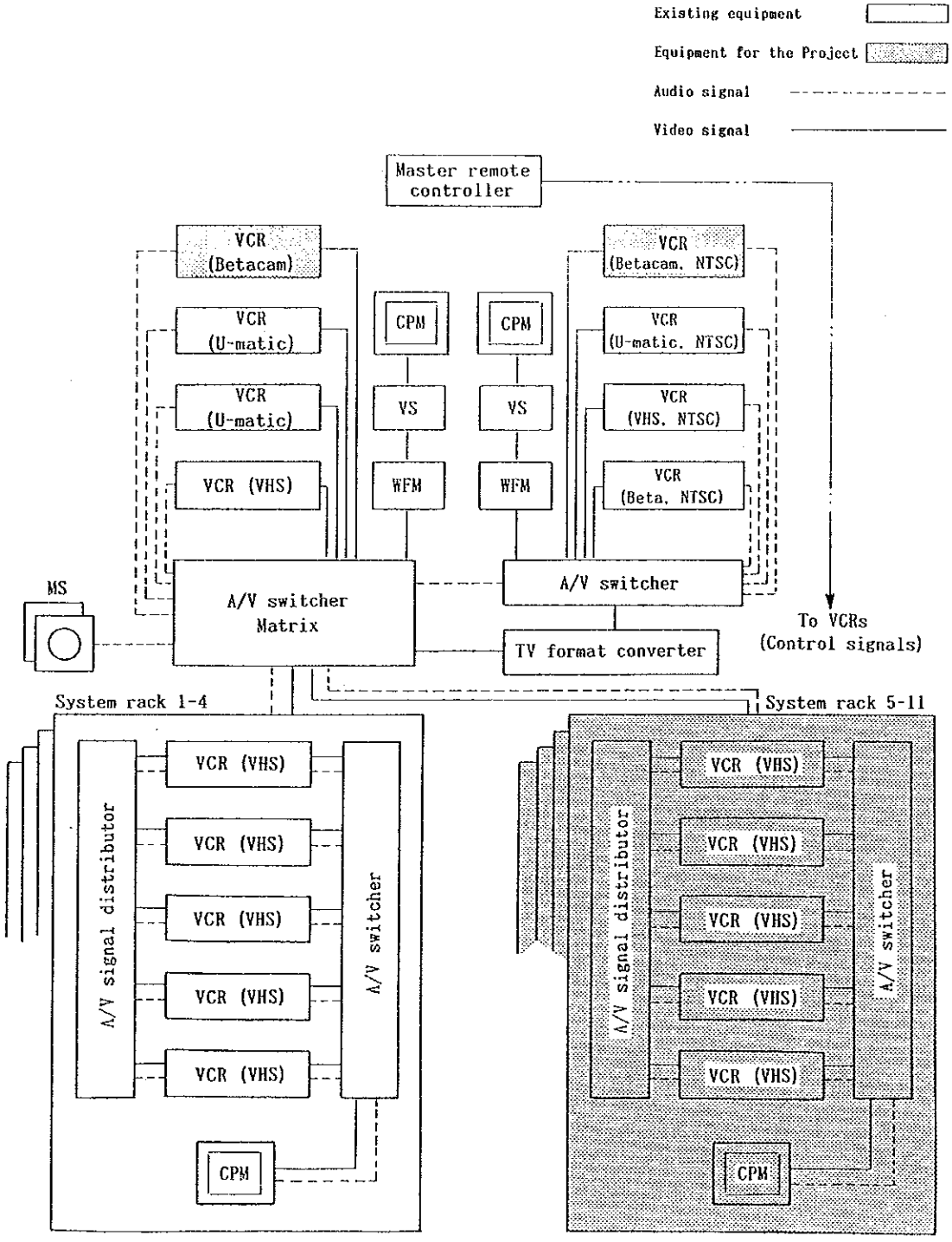
Fig. 4-10-3 Diagram of Equipment for A/B Roll Editing



Symbols

VCR : Video cassette recorder
CPM : Color picture monitor
MPM : Color master monitor
MS : Master moniter
ORT : Open-reel tape recorder
DAT : Digital audio tape recorder

Fig. 4-10-5 Diagram of Equipment for Post-Production



Symbols

VCR : Video cassette recorder
MPM : Color master monitor
WFM : Waveform monitor
CPM : Color picture monitor
MS : Master moniter
VS : Vector scope

Fig. 4-10-6 Diagram of Equipment for Duplication

4-3-9 Basic Design Drawings

(1) Area

First floor	1,500 m^2
Ground floor	3,279 m^2
Total	4,779 m^2

(2) List of drawings

01 Site plan

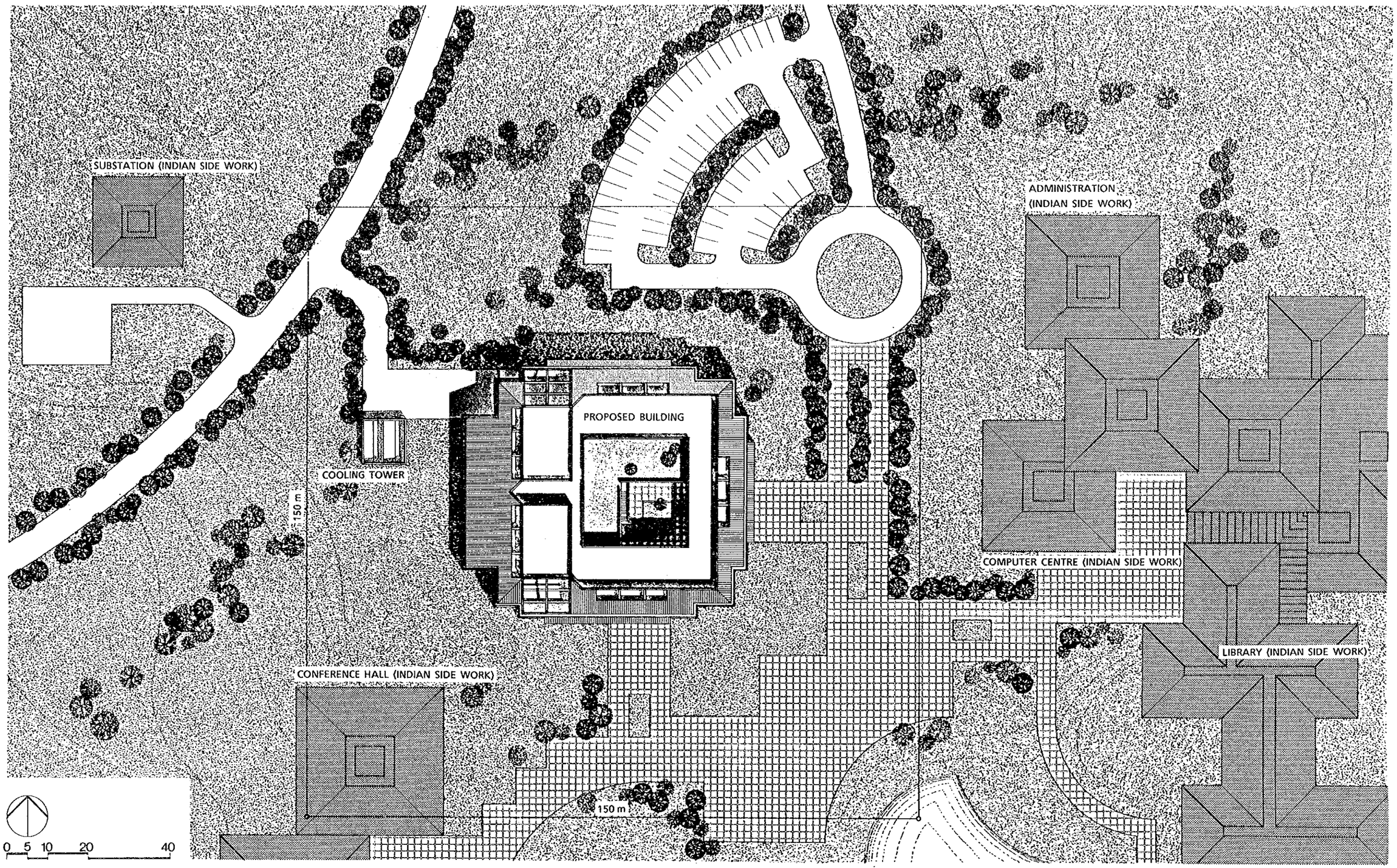
02 Ground floor plan

03 First floor plan

04 Section

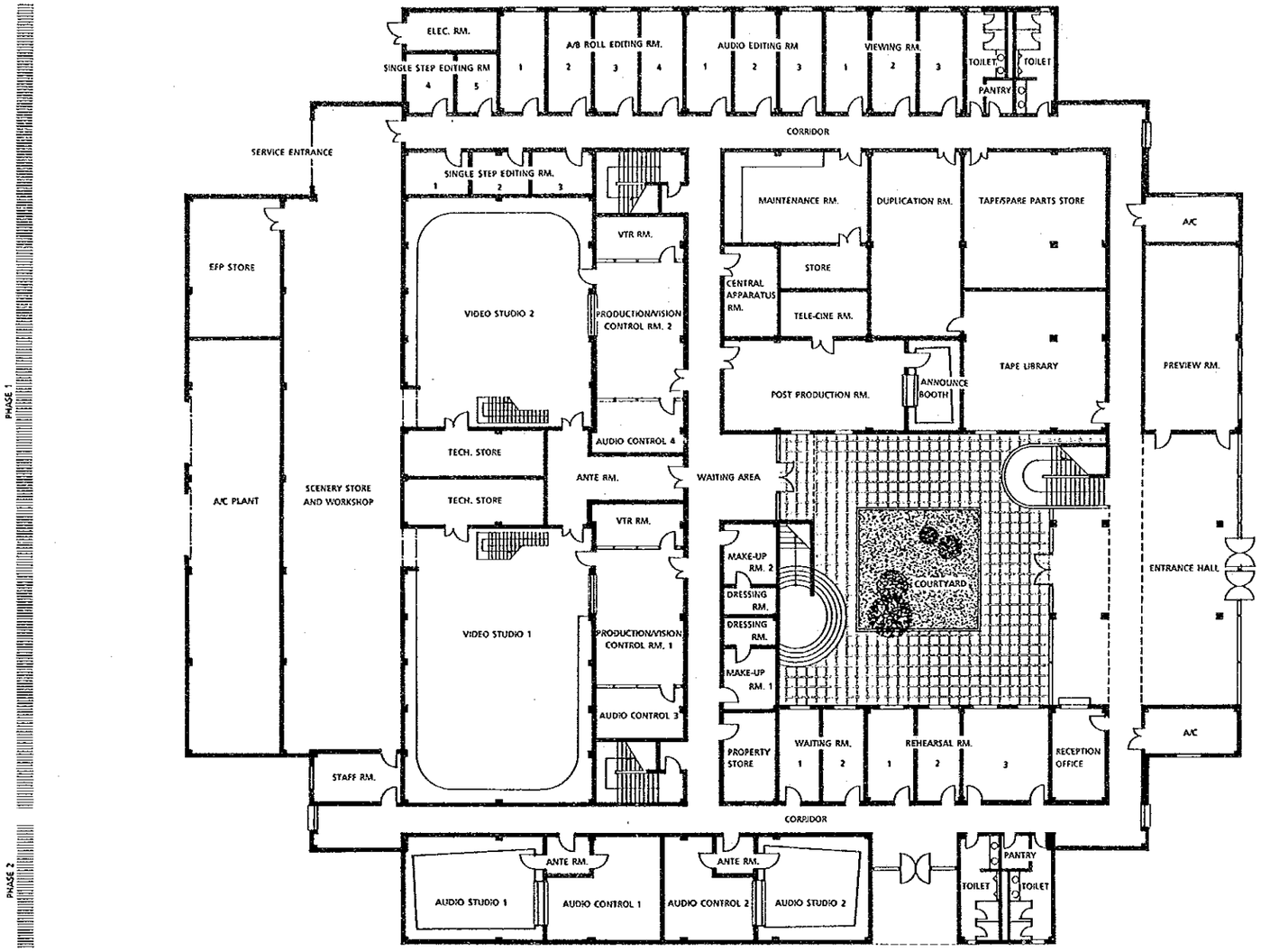
05 Elevation

06 Elevation



THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL MEDIA PRODUCTION FACILITIES OF INDIRA GANDHI NATIONAL OPEN UNIVERSITY IN INDIA

SITE PLAN



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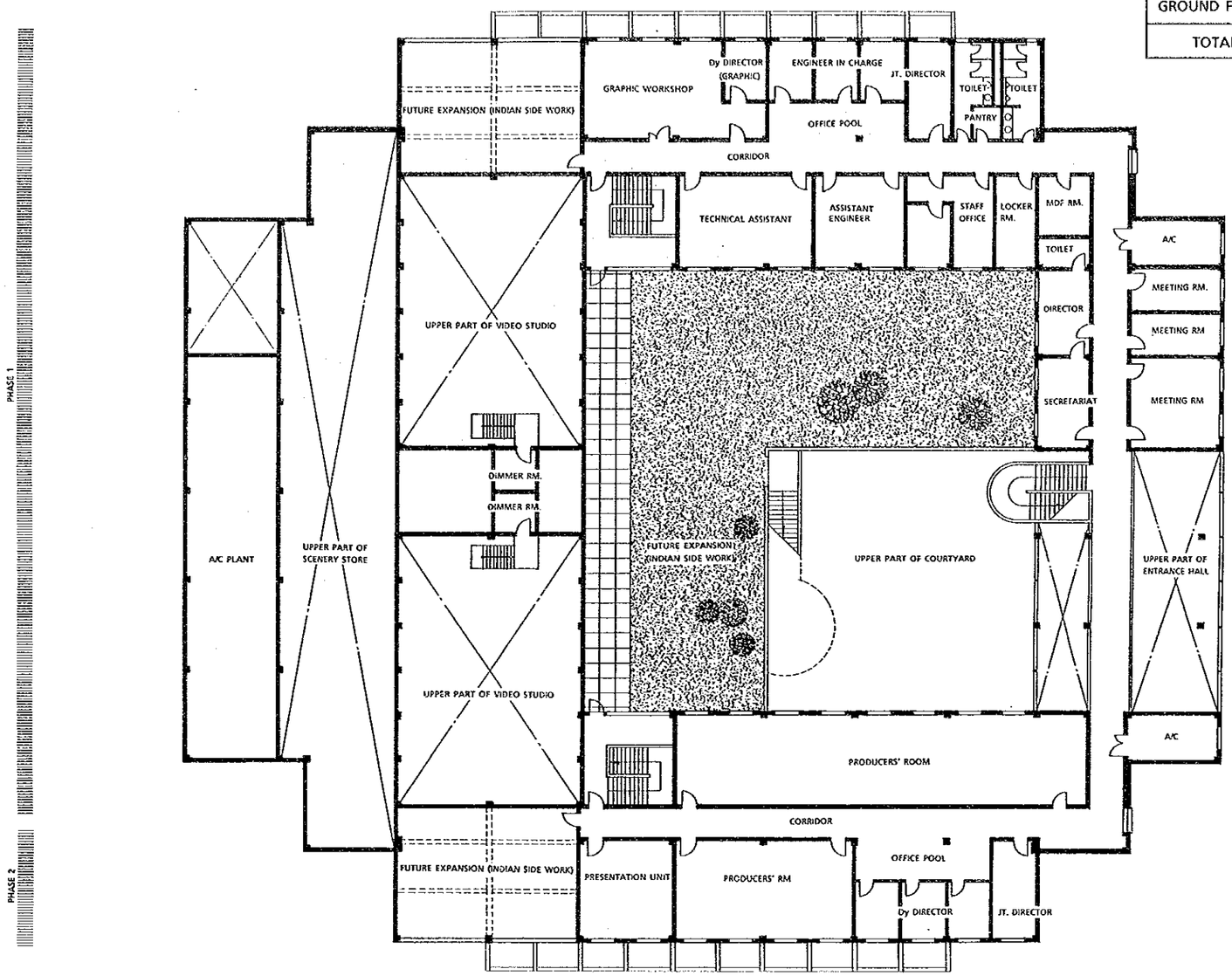
THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL MEDIA PRODUCTION FACILITIES OF INDIRA GANDHI NATIONAL OPEN UNIVERSITY IN INDIA

GROUND FLOOR PLAN

FLOOR AREA

	PHASE 1	PHASE 2	TOTAL
FIRST FLOOR	1,212 m²	288 m²	1,500 m²
GROUND FLOOR	2,892 m²	387 m²	3,279 m²
TOTAL	4,104 m²	675 m²	4,779 m²



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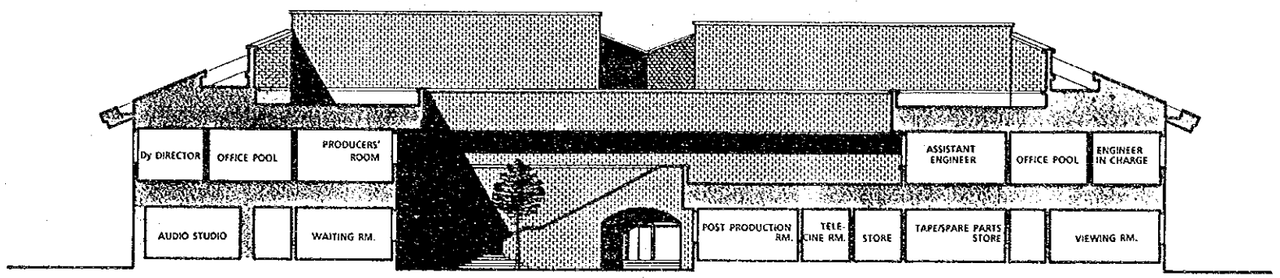
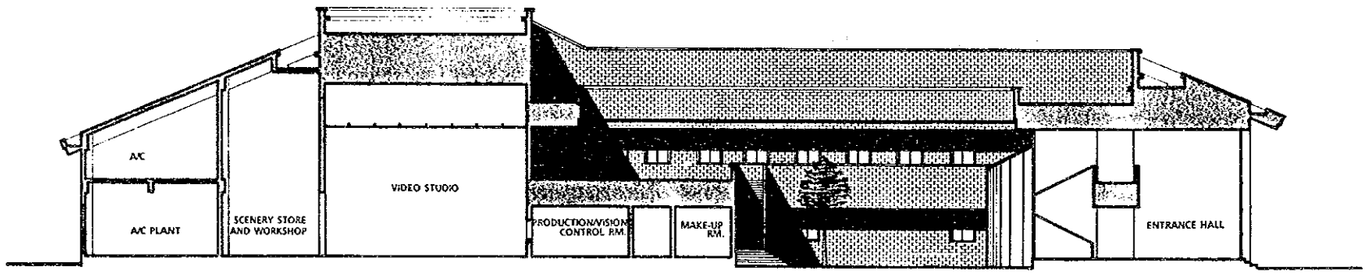
THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL MEDIA PRODUCTION FACILITIES OF INDIRA GANDHI NATIONAL OPEN UNIVERSITY IN INDIA

FIRST FLOOR PLAN



A – A SECTION



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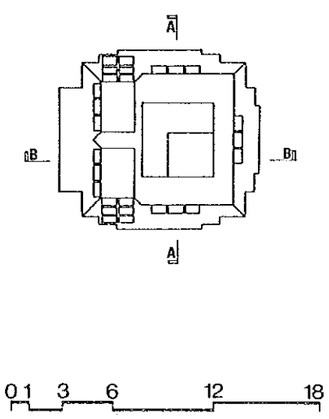
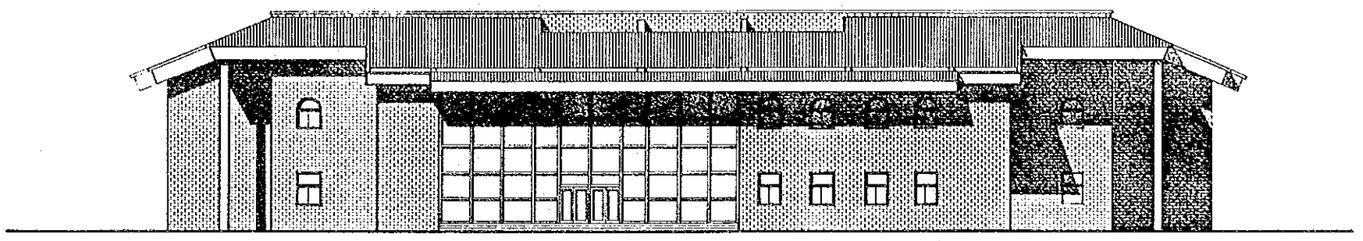
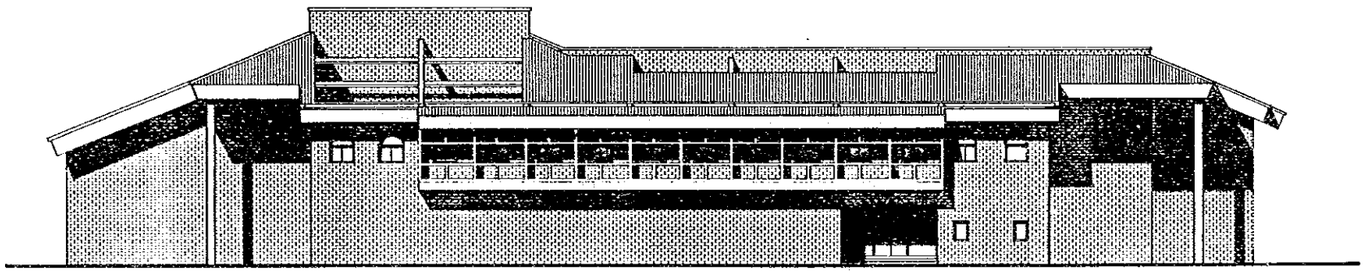


THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL MEDIA PRODUCTION FACILITIES OF INDIRA GANDHI NATIONAL OPEN UNIVERSITY IN INDIA

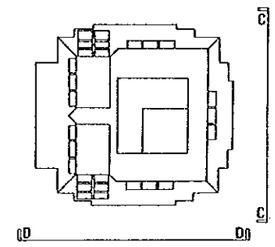
SECTION

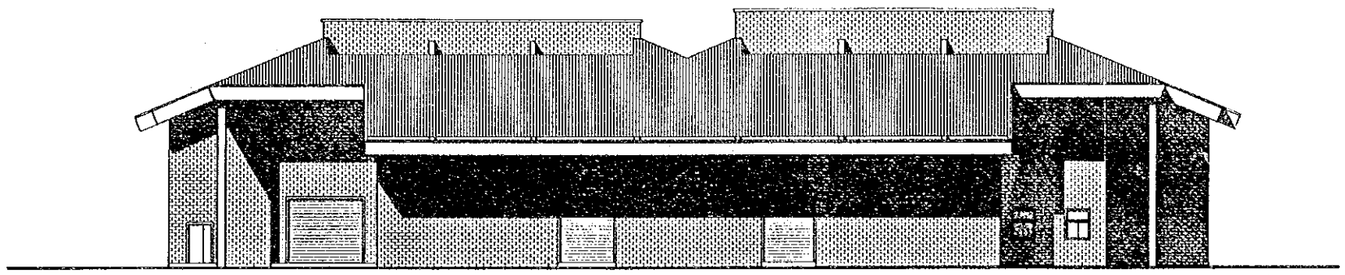


C – C ELEVATION

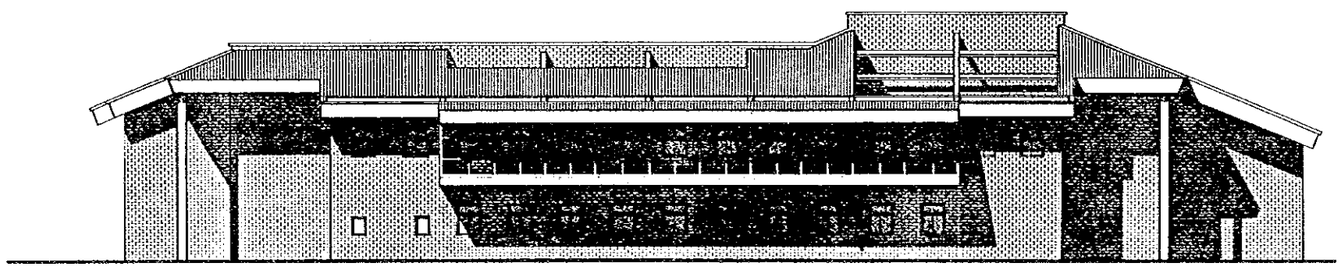


D – D ELEVATION

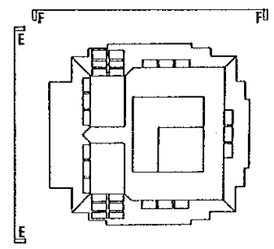




E – E ELEVATION



F – F ELEVATION



4-4 Implementation Plan

4-4-1 Implementation Policy

The proposed building of the project is a two storey reinforced concrete structure with an approximate total floor area of 4,800m^2. Though the scale of the building is not large, considerable time will be required for construction of acoustical parts and for coordination between building construction and equipment installation work. Thus, it is difficult to complete the building construction as well as the procurement and installation of the equipment in a period of 12 months. Therefore, this project will be implemented in two phases. As this project involves a wide variety of system equipment that needs to be installed during various stages of the construction, it is not advisable to separate the building construction phase from the equipment procurement and installation phase. Thus, the part of the building related to the production of video teaching programmes will be constructed and associated equipment will be procured and installed in Phase 1, while the part of the building section related to the production of audio teaching programmes will be constructed and associated equipment will be procured and installed in Phase 2. Regarding the existing equipment used in IGNOU, some items will be shifted into the proposed building in Phase 2 so as not to cause interruption of the IGNOU's production work.

4-4-2 Construction Management Plan

(1) Project implementing system

This project will be implemented within the framework of the grant aid assistance system of the Government of Japan. After the signing of the Exchange of Notes (E/N) by the Government of India and the Government of

Japan, and it is verified by the Government of Japan, grant aid assistance for the project will be commenced formally. The Indira Gandhi National Open University (IGNOU) will be the executing body for the consultant contract as well as for the construction contract under the project. Also, IGNOU will be responsible for executing Indian side work necessary for the project.

(2) Consultant for the project

Immediately after the signing of the E/N by the Governments of both countries, Indira Gandhi National Open University (IGNOU) will conclude a consultant contract concerning the detail design and supervision of the project with a Japanese consultant firm that participated in the basic design study, and the contract shall be verified by the Japanese Government. To implement the project smoothly, this consultant contract needs to be concluded immediately after the signing of the E/N. After the consultant contract is verified, the Japanese consultant firm prepares specifications and detailed working drawings based on discussions with IGNOU. Upon IGNOU's approval of these documents, the consultant firm will succeedingly assist IGNOU in tender procedures and execute the supervision work.

(3) Building contractor and equipment contractor

Most equipment procured and installed under the project needs specialized installation work and must be installed during various stages of the construction work. Particularly, the audio studios and video studios as well as the control rooms need to be carefully constructed in close coordination with the building contractor and the equipment contractor to ensure the designed acoustic performance. Should trouble occur after the building is completed, it would be difficult to judge if the trouble has

been caused by the construction work or the equipment work in the situation where work is done by two different companies. Thus, it is advisable in the execution of the project that the building contractor and the equipment contractor form a consortium which is jointly responsible for the work. Therefore, tender will be invited from consortiams of qualified Japanese building contractors which execute the building construction and qualified Japanese corporations which execute the procurement and installation of the equipment to select the contractor of the project.

4-4-3 Current State of Building Industry in India and Important Points to Note in Construction

(1) Current state of building industry in India

1) Local consultant

Around Delhi, there are architects who have published excellent creations and building consultant organizations, most of which are small-scale organizations with individual architects as the leader. Depending on the scale of the project, these organizations hire structural engineers, electrical engineers, mechanical engineers etc. to form a group necessary for proceeding with the design work. By contrast, since the detail design of this project will be implemented under the framework of a grant aid assistance from the Government of Japan, it must be completed in a limited period of time. Furthermore, as this project is a production facility for A/V teaching programmes, close coordination in Japan is necessary between the building design side and the equipment side. Thus, it is difficult to commission Indian consultants to participate in the detail design of the project.

2) Local contractors

Indian construction companies are rated in the ranking list by CPWD (Central Public Works Department) and are given the ceiling on the project amount they can tender according to their rating. Regarding grade 1, there are more than 300 registered firms all over the country which have no ceiling on the project amount, but few of them run a modern management. While supervisors in these firms are familiar to the design and quality of construction, the future problem lies in improvement of workmen's productivity, speed of construction, mechanization of the construction method etc. However, as the construction work in India must be executed by registered firms, Japanese corporation is required to make subcontracts with local contractors for the execution of the project.

3) Construction materials

India restricts the import of materials that are locally made, and thus the construction materials used for the project are Indian-made in principle. However, as the building of this project is for A/V programme production by means of sophisticated audio-visual equipment, it is difficult to construct the building having the required functions using Indian-made construction materials alone. Thus, it is necessary to consider the import of soundproof doors in the studios, automatic voltage regulator to adjust the voltage fluctuations etc. Custom duties for the import of these items shall be borne by IGNOU.

4) Building permit formalities

This project will be implemented as a part of the IGNOU campus master plan. The campus master plan has been made by Sharat Das and

Associates, an Indian firm, which has already obtained the following permits:

1. A conceptual approval of the master plan (DUAC: Delhi Urban Art Commission)

   The master plan was reviewed in terms of zoning approach, urban form, development form etc. which are specified by the Delhi Development Board.

2. Conceptual approval on development works (MCD: Municipal Corporation of Delhi)

   The campus roads, bridges, street lights, water supply, drainage, substations etc. drawn in the master plan were reviewed whether they comply with the Building Byelaw of Delhi.

As the next step, conceptual and formal permits for individual buildings must be obtained. Regarding buildings in the housing area (phase 1), the DUAC has issued the conceptual approval on August 24, 1992, and, at the time of the Basic Design Study survey of this project, MCD is reviewing it for formal permit.

An application will be submitted to DUAC for a conceptual approval on buildings in the academic area including the building of this project as soon as the basic design of this project is completed. It will take about one month to obtain the approval. After the conceptual approval is issued by DUAC, an application supported by detailed working drawings of individual buildings must be submitted to MCD for formal permit. Regarding the proposed building, after the Japanese consultant firm submits the necessary drawings for a formal permit to IGNOU, acting on behalf of IGNOU, Sharat Das and Associates will be responsible for obtaining the formal permit. Once the application is

filed, it normally takes three months to obtain the formal permit. In order to shorten entire process of the project, it is planned to proceed the application procedure and the tender procedure simultaneously.

(2) Points to note in construction

1) Works to be undertaken by the Indian side

Before the start of the construction work by the Japanese side, the following works are required to be completed at the project site by the Indian side:

- Land leveling and clearing, felling of trees, removal of obstructions such as stones exposed above the ground.
- Preparation of access roads to the project site
- Installation of temporary utility lines such as power supply, water supply, drainage and telephone line up to the boundary line of the project site.

(Note: The project site is defined as a 150m square block which is shown in the Minutes of Discussions of the Basic Design Study attached in ANNEX-1)

2) Works to be undertaken by the Japanese side

Following points shall be noted in the work.

- In consideration of time for supply under the local condition, procured materials should be ordered sufficiently in advance.
- Japanese contractor shall give proper instructions to the local workmen in detail and sufficient time shall be spent for complicated and sophisticated part of the work to ensure satisfactory quality of the building. Therefore, sufficient construction time shall be secured.

- During the course of the construction, it is necessary to keep close coordination between the building construction and equipment installation.

4-4-4 Construction Supervision Plan

Based on the framework of the grant aid assistance system of the Japanese Government, the Japanese consultant firm will be responsible for the detail design and supervision of the construction work in accordance with the consultant contract concluded between the competent authority of the Government of India and the consultant firm. The objective of the construction supervision is to ensure the quality of the building by means of giving instruction and suggestion as well as coordination from the neutral standpoint so as to assure the construction is being executed in compliance with the design documents. Major supervision services are as follows:

(1) Assistance to tendering and construction contract

The Japanese consultant firm shall prepare all the tender documents necessary for the selection of the Japanese consortium which will take charge of the building construction as well as the procurement and installation of the equipment. The consultant firm will perform tender formalities, which include announcement of tender, acceptance of applications, prequalification, distribution of the tender documents, acceptance of tenderers' documents, and evaluation of tender results. The firm shall also advise to the executing agency of the Government of India on concluding the contract.