

### 4-3-3 Nursery Plan

#### A. Outline of Nursery Training

Hmawbi, the site for this training center, is located in the plains at the southwestern end of the Pegu Mountains. The average annual rainfall for the 20 years up to 1980 was 2,587mm. The total rainfall during the rainy season from May to October is about 2,500mm, which accounts for about 97% of the total annual rainfall in this area. Generally, seedlings are planted in the plantation forest in June and July when it rains. So it is necessary to sow and grow seeds of each species in anticipation of the best timing for delivery to the plantation forest. The period of nursery practice is 1 year for teak and 3 to 4 months for other species. Teak seeds are sown in the stump nursery beds and in the dry season the seedlings are grown by the application of sprinkled water. There is no need to control sunshine. Seeds of species other than teak are sown in the germination boxes and the sprouts are transplanted to plastic pots and irrigated by water sprinklers. When they are in sprout stage, the sunshine control will be required.

Plant species to be used in the training courses offered at this center are shown in the table below.

Table 4-4 Species to Be Used in Training Courses

Objective	Species (Burmese Name)	Botanical Name
Commercial Wood	Teak Pyinkado Padauk	<i>Tectona grandis</i> <i>Xylia dolabriformis</i> <i>Pterocarpus macrocarpus</i>
Village Supply Wood	Mezali Sit Bawzakaing Sha Paukpanpyu	<i>Cassia siamea</i> <i>Albizzia procera</i> <i>Leucaena leucocephala</i> <i>Acacia catechu</i> <i>Sesbania grandiflora</i>
Industrial Wood	Eucalypt Eucalypt Htinshu Yamane	<i>Eucalyptus camaldulensis</i> <i>E. grandis</i> <i>Pinus khasya</i> <i>Gmelina arborea</i>

To the above, some species such as *acacia mangium*, *acacia auriculiformis* and so on will be used in training courses, those species are useful as industrial wood or fuelwood.

#### B. The Site Condition for Nursery

The site for the nursery is a rectangular piece of land 260m long east to west and 34m long south to north. The site is located on the south side of the inner road connecting the Rangoon-Prome Road and the Hmawbi Seed and Seedling Center. The site is flat and slopes gently toward southwest with a gradient of  $-1^\circ$ .

Currently seedlings of trees to be planted along the streets (*Polyathia longifolia*, *Mimusops elengi*, *Mesua ferrea*) and fruit trees (*Psidium guajava*) are grown on the site and sesame are also planted. The site never floods and is well drained. Soil of the site is Acrisols.

#### C. Composition of Nursery and Layout Plan

In the light of the purposes and contents of the nursery practice, the seedling exhibition program and development of nursery practice technic, it was decided to prepare nursery bed for potted seedlings with an area of 1,221m<sup>2</sup> and nursery beds for stump seedlings with an area of 625m<sup>2</sup>, in addition to a necessary supplementary lot, a reserve lot and the farm roads.

Table 4-5 Composition of Nursery

Item	Area	Note
Nursery for Potted Seedling	1,221m <sup>2</sup>	w / space between beds
Nursery for Stump Seedling	625m <sup>2</sup>	w / space between beds
Site for Attached Facilities	1,443m <sup>2</sup>	
Reserve Lot	886m <sup>2</sup>	
Farm Road	1,914m <sup>2</sup>	
Total	6,089m <sup>2</sup>	

The nursery will be located adjacent to the workshop building and divided into several fields by farm roads, which will ensure efficient training procedures.

#### D. Outline of Nursery and Attached Facilities

##### (1) Nursery Beds for Potted Seedlings (1,221m<sup>2</sup>)

The nursery beds for potted seedlings will be located in a rectangular piece of land 43m long east to west and 28.4m long south to north. Each bed will measure 1.2m in width, 9.5m in length and 10 cm in height. Each will gently slope in order to drain rainwater. The space between the beds will have a width of 0.8m. Each bed will lie east to west to avoid direct sun-scorch. There will be 4 beds lying east to west and 10 beds south to north, 40 in total.

Each bed will be hardened to a depth of about 30cm, upon which bricks will be laid surrounding by a concrete frame. The entire bed will be covered with a VC sheet with a thickness of 0.4mm. Further, a 10cm high wooden frame will be elected over the bed to support the vertical seedlings.

Fixed-position sprinklers will be installed inside the field. The entire field will be divided into four blocks and sprinkling will be done separately in each block or simultaneously in all four blocks. Draining will be done through drain ditches dug along the roads. Black cheesecloth with a shading rate of 51% will be used to control sunlight.

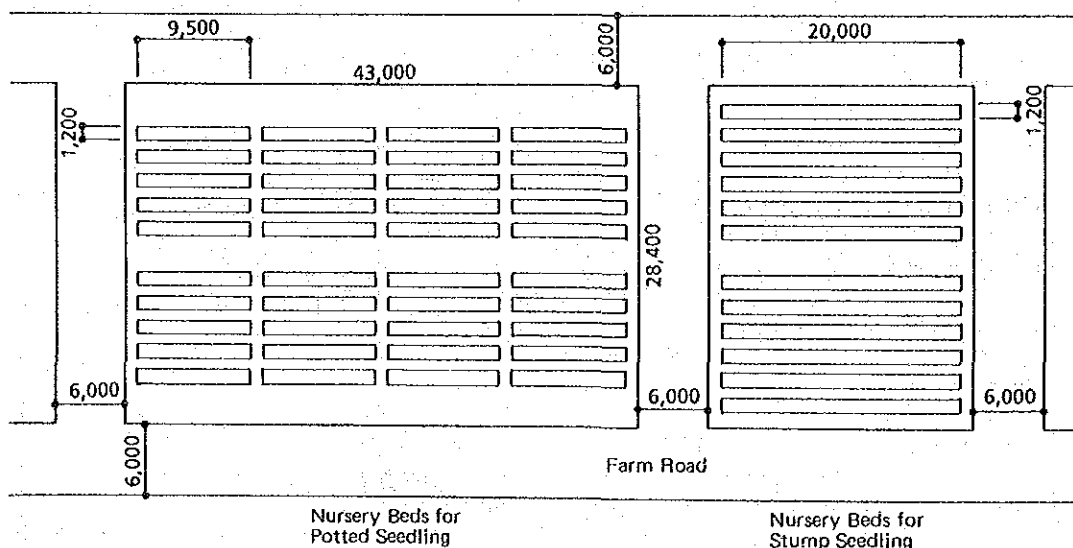


Fig. 4-7 Outline of the Pot Nursery Beds

(2) Nursery Beds for Stump Seedlings (625m<sup>2</sup>)

Teak seedlings will be raised mainly in the nursery beds for stump seedlings located in a rectangular piece of land, 22m long east to west and 28.4m long south to north. The beds run parallel to the nursery beds for potted seedlings which lie across the other side of the road.

The site for the nursery beds for stump seedlings will be cultivated and manured, and then the beds, each of which will measure 1.2m in width, 20m in length and 20cm in height, will be prepared. The space between the beds will be 0.8m wide. Although up to 12 beds can be prepared, only six beds will be prepared initially. Fallow land will be used for the additional six beds.

The whole field will be divided into 2 blocks and sprinkling will be done separately in each of the two blocks or simultaneously in both blocks; in this field hand-carry sprinklers will be used. It is unnecessary to shade sunlight in this field.

(3) Attached Facilities (site area: 1,443m<sup>2</sup>)

The following facilities necessary for raising seedlings will be built near the nursery.

- |  |                  |                              |
|--|------------------|------------------------------|
| 1. Tube well                                     | 1                | (50m in depth)               |
| 2. Elevated water tank                           | 1                |                              |
| 3. Reservoir Pond                                | 50m <sup>3</sup> |                              |
| 4. Pump house (to house the pump for sprinkling) |                  |                              |
|  |                  | 3.5m x 4m = 14m <sup>2</sup> |
| 5. Germination shed                              |                  | 8m x 10m = 80m <sup>2</sup>  |
| 6. Glasshouse                                    |                  | 8m x 10m = 80m <sup>2</sup>  |
| 7. Potting shed                                  |                  | 8m x 17m = 136m <sup>2</sup> |
| 8. Compost shed                                  |                  | 8m x 4m = 32m <sup>2</sup>   |
| 9. Nursery warehouse                             |                  | 6m x 26m = 156m <sup>2</sup> |

A constant temperature unit (21°C to 17°C) and a refrigerator will be installed in the workshop to store seeds.

#### (4) Farm Roads

In designing, road-traffic safety procedures for tractors, equipment transport tractors, water tanks and other vehicles should be the primary consideration. The farm road bed's width will be 6m and the road's width will be 4m. There will be ditches on both sides of all roads. The road level will be raised with soil excavated from the ditches. Road paving materials will be mainly crushed iron-stones which are readily obtainable in Burma. Part of the crossings will have cut-off corners to ensure smoother traffic flow.

#### E. Maximum Quantity of Irrigation Water

Table 4-6 shows the monthly weather and the soil water balance data prepared by the Hmawbi Seed and Seedling Center located adjacent to the site of this training center.

According to these data, there is a maximum monthly potential quantity of evaporation in April (213mm/month), and from this a maximum daily potential quantity of evaporation of 7.1mm/day (213mm/30days) is obtained. The maximum quantity of irrigation water required can be calculated on the assumption that this evaporated quantity of water can be supplied by sprinkling.

Table 4-6 Simple Monthly Soil Water Balance

Month	Rain (mm)	Rainy Day	Potential Evapotranspiration (mm/month)	Actual Evapotranspiration	Soil Water		
					Storage	Deficit	Surplus
Jan	7	1	109	7	0	102	0
Feb	5	0	134	5	0	129	0
Mar	9	0	189	9	0	180	0
Apr	18	1	213	18	0	195	0
May	305	13	149	149	100	0	56
Jun	490	24	93	93	100	0	397
Jul	578	22	84	84	100	0	494
Aug	591	24	84	84	100	0	507
Sep	348	17	87	87	100	0	261
Oct	192	9	96	96	100	0	96
Nov	33	3	87	87	46	0	0
Dec	11	1	84	57	0	27	0

source: FD

(1) Sprinkling Area

When the total area for nursery beds for potted seedlings is divided into four blocks, the area of each block is:

$$11.2\text{m} \times 21.5\text{m} = 240.8\text{m}^2 \quad 240.8\text{m}^2 \times 4 = 963.2\text{m}^2$$

When the total area for nursery beds for stump seedlings is divided into two blocks, the area of each block is:

$$13\text{m} \times 22\text{m} = 286\text{m}^2 \quad 286\text{m}^2 \times 2 = 572\text{m}^2$$

Thus the total sprinkling area is:

$$963.2\text{m}^2 + 572\text{m}^2 = 1,535.2\text{m}^2$$

(2) Condition for Calculation of Irrigation Water Required

1. Consumption of Water ..... 7.1mm/day
2. Interval of Watering ..... everyday
3. Efficiency of Watering ..... 85%
4. Watering hour per day ..... 45min.

(3) Calculation of Quantity of Water Required for Sprinkling

nursery beds for potted seedlings

$$Q_p = 166.7 \times (0.09632 \times 7.1 \times 0.85) / 0.75 = 178.8 \text{ } \ell/\text{min}$$

nursery beds for stump seedlings

$$Q_p = 166.7 \times (0.572 \times 7.1 \times 0.85) / 0.75 = 106.2 \text{ } \ell/\text{min}$$

Assuming that sprinkling will be done simultaneously for all the nursery beds, the total quantity of irrigation water required per minutes is:

$$Q = 178.8 \ell/\text{min.} + 106.2 \ell/\text{min.} = 285 \ell/\text{min.}$$

Thus the maximum quantity of water required per day is:

$$285 \ell/\text{min} \times 45 \text{ min/day} = 12,825 \ell/\text{day}$$

(4) Reservoir Capacity

Since the reservoir operates to maintain the maximum quantity of irrigation water for two days of sprinkling, its capacity should be  $26\text{m}^3$  ( $12,825 \ell = 13\text{m}^3$ ,  $13\text{m}^3 \times 2 = 26\text{m}^3$ ). In consideration of the need to water trees and lawns as well, its capacity should be  $50\text{m}^3$ .

F. Water Supply Source

The water to be stored in the reservoir will be supplied from a tube well to be dug at the northwestern end of the site for the nursery. The water will be conveyed through a pressure pump and sprinklers. There are four tube wells in the Hmawbi Seed and Seedling Center which is adjacent to the site for this training center. Each of these wells is 10.16cm in diameter and 46m in depth, and each supplies a sufficient quantity of water. The

pH test of the water pumped up from these wells revealed a pH value of 6.4.

## G. Sprinkler

### (1) Sprinkler System

1. Sprinkling in the nursery beds for potted seedlings will be done either separately in each block or simultaneously in all four blocks with fixed-position sprinklers. Each of the sprinklers will automatically stop sprinkling when the predetermined volume of water flow has been reached.

2. Sprinkling in the nursery beds for stump seedlings will be done either separately in each of the blocks or simultaneously in both blocks with hand-carry sprinklers.

### (2) Calculation of Quantity of Water used for Sprinkling

#### 1. Nursery beds for potted seedlings

In consideration of the need to sprinkle separately in each block, 6 sprinklers will be installed in each block. Quantity of water required by each sprinkler is:

$$q = 178.8\ell/\text{min} \div (6 \times 4) = 7.45\ell/\text{min}$$

#### 2. Nursery beds for stump seedlings

Since hose sets and other devices will be movable, a total of 3 sprinklers can be installed in a line at intervals of 10.5m. Two lines of 3 sprinklers will be installed in 1 block.

Thus, the quantity of water required for each sprinkler is:

$$q = 106.2\ell/\text{min} \div (3 \times 2 \times 2) = 8.85\ell/\text{min}$$

### (3) Sprinkler

	Nursery beds for Potted Seedling	Nursery beds for stump Seedling
Nozzle Diameter	2.8mmØ	3.0mmØ
Pressure	2.0kg/cm <sup>2</sup>	2.0kg/cm <sup>2</sup>
Water Quantity	7.5ℓ.min	8.5ℓ/min
Sprinkling Area	max. 20m	max. 21m



The diameter of sprinkled area will be adjustable.

#### (4) Sprinkler Tube

Since a removable coupler will be mounted on the lower part of the sprinkler tube, the upper portion (which includes the sprinkler head and the two-legged spike) can be removed when it is unnecessary and also during rainy season.

#### (5) Sprinkling Force

##### 1. Nursery beds for potted seedlings

$$q = (7.5\ell/\text{min} \times 6\text{nos} \times 60\text{min}) \div 240.8\text{m}^2 = 11.2\text{mm}/\text{hour}$$

##### 2. Nursery beds for stump seedlings

$$q = (8.5\ell/\text{min} \times 3\text{nos} \times 2 \times 60\text{min}) \div 286\text{m}^2 = 10.7\text{mm}/\text{hour}$$

#### (6) Sprinkling Time

##### 1. Nursery beds for potted seedlings

$$T = (7.1 \div 0.85\text{mm}/\text{day}) \div (11.2\text{mm}/\text{hour}) = 0.74\text{hour}/\text{day}$$

Accordingly, the sprinkling time required will be 45 minutes per day (22.5 minutes each in the morning and in the evening).

##### 2. Nursery beds for stump seedlings

$$T = (7.1 \div 85\text{mm}/\text{day}) \div 10.7\text{mm}/\text{hour} = 0.78\text{hour}/\text{day}$$

Accordingly, the sprinkling time required will be 47 minutes per day (23.5 minutes each in the morning and in the evening).

#### (7) Calculation of Pump's Capacity

The total quantity of water sprinkled is:

$$q = 7.5\ell/\text{min} \times 6 \times 4 + 8.5\ell/\text{min} \times 3 \times 4 = 282\ell/\text{min}$$

Discharge pressure	20m
Initial lift	1.5m

Intake lift	2.5m
Plumbing loss	1.0m
total	25m

If a 10% allowance is added to this, the total lift is:

$$25 \times 1.1 = 28 \text{m}$$

Accordingly,

$$\text{Pump shaft power is: } L = (0.162 \times 1.0 \times 0.282 \times 28) / 0.55 = 2.34 \text{kW}$$

$$\text{Motor power is: } L = (2.34 \times 1.25) / 1.0 = 2.9 \text{kW}$$

#### H. Sunshade

Black cheesecloth with a shading rate of 51% will be used to shade the nursery beds for potted seedlings from the sun.

The size of black cheesecloth will be 10.5m x 11.7m. A total of 8 sheets will be required to cover up the entire bed. The sunshades will be connected to each other at the height of 2.25m. The main pole will be fixed with a wire rope and a stake. Wire ropes will be passed over horizontal poles and then tightened by the wire tightening equipment. And these wire ropes will be used to put the cheesecloth in place. When it rains, large drops of rain from above the sunshade may damage seedlings. So on such occasion the sunshade should be opened. When training in nursery practice is not conducted, the black cheesecloth can be removed and housed in the warehouse.

#### 4-3-4 Forestry Training Equipment Plan

As to the forestry training at this center utmost emphasis will be placed on field and laboratory training, not on lecture-type training. The Burmese side believes that in this way, training efficiency will be enhanced and the contents of training programs will be drastically improved, which in turn will promote the nation's efforts to develop necessary human resources. This is evidenced by the training curriculum presented by the Forest Department. Of the cumulative total annual training time of 4,408 hours, 2,251 hours, or about 60%, are for field and laboratory training, study tours and audiovisual-aided lectures. The equipment to be installed in this center are aimed at meeting this objective.

The requirements of the Forest Department on the equipment can be summarized as follows.

1. Equipment and machinery necessary for improving audiovisual education and producing training materials.
2. Equipment and machinery necessary for improving practical training, namely field and laboratory training and study tours.
3. Equipment and machinery necessary for publicizing the significance of modern forestry technologies to the general public.

The equipment plan should basically comply with above objective and requirements. In selecting the equipment and machinery required and in determining the quantities to be supplied, the purposes of the training courses and the local situation should be the primary considerations, based on which the following specific requirements should be considered.

1. Simple, durable and easy to maintain.
2. Conducive to reduction in running costs.
3. Optimum number of equipment to attain the training goals.
4. Only those which are suited for basic experimental training in biology and chemistry should be selected. Equipment and instruments which

require advanced technical knowledge on the part of trainees in handling and operating should not be selected.

5. Equipment and machinery for forest roads should be those suited for use in construction of forest roads less than 4m wide.
6. Equipment and machinery for use in the workshop should be mainly those necessary for maintenance of vehicle machinery.

The equipment, machines and instruments selected in accordance with the above criteria are as shown below.

## List of Training Equipment

### 1. Laboratory Equipment

No.	Item	Q'ty (Pcs./Nos.)
1.	Germinator (adjustable temperature accuracy: $\pm 0.1^{\circ}\text{C} \sim 0.2^{\circ}\text{C}$ )	3
2.	Vacuum Pump (rotary wing type, 2-stage)	1
3.	Laboratory Washer (washable capacity: approx. 1,280pcs / test tube)	2
4.	Autoclave (normal pressure: $1.2\text{kgcm}^2\text{G}$ ; temperature: $121^{\circ}\text{C}$ adjustable range: $105 \sim 123^{\circ}\text{C}$ )	2
5.	Biological Microscope (eyepiece lens: 10, 15 $\times$ , objective lens: 4, 10, 40 $\times$ )	13
6.	Stereoscopic Microscope (zoom type, total magnification: 8 ~ 60 $\times$ , eyepiece lens : 10, 15 $\times$ , object lens: 0.8 ~ 4 $\times$ )	13
7.	Refrigerator (freezer 120 $\ell$ +refrigerator 300 $\ell$ )	2
8.	Chemical Balance (digital indication type)	2
9.	Fume Hood (interior finishing: chemical resistance and heat-proof made)	1
10.	Water Distiller (capacity: 1.5 $\ell$ /h)	2
11.	Vacuum Packing Machine (seal width: 10mm, seal length: 130mm)	1
12.	Kjeldahl Digester (including micro-kjeldahl N2 distiller-device and micro-kjeldahl digester)	1
13.	Hot Plate heater (temperature: $50 \sim 250^{\circ}\text{C}$ , plate size: 300 $\times$ 250mm)	14
14.	Dry type Sterilizer (internal dimension: W600 $\times$ D500 $\times$ H500mm, max. temperature: $200^{\circ}\text{C}$ )	1
15.	Top loading Balance (capacity: 100g)	14
16.	Cold room with Shelves (adjustable range: $0 \sim 60^{\circ}\text{C}$ )	1
17.	Specimen Stock Drawer	1
18.	Laboratory center table (L3,600 $\times$ W900 $\times$ H800mm)	14

No.	Item	Q'ty (Pcs./Nos.)
19.	Laboratory side table (L1,800×W750×H800(950)mm)	20
20.	Laboratory Cabinet (steel made)	10
21.	Work table (L1,800×W900×H750mm)	8
22.	Sink (L1,800×W750×H750)	4
23.	Biological Microscope with Camera (eyepiece lens:10×, object lens:4,10,20,40,100×)	1
24.	Centrifuge (max.centrifugal force:2,000×G, capacity:15ml×6pcs.)	1
25.	Constant Temperature Water Chamber (temperature range:15°C~70°C, capacity:18ℓ)	4
26.	Plants cultivation test device (internal dimension: L600×W630×H800mm, temperature control range:10~ 35°C±0.5°C, humidity control range:55~80%±5%)	1
27.	Clean bench (dimension:L1,440×W780×H2,190mm)	1
28.	PH Meter (analog indication type, glass electrode type)	8
29.	Instructor's table (L2,400×W900×H850mm)	2
30.	Glassware (test tube, pipette, flask, beaker, etc.)	1 Set
31.	Dissector Set (10pcs./set)	32 Sets
32.	Insect Collecting Implements (insect net, insect killing jar, insect killing tube, soil sampling trowel set)	20 Sets
33.	Plant Collecting Implements (plant press holder, transplant trowel, root trowel, pruning shears, branch shears, vacuum)	20 Sets
34.	Cinerator, Loop (internal sterilization temperature: 800~850°C, external dimension:L95×W170×H200mm)	1 Set
35.	Razor Blade	100 Packs
36.	Rotary Type Microtome (thickness:1~40 micron)	1 Set

## 2. Nursery Equipment

No.	Item	Q'ty (Nos./Nos.)
1.	Wheel Tractor (4-wheel drive, 60PS/2,500rpm)	1
2.	Trailer (capacity:3tons)	1
3.	Disc Plough (capacity:48 ~ 57a/hr)	1
4.	Disc harrow (capacity:75 ~ 100a/hr)	1
5.	Trencher (working width:12, 15, 14 ~ 42cm, working depth:80 ~ 130cm)	1
6.	Hand tractor (working width:850mm, 9 ~ 23 a/hr, 7PS/2,000rpm)	1
7.	Soil Crusher (blender type)	1
8.	Soil Siever (0.5 ~ 2PS / 600 ~ 700rpm)	1
9.	Concrete Mixer with Engine (working capacity:0.1 ~ 0.15m <sup>3</sup> )	1
10.	Engine Sprayer (10ℓ/min)	2
11.	Hand Sprayer (4.5ℓ)	15
12.	Pot Making Machine (film width:150 ~ 350mm)	1
13.	Roller Conveyer (L5,000×W400)	1
14.	Roller Conveyer (L5,000×W400)	1
15.	Conditioning Chamber (capacity:11m <sup>3</sup> , 0~20°C, accuracy: ±2°C)	1
16.	Plastic Germination Box (polystyrene made)	60
17.	Belt Conveyer (L5,000×W350)	2
18.	Refrigerator (235ℓ)	1
19.	Plant Cutter with Engine	1
20.	Wheelbarrow	3
21.	Shovel (round shaped, with helve)	60
22.	Hoe (overall length:360mm)	60
23.	Watering Pot (plastic made, capacity:6ℓ)	10
24.	Rake (12-claws)	60

### 3. Silviculture Equipment

No.	Item	Q'ty (Pcs./Nos.)
1.	Chain Saw (with 24" bar chain)	20
2.	Bush Cutter (10" round saw)	30
3.	Earth Auger (with engine drill)	10
4.	Tree Pruning Machine (3-drill, 5.5m)	1
5.	Tractor (main body:4,120×1,650×2,025mm, 26PS/3,000rpm)	1
6.	Pruning Tool set (pruning shears, saw set)	30 Sets
7.	Pruning Ladder (6m)	10
8.	Thinning Tool set (hatchet:21cm, saw:24cm)	30 Sets
9.	Pot Carrying Case (polypropylene made)	100
10.	Tree Climbers (step, safety belt, step hanger set)	10 Sets
11.	Measuring Rope for Planting Distance (measuring rope, 100m)	5
12.	Carrying Sheets for nursery trees (blue sheets 3.600×5.400)	10
13.	Setting Files (for saw chains, stick, round file, flat file)	100 Sets
14.	Turfor (capacity:750kg)	2
15.	Tent (for 4 persons)	13 Sets
16.	Tent (for 2 persons)	2 Sets
17.	Sickle (large:1.5m with handle, small:39cm with handle)	120
18.	Whetstone	30

### 4. Forest Fire Fighting Equipment

No.	Item	Q'ty (Pcs./Nos.)
1.	Collapsible Water Tank (capacity:2,000ℓ)	5
2.	Transceiver (FM 144MHz, 1.5W)	5



No.	Item	Q'ty (Pcs./Nos.)
3.	Tank Lorry (with 12mm hose, capacity:1,000ℓ)	1
4.	Engine Fire Pump (with hose and nozzle, 37HP)	2
5.	Hand Pump (18ℓ, with jet shooter)	35
6.	Fire fighting kit (5 items set, with bag)	35 Sets
7.	Search Light set (1KW, with engine generator)	3 Sets
8.	Siren	5
9.	Helmet	35
10.	Fire Suit	35
11.	Head Lamp (with rechargeable battery)	35

#### 5. Forest and Road Survey Equipment

No.	Item	Q'ty (Pcs./Nos.)
1.	Compass with tripod (12×,rollable type)	15 Sets
2.	Measuring Tape (100m)	20
3.	Measuring Tape (50m)	20
4.	Clinometer (metal made)	15
5.	Diameter Tape (5m, cloth made)	15
6.	Caliper (for measuring diameter:30cm)	15
7.	Relascope (L150×H120×W56mm)	1
8.	Hypsometer (blume-leiss, accuracy:max.±1%)	15
9.	Planimeter (indicator:liquid crystal, 8-figures)	15
10.	Stereoscope (table type reflection mirror type)	10
11.	Stereoscope (portable type, reflection mirror type)	10
12.	Transit Compass with tripod (telescope, length:170mm, 30×)	5 Sets

No.	Item	Q'ty (Pcs./Nos.)
13.	Hand level (length:200m, 5×)	15
14.	Drawing table (utility range:577×875mm)	30
15.	Drawing tool set (16 items set, compass, divider, etc)	30
16.	Vernier Calipers (0~200)	5
17.	Binocular (8~20×)	15
18.	Map Measurer	5
19.	Soil Moisture meter	1
20.	Hand Driving Sampler	10
21.	Sample Cans	50
22.	Portable Cone Petrometer (for measuring soil supports)	15
23.	Measuring Rod (6m)	30
24.	Ranging Rod (2m)	15
25.	Optical Square	2
26.	Curvimeter (double, 1/30,000, 1/50,000)	15
27.	Measuring Rod (box type, 5m, 3-steps literalreading)	10
28.	Plane board measuring Kit (plane board, tripod, alidade)	15 Sets
29.	Soil Sampling Cylinder	10
30.	Increment Borers (30cm)	10
31.	Lighting table (utility dimensions:1,171×828mm)	2
32.	T-square (acrylic-edge, 90cm)	5
33.	Level (aruminum made, 600mm)	5
34.	Direction Compass	20

## 6. Forest Road Construction Equipment

No.	Item	Q'ty (Pcs./Nos.)
1.	Angledozer (rated out-put:110PS/1,900rpm, blade:2,890×830mm)	1
2.	Tractor Shovel (rated out-put:74PS/2,400rpm, bucket capacity:1.5m <sup>3</sup> )	1
3.	Back hoe (rated out-put:52PS/2,400rpm, bucket capacity:0.25m <sup>3</sup> )	1
4.	Motor Grader (rated out-put:77PS/2,400rpm, blade width:2,800mm)	1
5.	Portable crusher (crush size:aprox. 12mm)	1
6.	Compressor (air discharge flow:3.7m <sup>3</sup> /min)	1
7.	Hand Drill (perforation capacity:10mm)	1
8.	Hand Breaker (stroke:900bpm)	1
9.	Belt Conveyer (L7×W0.35m)	1
10.	Vibrating Roller (rated out-put:25.5PS/2,500rpm)	1

## 7. Meteorological Observation Equipment

No.	Item	Q'ty (Pcs./Nos.)
1.	Aneroid Barometer (measuring range:690 ~ 790mmHg)	2
2.	Maximum & Minimum Thermometer (rutherford type)	2
3.	Polymeter (literal-reading, available to measure temperature, evaporative tension and dew point)	2
4.	Hygrometer (20% ~ 100%)	2
5.	Earth Thermometer (5cm, 10cm, 20cm)	4 Sets
6.	Thermo-hygrograph (measuring range:temp:-20 ~ +50°C, humidity:0 ~ 100%)	1
7.	Rain Gauge (dia:20cm, height:60cm)	2

No.	Item	Q'ty (Pcs./Nos.)
8.	Barograph (measuring range:940 ~ 1,045mb)	1
9.	Anemometer (combined wind vane and anemometer)	1
10.	Pluviograph (bucket remote type)	1
11.	Instrument Shelter (double-louver door, with legs)	1
12.	Sunshine Recorder (Jordan sunshine gauge, for 1 day)	1
13.	Thermometer set (8 items)	10 Sets
14.	Air meters (biram air meters, measuring range:0 ~ 15m/S)	1
15.	Thermometer (thermocouple type, measuring range:-30 ~ +1,250°C)	2 Sets

#### 8. Repairing Workshop Equipment

No.	Item	Q'ty (Pcs./Nos.)
1.	Hot Water Car Washer (discharge pressure:60kg f/cm <sup>2</sup> , capacity:780ℓ/h)	1
2.	Parts washing stand (capacity:14ℓ/min)	1
3.	Engine Cleaner	5
4.	Chassis Lubricator (discharge pressure:230kg/cm <sup>2</sup> , capacity:350g/min)	1
5.	Oil Lubricator (capacity:7 /min, discharge pressure:12kg/cm <sup>2</sup> )	1
6.	Oil Bucket Pump (capacity:40cc/stroke)	2
7.	grease Gun (capacity:500cc, max, pressure:250kg/cm <sup>2</sup> )	5
8.	Air Gun	5
9.	Drum Pump	2
10.	Drum Carrier (loading capacity:250kg)	1

No.	Item	Q'ty (Pes./Nos.)
11.	Oil Measure (capacity:4ℓ)	2
12.	Oiler (capacity:250cc)	5
13.	Funnel	5
14.	Garage Jack (1.5t×2, 5t×1, 10t×1)	1 Set
15.	Rigid Rack (1.5t×4,5t×2)	1 Set
16.	Hand Truck (loading capacity:30kg,L900×W600mm)	2
17.	Hydraulic Press (capacity:35t)	1
18.	Service Creeper	2
19.	Engine Tune-up tester (for 4, 6, 8 cylinders, engine tachometer:0 ~ 1,600/0 ~ 8,000rpm)	1 Set
20.	Timing Light (maximum revolutions:6,000rpm)	3
21.	Spark Plug Cleaner	3
22.	Circuit Tester (measuring range:direct current voltage:2/4/20/40V, alternating current voltage:250/500V, direct current:200mA, resistance:×1/10/100kΩ)	3
23.	Battery Quick Charger	1
24.	Battery Hydrometer Set	5 Sets
25.	Electric Soldering Iron	5
26.	Solderless Terminal Kit	5 Sets
27.	Booster Cable	5
28.	Battery Filler	5
29.	Funnel (polyethylene)	5
30.	Measure	5
31.	Bench Drill	1
32.	Drill set	2 Sets
33.	Bench Grinder with Eye shield	1
34.	Tool tray (Dimensions L450×W300×D120mm, L600×W450×D150mm, L900×W600×D150mm)	5 Sets

No.	Item	Q'ty (Pcs./Nos.)
35.	Wire Brush (310mm, 270mm)	20 Sets
36.	Engine Brush	20
37.	Work Bench (L1,780×W600×H750mm)	2
38.	Vise	3
39.	Compression Gauge for Gasoline Engine	1
40.	Compression Gauge for Diesel Engine	1
41.	Piston Ring Compressor	5
42.	Piston ring Tool	5 Sets
43.	Piston Feeler Gauge	5 Sets
44.	Press Gauge	5 Sets
45.	Diesel Nozzle Tester	2
46.	Radiator Cap Tester	2
47.	Red Check Set	10 Sets
48.	Cylinder Gauge	2
49.	Oil Pressure Gauge	2
50.	Hand Valve Lapper (20Ømm)	20
51.	Rubber Cap for Above	10 Sets
52.	Hand Valve Lapper (30Ømm)	20
53.	Rubber Cap for Above	10 Sets
54.	Hand Value Lapper (35Ømm)	20
55.	Rubber Cap for Above	10 Sets
56.	Valve Lifter (30 ~ 225mm)	5
57.	Sound Scope	5
58.	Chuck Gauge	5
59.	Tire Pressure Gauge	5
60.	Tire Service Tool Set	5 Sets
61.	Tube Vulcanizer Set	1 Sets

No.	Item	Q'ty (Pos./Nos.)
62.	Cold Patch Set	10 Sets
63.	Body Fender Tool Set	2 Sets
64.	Body Repair Tool Set	2 Sets
65.	Hack Saw Frame	10
66.	Hack Saw Blade	30
67.	Gas Cutting & Welding Tool Set	1 Set
68.	Cylinder Carrier	1
69.	Arc Welder	1
70.	Clamp (dimension:50×38mm, 100×250mm)	10 Sets
71.	Vice Grip Bending Tool (175mm, 230mm, 200mm)	10 Sets
72.	Air double Action Sander (revolution:10,000rpm)	2
73.	Sanding Pad (size:70×40mm, 75×60mm, 120×70mm)	50 Sets
74.	Metal Cutting Snip (for cutting left-direction, right-direction, straight-direction)	5 Sets
75.	Impact Driver Set ((-)bit(L)(S), (+)bit(L)(S) per 1 pc.)	5 Sets
76.	Paint Spray Gun (nozzle dia:1.3mm×2pcs, 1.5mm×3pcs.)	1 Set
77.	Spray Gun Container (capacity:1,000cc)	6
78.	Air Compressor (pressur:8~9.9kg/cm <sup>2</sup> , discharge capacity:430ℓ/min, air tank capacity:120ℓ)	1
79.	Air. Hose	20
80.	Hose Band	50
81.	Hose Joint Set	50 Sets
82.	Quick Hose Connector	20
83.	Air Transformer	1
84.	Outside Micrometer	2
85.	Vernier Caliper Set (0~150,0~200,0~300)	10 Sets
86.	Outside Caliper (200mm)	10

No.	Item	Q'ty (Pcs./Nos.)
87.	Inside Caliper (measuring range:200mm)	10
88.	Steel Rule (measuring range:600mm, 1,000mm)	10 Sets
89.	Standard Feeler Gauge (leaf length:65mm)	10
90.	Screw Pitch Gauge (pitch:0.25~2.50, 28pcs.)	10
91.	Dial Indicator (measuring range:0~10mm)	10
92.	Magnetic Base (overall height:233mm)	10
93.	Surface Plate (L900×W900×H125mm)	1
94.	V. Block (L100×H68×W40, L150×W90×H65mm)	10 Sets
95.	Straight Edge (L500×H40×W8mm)	10
96.	Square (150mm)	10
97.	Thermometer (scale:-20°C~200°C)	10
98.	Hand Spring Balance (capacity:2kg, 10kg)	10 Sets
99.	Tape Measure (measuring range:0~5, 0~20m)	30 Sets
100.	Torque Wrench (scale:50~560kgfcm, 100~920kgfcm, 200~1,300kgfcm, 500~2,800kgfcm, 100~450kgfcm, 200~900kgfcm, 400 ~1,800kgfcm, 400~2,800kgfcm, 600~4,200kg fc)	5 Sets
101.	Air Impact Wrench (bolt diameter:16mm)	1
102.	Electric Drill (Ø13mm, Ø6.5mm)	1
103.	Mechanic Set (for large sized:100 items set, for middle sized:50 items set)	5 Sets
104.	Stud Remover (maximum bolt diameter:19mm)	5
105.	Screw Extractor (bolt removable size:6.5~16mm, 5 pcs set)	10 Sets
106.	Taps & Dies Set (mid-tap 28pcs, dies 26 pcs, tap wrench, tap holder, die handle)	2 Sets
107.	Adjustable Wrench (max.open:42mm, overall length:375mm)	10
108.	Adjustable Reamer Set (utility range:12~27mm, 8 pcs)	2 Sets



No.	Item	Q'ty (Pcs./Nos.)
109.	Sledge Hammer (nominal weight:4lbs, 10lbs)	10 Sets
110.	Universal Puller Set (gear puller, wheel puller, terminal puller, etc.)	2 Sets
111.	Gasket Punch Set (5 ~ 16mm, 9 pcs)	2 Sets
112.	Tool Stand (size:L600×W400×H1,050mm)	5
113.	Cylinder Gauge (measuring range:10 ~ 18, 18 ~ 35, 35 ~ 60, 50 ~ 150)	5 Sets
114.	Spanner Set	10 Sets
115.	Socket Wrench Set (ratchet handle, nut spinner handle, extension bar, sliding handle, cross bar)	10 Sets
116.	Engineer's file set (12 items, rough, mid, smooth)	20 Sets
117.	Glove	50 Pair
118.	Ruler (150, 300, 600, 1,000, 1,500)	10 Sets
119.	Clamp on current meter	1
120.	Vernier height Gauge (measuring length:300, minimum reading scale:0.02)	4

## 9. Audiovisual Equipment

9-1 For Seminar rooms (30 persons × 2 rooms and 50 persons × 1 rooms)

No.	Item	Q'ty (Pcs./Nos.)
1.	35mm Slide Projector (usable slide:2×2 slide)	3
2.	OHP (stage size:285×285mm)	3
3.	Screen	3
4.	VTR (VHS)	3
5.	Monitor TV	3
6.	Curtain (for 3 rooms)	1 Set
7.	System Rack	3

No.	Item	Q'ty (Pcs./Nos.)
8.	Dynamic Microphone	6
9.	Mixer Power Amplifier	3
10.	Speaker	6 Set
11.	Microphone Stand (for table, floor 1 pc each)	3 Sets
12.	Cassette Tape Recorder	3
13.	Cables (for speaker and microphone)	1 Set

9-2 For Seminar Room (100 persons × 1 room)

No.	Item	Q'ty (Pcs./Nos.)
1.	System Rack	2
2.	Dynamic Microphone	4
3.	Mixer Power Amplifier	2
4.	Speaker	4
5.	Microphone Stand (for table, floor 1 pc each)	2 Sets
6.	Cable (for speaker, microphone, mixer)	1 Set
7.	Cassette Tape Recorder	2
8.	35mm Slide Projector	1
9.	OHP	1
10.	Screen	1
11.	VTR (VHS)	1
12.	Monitor TV	1
13.	Curtain	1 Set

9-3 Training Hall

No.	Item	Q'ty (Pcs./Nos.)
1.	Spread Screen	1
2.	Automatic Operated Variable Curtain	1 Set
3.	Automatic Operated Main Curtain	1 Set
4.	Screen with Tripod for OHP	1
5.	OHP (stage size:285×285mm)	1
6.	Automatic Operated Curtain	1 Set
7.	Main Speaker	4
8.	Video Projector	1
9.	Lecture Table with Operation Panel	1
10.	Power Amplifier	1
11.	Microphone (with stand for table)	1
12.	Microphone (with stand for floor)	1
13.	Wireless Microphone	2
14.	Wireless Antenna	2
15.	Wireless 2-channel Receiver	2
16.	Microphone	2
17.	Speaker	4
18.	Cassette Tape Recorder	1
19.	VTR (VHS)	1
20.	Microphone Cable, Speaker Cable	1 Set
21.	Cabinet	1
22.	Episcope projector (aperture size:280×230mm, Magnification ratio:3.9 times at 1.5m)	1

9-4 Projection Room for Training Hall

No.	Item	Q'ty (Pcs./Nos.)
1.	16mm Projector (reel capacity:maximum 1,800m)	1
2.	35mm Slide Projector (usable slide:2×2(23×25m))	1
3.	Automatic Operated Curtain	1 Set
4.	Monitor TV	1
5.	Cassette Tape Recorder	1
6.	Monitor Speaker	1
7.	Steel Rack	2
8.	Audio Control Mixer	1
9.	Mixing Control table (with power amplifier)	1
10.	Control Board	1
11.	Cables, Connectors	1 Set

10 Training Materials Production Equipment

10-1 Video Editing Equipment

No.	Item	Q'ty (Pcs./Nos.)
1.	Video Mixer	1
2.	Telop System	1
3.	Video Recorder (VHS)	2
4.	Editing Controller	1
5.	Monitor TV	3
6.	Audio Cassette Deck	1
7.	Audio Mixer	1
8.	Microphone (with stand)	1
9.	Monitor Speaker	2
10.	Component Rack	1
11.	Connecting Cable	1 Set

### 10-2 Portable Video Taking Equipment

No.	Item	Q'ty (Pcs./Nos.)
1.	3-tube Color Camera	1
2.	Tripod with Dolly	1
3.	Portable VTR (VHS)	1
4.	Battery Pack	4 Sets
5.	AC Power Supply & Adapter	1 Set
6.	Lighting Kit	1 Set
7.	Desk (with chair)	2 Set
8.	Carrying Stand	1 Set
9.	Voltage Stabilizer	4

### 10-3 Equipment for Printing Room

No.	Item	Q'ty (Pcs./Nos.)
1.	Printing Machine (sheet size:315×440mm(max.), 90×140mm(min.))	1
2.	Plate making Machine (max. image area:300×430mm, cassette sheet feed type)	1
3.	Collating Machine (paper size:148×210 ~ 318×470mm)	1
4.	Bookbinding Machine (max. binding size:44×7cm)	1
5.	Plate making Camera	1
6.	Developing Machine (image area:max. width:310mm min, length:160mm)	1
7.	Washing & Drying Machine (treatable size:120×45cm)	1
8.	Paper Folding Machine (sheet size:max.35×100cm, Min.5×5cm)	1
9.	Paper Cutting Machine (Cutting width:450mm, Cutting range:450mm)	1
10.	Copying Rotary Press (electrically operated)	1

No.	Item	Q'ty (Pcs./Nos.)
11.	Plate making Machine	1
12.	Electric Stapler	1
13.	Manual Stapler	1
14.	Electric typewriter (paper width:420mm(16.5"), typing width:335mm(13.2"))	1
15.	Manual Type-writer (paper width:10 inch)	2
16.	Desk (with chair)	2 Sets
17.	Rack (for plate making machine and copying rotary press)	2
18.	Locker	3
19.	Color TP Maker	1
20.	Copy Machine (drying type)	1
21.	Stitching Machine	1
22.	Sink	1
23.	Voltage Stabilizer	6

#### 10-4 Equipment for Slide Film Production

No.	Item	Q'ty (Pcs./Nos.)
1.	Camera (35mm)	3
2.	Slide Processing Equipment (wet electronic photo type)	1
3.	Portable Automatic Paper developing Machine	1
4.	Equipment for dark room	1 Set
5.	Film Processor	1
6.	Enlarging Machine (color-filter, R.B.G adding type)	1
7.	Storing Bottle	1
8.	Desk (with chair)	2 Sets

No.	Item	Q'ty (Pcs./Nos.)
9.	Refrigerator (capacity:30ℓ)	1
10.	Sink	1
11.	Locker	2
12.	Rack	3
13.	Carry stand, Back paper for Carry Stand, Photographing table, Acrylic board	1 Set
14.	Stroboscope Leghting Kit	1 Set
15.	Voltage Stabilizer	2

10-5 Word Processor and Personal Computer

No.	Item	Q'ty (Pcs./Nos.)
1.	Word Processor with printer (English)	2 Sets
2.	Personal Computer (Ram memory:640KB(max.))	2 Sets
3.	8-figures Calculator	15
4.	OA Desk	4
5.	System Chair	4
6.	Power Supply backup Equipment	4 Sets
7.	Slide Ruler (round type)	40

11 Vehicle

11-1 Vehicle

No.	Item	Q'ty (Pcs./Nos.)
1.	Compact size bus (passenger capacity:35)	1
2.	Micro Bus (passenger capacity:26)	1
3.	Dump Track (4WD, passenger capacity:3)	1

No.	Item	Q'ty (Pcs./Nos.)
4.	Pick-up Truck (4WD, passenger capacity:2, loading capacity:800kg)	1
5.	Van (4WD, passenger capacity:5)	2
6.	Truck (equipped with crane, passenger capacity:3, loading capacity:6,000kg)	1
7.	Motorecycle (125cc, off-road)	2

11-2 Audiovisual Equipment for AV Van

No.	Item	Q'ty (Pcs./Nos.)
1.	Generator (1.7KVA, 230V)	1
2.	Curtain	1 Set
3.	Tripod Stand Screen	1
4.	35mm Slide Projector (usable slide:2x2 slide)	1
5.	Monitor TV	1
6.	VTR (VHS)	1
7.	Amplifier	1
8.	Hand Megaphone	3
9.	Cables	1 Set
10.	Portable Amplifier with Wireless Microphone	1



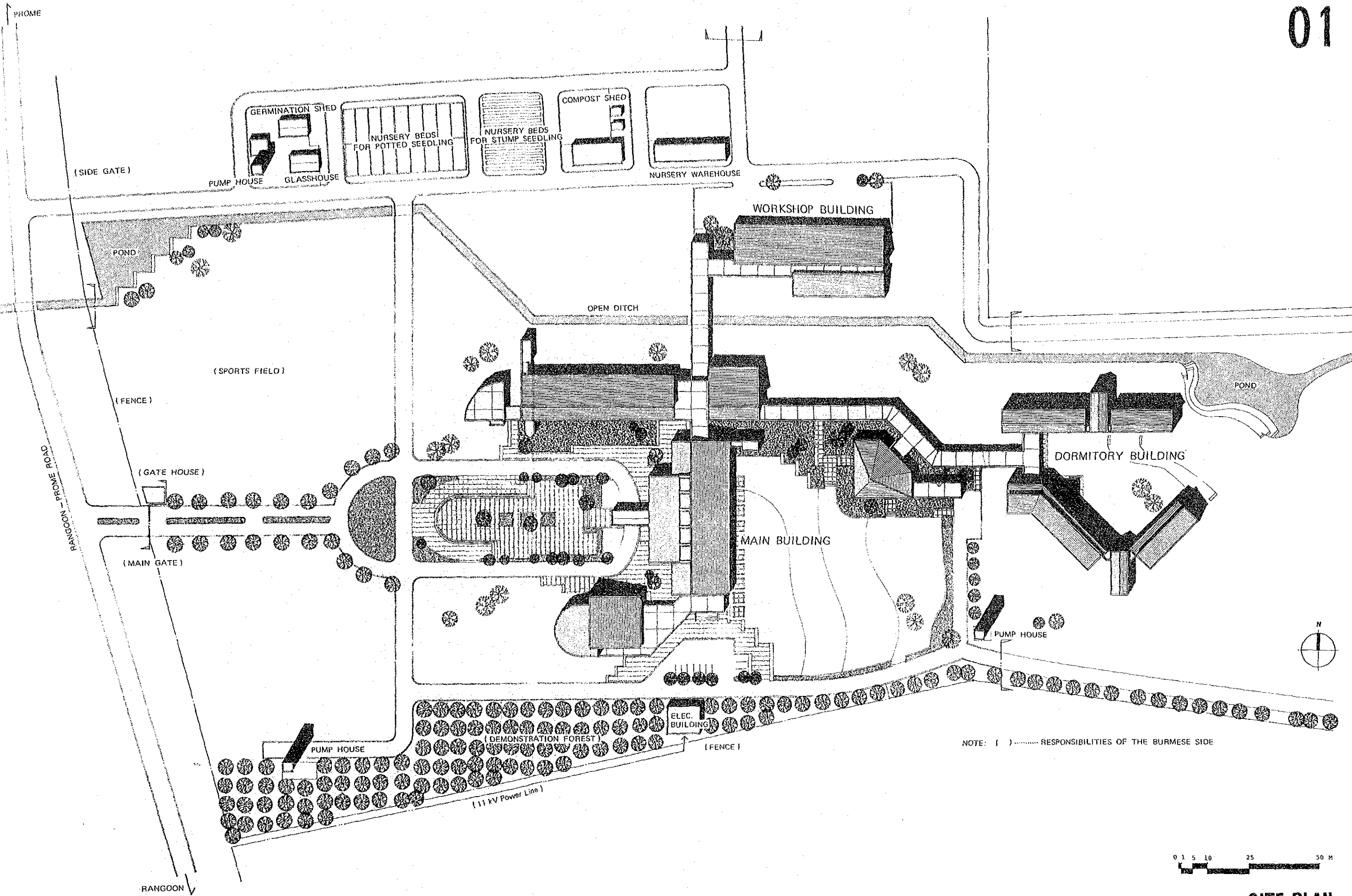
#### 4-3-5 Basic Design Drawings

##### A. Basic Design Drawings

01	Site Plan	1:1,200	
02	Main Building and Workshop Building		
	ground floor plan	1:600	
03	"	1st floor plan	1:600
04	Dormitory Building	ground floor plan	1:600
05	"	1st and 2nd floor plan	1:600
06	Main Building and Workshop Building		
	elevation and section -1	1:600	
07	"	elevation and section -2	1:600
08	Dormitory Building	elevation and section -1	1:600

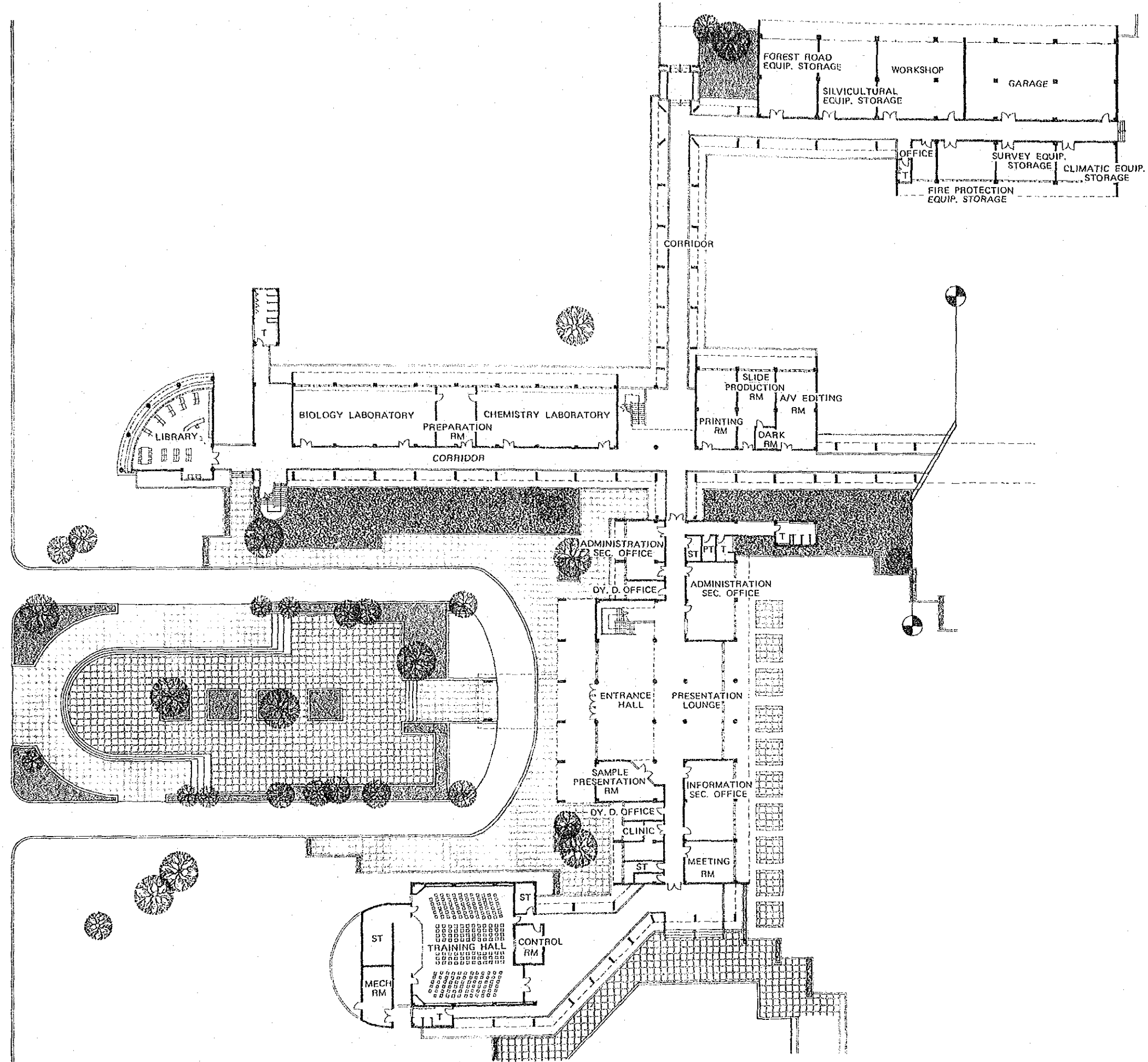
##### B. Floor Area

(1)	Main Building	-----	5,000m <sup>2</sup>
	G. Floor	-----	2,890m <sup>2</sup>
	1st. Floor	-----	2,110m <sup>2</sup>
(2)	Workshop Building	-----	1,010m <sup>2</sup>
	G. Floor	-----	1,010m <sup>2</sup>
(3)	Dormitory Building	-----	3,560m <sup>2</sup>
	G. Floor	-----	1,460m <sup>2</sup>
	1st. Floor	-----	1,050m <sup>2</sup>
	2nd. Floor	-----	1,050m <sup>2</sup>
(4)	Breezeway	-----	710m <sup>2</sup>
(5)	Nursery Facilities and Others	-----	540m <sup>2</sup>
<hr/>			
	Total Floor Area		10,820m <sup>2</sup>



# CENTRAL FORESTRY DEVELOPMENT TRAINING CENTER

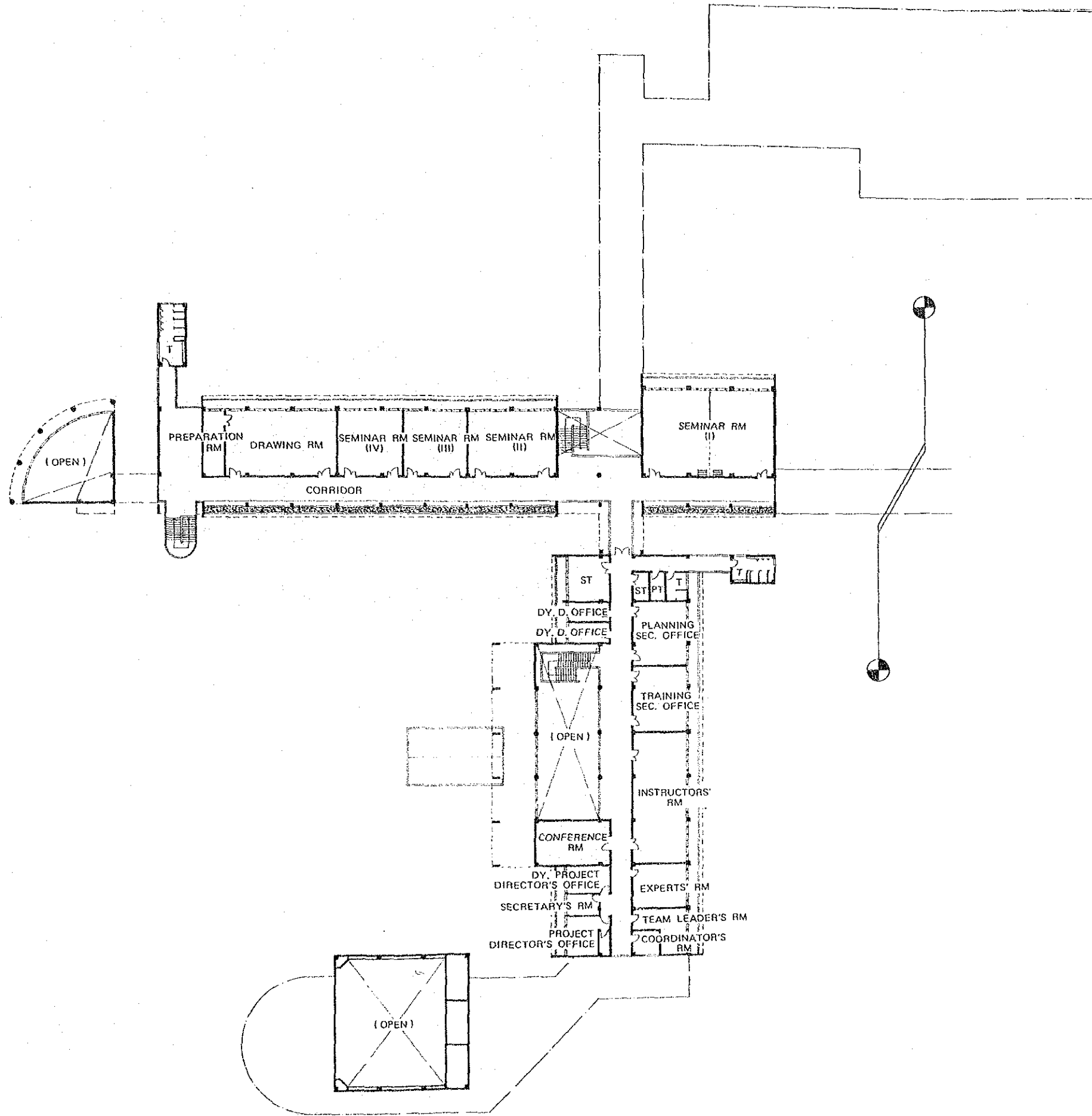
## SITE PLAN

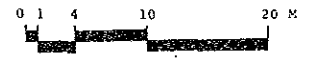
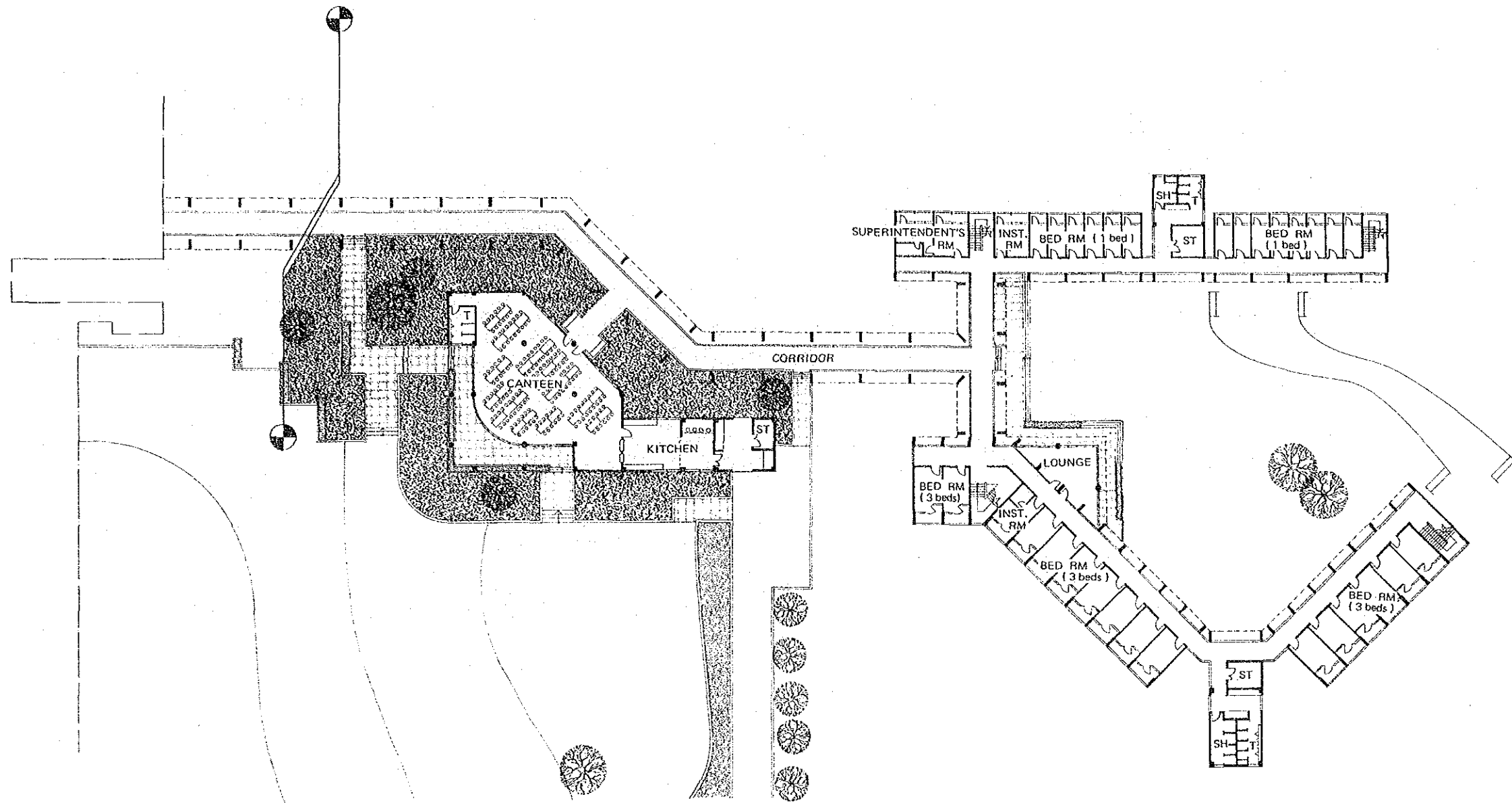


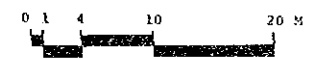
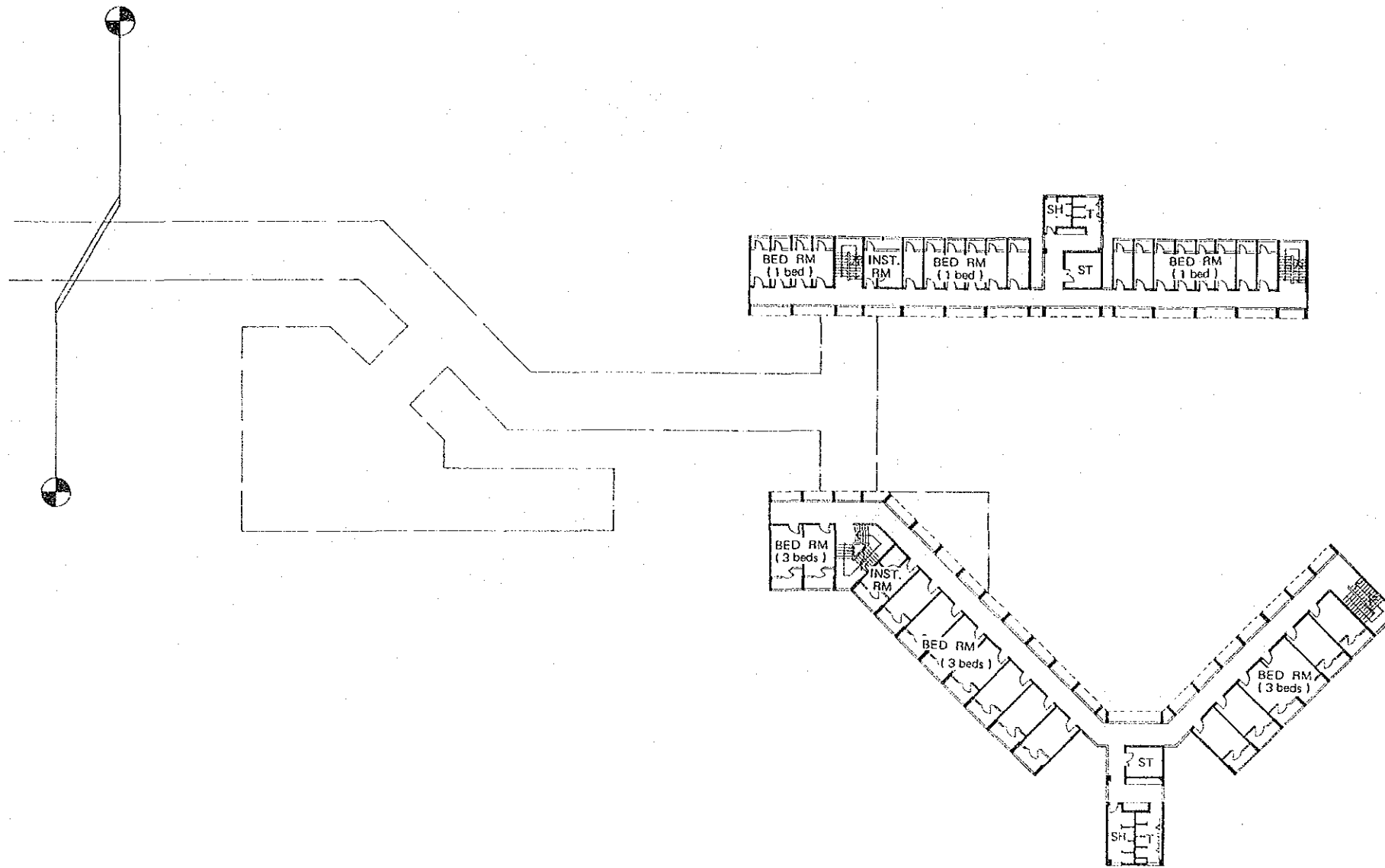
**CENTRAL FORESTRY DEVELOPMENT TRAINING CENTER**

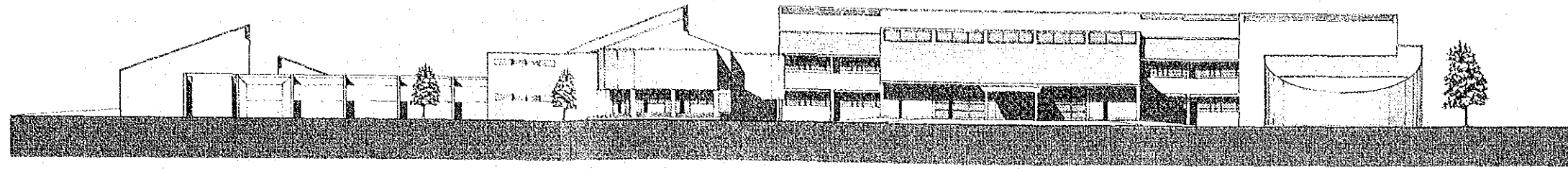
MAIN BUILDING • WORKSHOP BUILDING

**GFL PLAN**

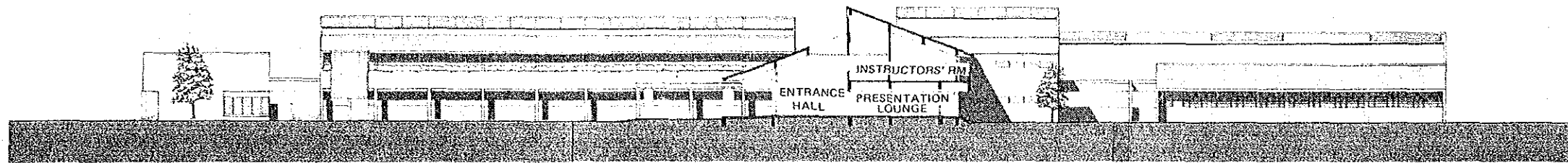




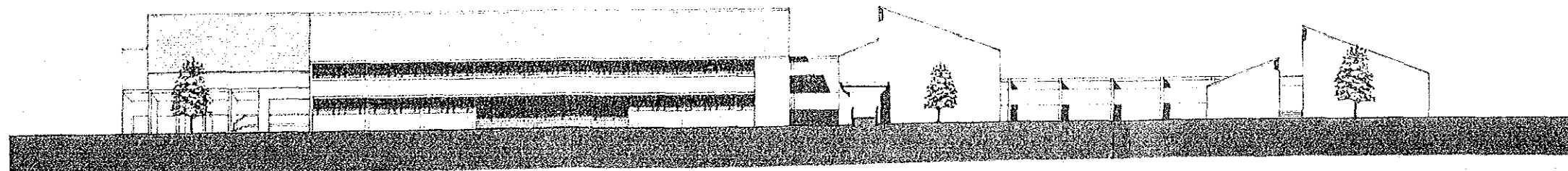




A-A' ELEVATION

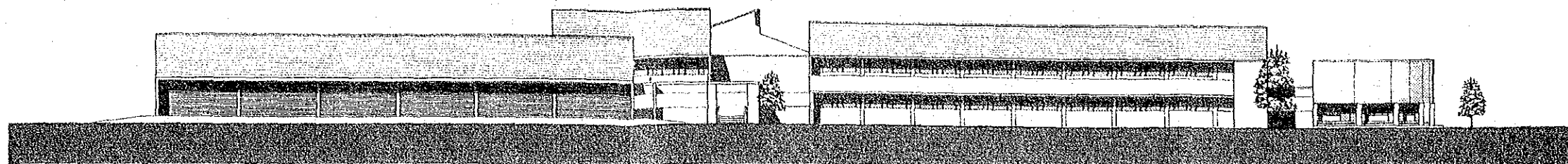


B-B' SECTION

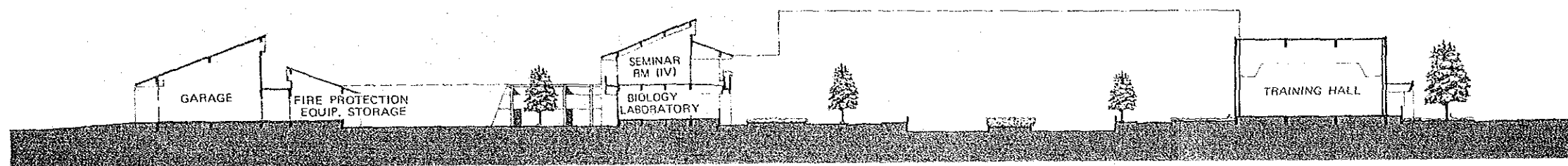


C-C' ELEVATION

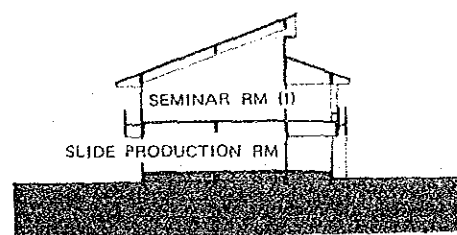




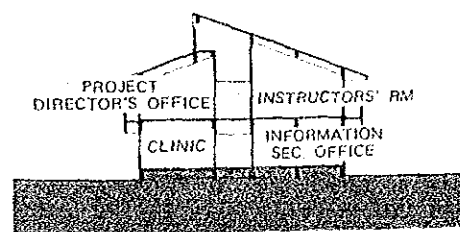
D-D' ELEVATION



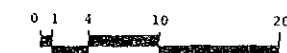
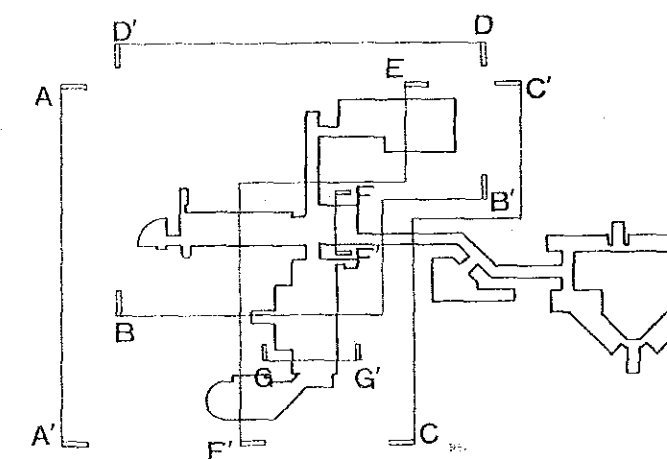
E-E' SECTION



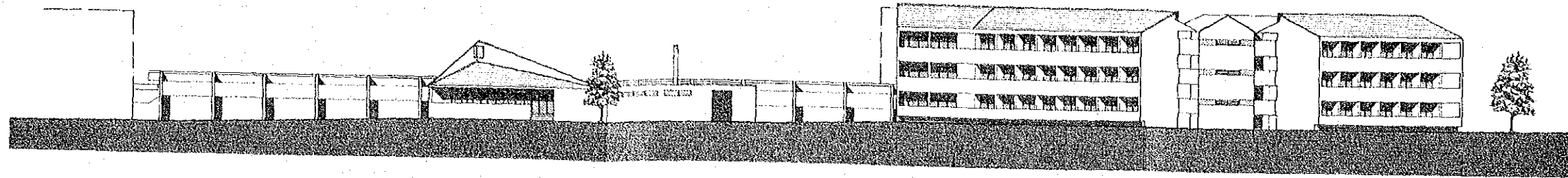
F-F' SECTION



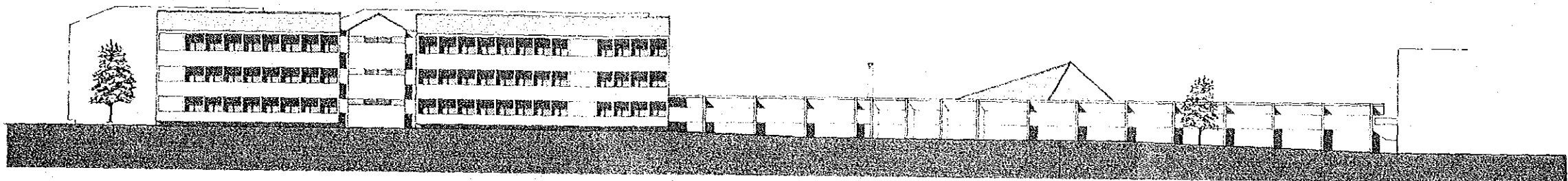
G-G' SECTION



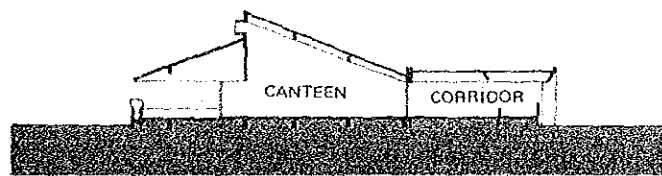




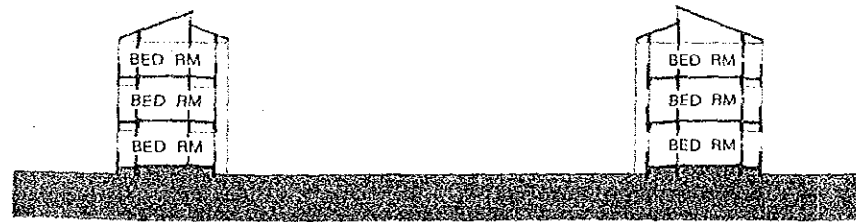
H-H' ELEVATION



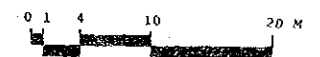
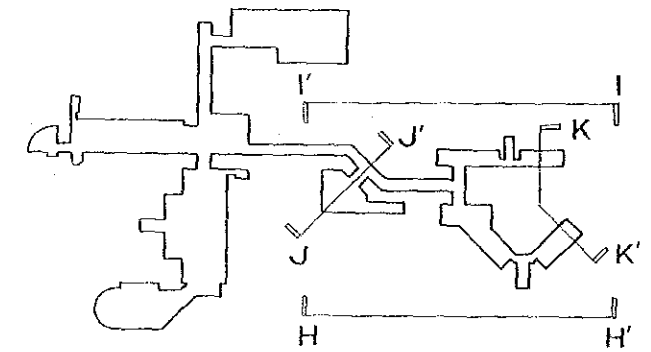
I-I' ELEVATION



J-J' SECTION



K-K' SECTION





#### 4-4 Execution Plan

##### 4-4-1 Execution Guidelines

The construction of this center will be implemented within the framework of the grant aid provided by the Japanese Government. This project will be formally started when it is approved by the Burmese Government and the Japanese Government and the Exchange of Notes is duly signed by both governments.

After the signing of the Exchange of Notes, the Burmese Government will conclude a consultant agreement with a Japanese consultant firm, and in compliance with the provisions of the agreement, detail design of the buildings and the equipment will be done. After completion of the detail design documents, a Japanese contractor and corporation selected through a tender will construct the facilities and procure and install the necessary equipment, machinery and instruments.

The period of construction works of the facilities to be done by the Japanese contractor will be about 13.5 months, in view of the scale and contents of the facilities, the local construction situation and the local climatic conditions. In order to complete the construction work within the said construction period, it is necessary to take note of the following factors.

As regards the construction work to be implemented by the Burmese side, site preparation (including the site for site office, construction material yard and workshop), demolition of the existing facilities and small streams, supply of water, installation of power supply and telephone line for use in construction work and all necessary office procedures must be completed before the commencement of the construction work done by Japanese side.

Since it will be difficult to carry out site preparation during the rainy season, it is desirable that during the rainy season the Exchange of Notes is signed by both governments and the necessary procedures for the preparation works are finished. And as soon as the rainy season ends, the construction work should be started. It is also necessary that during the period of detail design, the commencement time of each construction work

of both sides is defined and extensive prior consultations are held with all parties to ensure smooth progress of each construction work.

Since in Burma the rainy season lasts for about 6 months, from May to October (average monthly rainfall: about 417mm), the foundation works of buildings should be completed before the start of the rainy season in order to continue the construction works even in the rainy season. Such arrangement will minimize loss of time and labor during the rainy season.

While building materials, equipment and machines to be used in the construction work covered by the Japanese side should be procured locally wherever possible, those which cannot be procured locally will have to be imported from Japan. It is also necessary to establish a system under which the works to be covered by the Burmese side, including the office procedures to clear the equipment and materials imported from Japan through customs, will be done accurately.

The construction works will be carried out on the assumption that it will be implemented with the cooperation of the Construction Corporation of Burma. This means that the Construction Corporation, as the official organization representing the Burmese side, will be responsible for the supply of labor to the Japanese contractor and procurement of locally available building materials and equipment. It is necessary, therefore, for the Japanese side to realize the capabilities of the divisions of the Construction Corporation concerned in terms of execution and procurement, as well as the types of construction machines owned by them, in close collaboration with the Construction Corporation, in order to work out a really effective and economical execution plan. In this content, the cooperation of the Construction Corporation is essential to the success of this project.

#### 4-4-2 Scope of Works

##### A. Responsibilities of the Japanese Side

###### (1) Infrastructure

1. Power supply: Supply and installation of all necessary equipment to supply electric power to the facilities within the site.
  2. Telephone: Supply and installation of telephone system equipment within the site.
  3. Water supply: Installation of all necessary equipment to supply water to the facilities within the site.
  4. Drainage: Installation of the drainage and sewage treatment equipment within the boundary of the site.
- (2) Buildings: Buildings and equipment as specified in the basic design drawings in 4-3-5 of this basic design report.
- (3) Exteriors: Roads, courtyards and parking lots within the site (excluding the planting of greenery).
- (4) Equipment: Supply and installation of the equipment and machinery as specified in 4-3-4 of this basic design report.
- (5) Nursery: Nursery and its attached facilities as specified in 4-3-3 of this basic design report.
- (6) Transport of materials, equipment and machinery:  
Packing, loading, ocean freight, insurance, unloading and inland transport of the materials, equipment and machinery imported to Burma.

##### B. Responsibilities of the Burmese Side

###### (1) Infrastructure

1. Site preparation: Removal of obstacles in the project site, leveling of the ground.
2. Power supply: Supply and installation of 11kV power line (one overhead line) up to the south boundary of the site.
3. Telephone: Supply and installation of telephone trunk line (COL) cable up to the MDF in the main building.
4. Others:
  - . Construction of temporary access roads to the construction site.
  - . Offer of the space for the temporary site office, workshop, material stock yard etc.
  - . Temporary supply of water, electricity and telephone for the construction work.

(2) Buildings:	Staff Quarter	150
	Guesthouse	1
	Warehouse	1
	Garage	1
	Gate House	1
	Other necessary buildings not specified in this basic design report.	

(3) Exteriors: Access roads, playground, plantation of trees, inner roads, gates and fences, drainage around the site, etc.

(4) Equipment: Furniture, equipment and furnishings not specified in this basic design report.

(5) Payment of taxes on transport of materials, equipment and machinery:  
 Payment of all taxes on the procedures to clear the materials, equipment and machinery imported to Burma through customs, as well as the taxes on their unloading and inland transport.

(6) Approval, permission and application:  
 Approval, permission, application and bank arrangement

which will be needed for implementing the project and bearing of all related expenses and commissions.

(7) Tax exemptions:

Based upon the authorized contract, customs taxes and other public finance surcharges shall be exempted for Japanese personnel who are involved in the construction works.

(8) Provision of convenience:

Based upon the authorized contract, Japanese personnel who are involved in the project shall be accorded with convenience necessary for entering and staying in Burma to perform their duty.

(9) Others: All expenses which are necessary for implementing the project, other than those which are covered by the Japanese government's grant aid.

Among the works to be covered by the Burmese side, (1)-1, (1)-4 and part of (6) (application for approval of start of the construction work and bank arrangements) should be completed before the start of the construction to be covered by the Japanese side. Also it is necessary that all other works covered by the Burmese side are completed before the completion of the construction work by the Japanese side. Particularly, (1)-2 and (1)-3 should be completed at least 2 months before the completion of the construction work by the Japanese side because the time for inspection for the facilities constructed and the equipment installed is involved. Since the staff quarters are indispensable in implementing the project on schedule, the minimum number of the staff quarters necessary for smooth implementation of this project should be constructed before the completion of works.

#### 4-4-3 Supervision Plan

In accordance with the Japanese Government Grant Aid procedure, the consultant shall make a consultant agreement with the Government of Burma, to make detail design and supervise the construction of the project. The

purpose of supervision is to check whether the construction work is being executed properly according to the design documents and to improve the quality of the products through giving instructions, suggestions and coordination from the fair stand point in order to ensure the proper performance of the construction and equipment procurement contract.

The service of the consultant will include the following:

(1) Cooperation in works related to tender and contract:

The consultant shall prepare tender documents necessary for selection of Japanese corporations who will be engaged in construction work and equipment procurement, perform the tender and give advice on conclusion of the contract.

(2) Instruction, advice and coordination to contractors:

The consultant shall review the project schedule, construction plan etc. and offer instructions, advice and coordination to contractors.

(3) Inspection and approval of shop drawings and manufacturing drawings:

The consultant shall examine and approve shop drawings, manufacturing drawings and documents which shall be submitted by contractors.

(4) Confirmation and approval of construction equipment and materials as well as training and inspection equipment

(5) Report of work progress:

The consultant shall comprehend the schedule and conditions of the construction and report the progress thereof to the Burmese side.

(6) Inspections:

During the period from the commencement of the work to its completion the consultant shall inspect the facility and the training equipment when necessary to ensure the quality and function of the facility and equipment.

Judging from the facilities contained in this construction plan, the consultant shall dispatch one resident engineer to stay at the construction site during whole of construction process in order to execute the above mentioned duties. In addition, engineers shall be sent to the construction site whenever necessary during the progress of construction for all necessary inspections, instructions and coordination. Also, the



consultant shall report progress, disbursement, completion, turning over, etc. of the project to the Japanese Government authorities concerned.

#### 4-4-4 Procurement Plan

It is difficult to procure some of the required building materials, equipment and machinery in Burma. Also, most of the equipment, instruments and machinery to be used in the training programs will be procured outside of Burma. In principle, those materials, equipment, machinery and instruments difficult to procure in Burma will be imported from Japan. When there is a justifiable reason for procurement from a third country, such procurement arrangements will be made after detailed examination of the level of technology, standard prices and other factors in the third country and upon approval by the Burmese Government and the Japanese Government.

Of those which are to be procured in Burma, cement, aggregate, bricks and other important heavy-weight materials are produced in and around Rangoon and Hmawbi. Since the means of transportation to the project site have been improved, there will be no problem in transporting these materials to the project site. Also, because this project is to be implemented under the direct control of the Forest Department, the Ministry of Agriculture and Forests, it will be possible to procure high quality timber at relatively favorable conditions.

The outline of the procurement plan is as shown below.

##### (1) Materials and equipment to be procured in Burma

- |                               |                   |
|-------------------------------|-------------------|
| . cement                      | . timber          |
| . aggregate (sand and gravel) | . wooden fittings |
| . bricks                      | . glass           |

##### (2) Materials, equipment and machinery to be imported

- |                    |                  |
|--------------------|------------------|
| . reinforcing bars | . outlets        |
| . paint            | . electric cable |
| . tiles            | . boards         |

- . roofing materials
- . ceiling boards
- . aluminum-framed glass sliding doors
- . steel doors
- . stainless steel pipes
- . waterproof veneer plywood boards
- . metal goods
- . lighting apparatus
- . ventilating fans
- . equipment and machinery for use in training programs
- . transformers
- . motive power equipment
- . PVC pipes, steel pipes
- . valves
- . pumps
- . sanitary equipment
- . air conditioning equipment
- . ceiling fans

In principle, materials and equipment to be procured locally will be supplied by Burmese government authorities concerned through the Construction Corporation. For example, cement, bricks and glass will be supplied by the Ceramic Industries Corporation and timber and wooden products by the Timber Corporation. In procuring these materials and products from the corporation concerned, it will be necessary to prepare prior allotment plans and then follow the necessary procedures to obtain supply quotas for each. When procuring materials and products locally, it will be essential to calculate in advance the quantities to be supplied, quantities to be used and the method of procurement of each material or product.

#### 4-5 Implementation Schedule

This project will commence after the two governments sign the Exchange of Notes on the grant aid of the Japanese Government. After the signing of the Exchange of Notes, the Burmese Government will select a Japanese consultant firm and then consultant agreement will be concluded between the Burmese Government and the Japanese consultant firm selected.

The implementation schedule of the project will be divided into three main stages ; detail design, invitation to tender and construction work.

##### (1) Detail Design

After the consultant agreement is made and verified by the Japanese Government, the detail design will be started. In this stage the detail design drawings, specifications and tender documents necessary for inviting tenders will be prepared based on the Basic Design Study Report. At the same time, the Japanese consultant firm will have consultations with the parties concerned from the Burmese side on the contents of the facilities and the equipment and finally obtain approval of the tender documents from the Burmese government authorities. It is expected this stage will take about 2.5 months to complete.

##### (2) Invitation to Tender

The construction company and the equipment supplier shall be appointed by tender. The tender will be processed in the procedure of tender notice, tender, evaluation of tender amount, appointment of the construction company and equipment supplier and signing of contract. The whole tender procedure will take approximately 2 months.

##### (3) Construction Work

After signing the construction contract, the construction will commence under verification by the Japanese Government. Judging from the scale of facilities, local meteorological conditions and other local construction conditions, the construction including equipment procurement and installation is expected to take approximately 13.5 months.

With the above conditions in mind, the implementation schedule of the project after the signing of Exchange of Notes is shown in the Fig. 4-8 below.

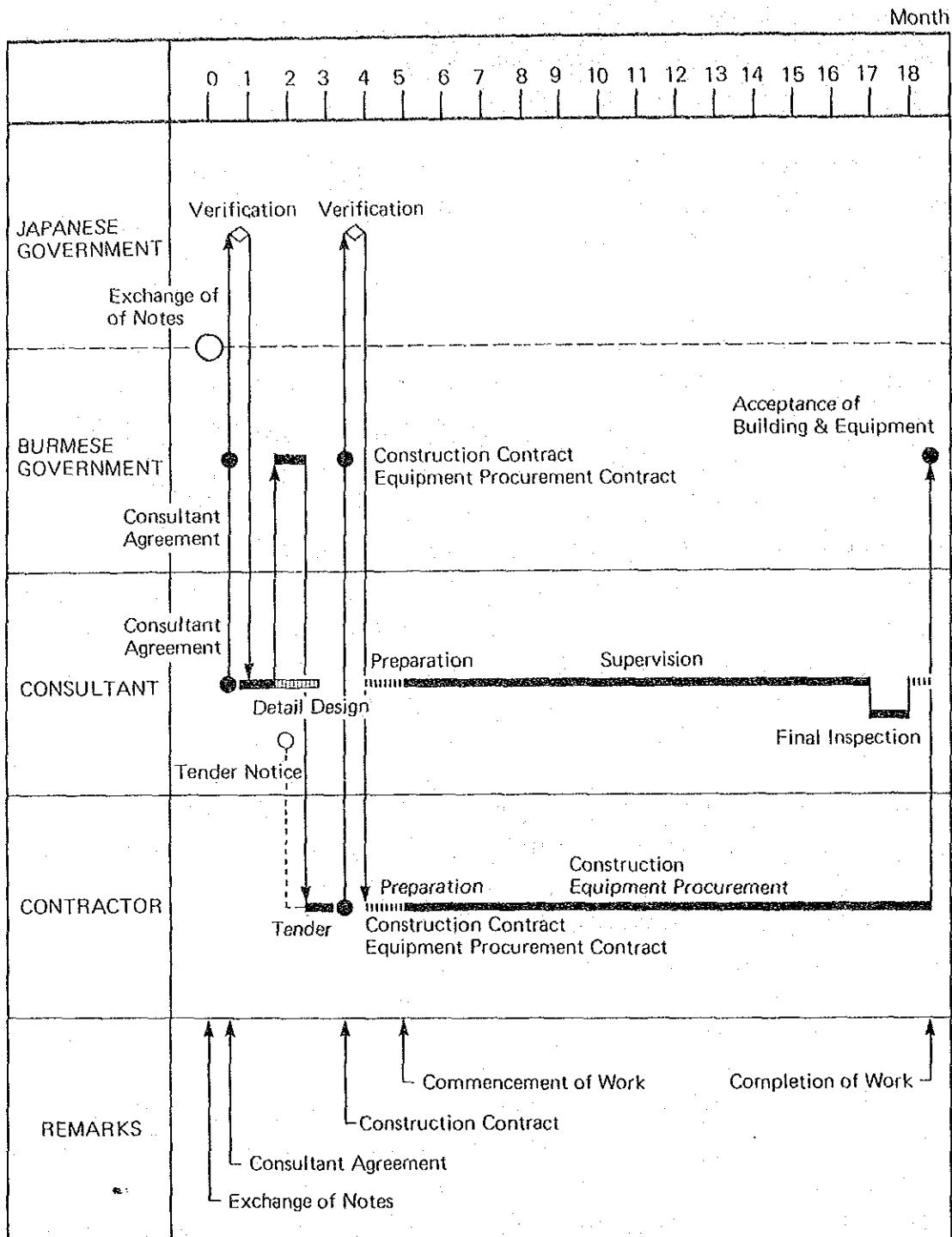


Fig. 4-8 Execution Schedule

## 4-6 Maintenance and Administration Plan

### 4-6-1 Maintenance and Operation of the Facilities, Equipment and Machinery

Although both the execution plan and the procurement plan will be worked out by taking into consideration the steps to be taken in order to facilitate smooth maintenance and operation, it is also important that CFDTC, as its responsibilities, should assign qualified staffers to operate and maintain the facilities and the equipment. The staffers will be trained by the Japanese consultant and/or the contractor at the site so that they may be competent for the operation of equipment and machinery, as well as maintenance and inspection of them. They will also be provided with the necessary literature such as operation manuals.

The points to be especially noted in maintaining and operating the facilities, equipment and machinery are itemized below.

#### A. Building

1. Windows should be kept open periodically (about twice a week) to ensure adequate ventilation and prevent the interior walls from getting moldy.
2. All the facilities (finished surfaces in particular) should be kept clean. When iron portions of the facilities get rusty, they should be derusted promptly and coated with paint to prevent any further spread of rust.
3. Gutters should be inspected about twice a year so that they will not get clogged.
4. Equipment and machinery should be operated and inspected by engineers who have a sufficient knowledge of electricity or machinery in accordance with instructions for use.
5. Daily or weekly written reports on maintenance and inspection of equipment and machinery should be prepared and kept in order that it will be easier to have a firm grasp on the current conditions of the facilities. Also a well organized method of controlling the stock of expendables and spare parts should be developed and implemented so that

purchase orders for replacement parts and the like may be placed with suppliers well in advance.

6. When a piece of equipment or a machine is found to be out of order, it should be immediately stopped and inspected so that it may not affect other equipment and machines.

#### B. Equipment, Machinery and Materials

1. A well organized inventory control method should be developed and implemented so that the current quantities and conditions of equipment, machinery, spare parts and expendables may be grasped accurately.
2. Equipment and machines should be used after perusal of instructions for use. They should be operated correctly and accurately so that they may not suffer unnecessary damages due to mishandling.
3. Equipment and machines should always be cleaned and fixed after use. Training equipment and instruments, in particular, should be handled carefully after use because they can be easily tainted or damaged.

#### 4-6-2 Maintenance and Administration Expenses

The maintenance and administration expenses to be defrayed by CFDTTC will be broadly divided into personnel expenses and facilities operating expenses.

The Forest Department will implement a program to increase its personnel from 1987. And as part of this program, 150 staffers will be recruited for this center. The personnel expenses and the maintenance and operation expenses will be calculated on the assumption that the prospective training center will be staffed with the newly recruited 150 employees.

## A. Personnel Expenses

1. Salary	641,000 Ks/year
2. Wages	183,000
3. Travelling Allowance	380,000
4. Training Allowance	324,000
<b>Total</b>	<b>1,528,000 Ks/year</b>

Table 4-7 Calculation of Salary

(In Ks)

Rank	No. of Staff	Total (Ks/year)	Salary Per Staff	
			Per Year	Per Month
Project Director	1	15,600	15,600	1,300
Dy. Project Director	1	14,400	14,400	1,200
Dy. Director	4	48,000	12,000	1,000
Dy. Asst. Director	14	117,600	8,400	700
Superintendent	1	6,240	6,240	520
Instructor	31	163,680	5,280	440
Middle Class Staff (320-15-440)	16	84,480	5,280	440
Supervisor Rank (210-15-330)	18	71,280	3,960	330
Other Ranks				
- (185-15-305)	2	7,320	3,660	305
- (160-10-230)	5	13,800	2,760	230
- (150-10-220)	8	21,120	2,640	220
- (130-10-200)	4	9,600	2,400	200
- (125- 5-150)	1	1,800	1,800	150
- (110- 3-125)	44	66,000	1,500	125
<b>TOTAL</b>	<b>150</b>	<b>640,920</b>		

B. Facilities Operating Expenses

1. Power Charges -----	255,000 Ks/year
2. Telephone Charges -----	38,000
3. Building Maintenance -----	50,000
4. Vehicle Maintenance -----	50,000
5. Fuel and Lubricants -----	80,000
6. Teaching Materials -----	30,000
7. Miscellaneous -----	57,000
<b>Total</b>	<b>560,000 Ks/year</b>

Calculation of Power Charges

Table 4-8 Breakdown by Building of Power Consumption

Name of building	Installed load (KW)	Running hour (H/Day)	Running day (Day/M)	Demand factor (%)	Assumed power consumption (KWH/M)
Main Building Workshop	240	9	25	50	27,000
Canteen	40	9	30	30	3,240
Dormitory	80	15	30	30	10,800
Other Facilities	100	12	30	30	7,200
<b>Total</b>					<b>48,240</b>

Power rates applicable to the CFDTC facilities are as follows.

0.54Ks/WH for up to 500kWH

0.44Ks/Wh for 500kWH or more

Accordingly, power charges/month will be

$$500\text{kWH/month} \times 0.54\text{Ks} + (48,240\text{kWH} - 500\text{kWH}) \times 0.44\text{Ks} = 21,276 \text{ Ks/month}$$

and yearly power charges will be

$$21,276\text{Ks/month} \times 12\text{month/year} = 255,000\text{Ks/year.}$$



### Calculation of Telephone Charges

Telephone rate: 2.1Ks/call (up to 3 minutes)

Number of calls: 60 calls/day on the average (2 calls/day on the average with assistant managers and higher ranks, 0.2 call/day on the average with clerical workers and the like.)

Time per call: less than 3 minute

Telephone Charges =2.1Ks x 60calls/day x 25days/month x 12month/year  
=3,150Ks/month x 12month/year  
=37,800Ks/year  
=38,000Ks/year

### C. Evaluation of the Maintenance and Administration Expenses

CFDTC's maintenance and administration expenses of 2,100,000Ks will be appropriated out of the budget of the Forest Department. The total budget for 1986/87 of the Forest Department is 186,700,000Ks. The estimated maintenance and administration expenses of CFDTC will account for 1.12% of the Forest Department's total budget and 2.11% of current expenditure of 99,300,000Ks. Accordingly, it can be said that the appropriation from the Forest Department for the maintenance and administration activities of CFDTC will be feasible.

A review of the annual budgets for other similar facilities reveals that the total annual budget for the Burma Forest School is about 2,600,000Ks (1986/87) and that for Burma Central Agricultural Development Training Center about 2,300,000Ks (1986/87). In comparison with these, the maintenance and administration expenses for this training center can be considered reasonable.

#### 4-7 Estimate of Project Costs to be borne by the Burmese Government

Considering of the contents and scale of the facilities and the extent of the necessary equipment and machinery, the project costs to be borne by the Burmese Government can be roughly estimated as follows.

(1) Site Preparation Work.....	300,000Ks
(2) Infrastructure Work.....	3,000,000Ks
1. Electricity supply	880,000Ks
2. Telephone installation	180,000Ks
3. Water supply	780,000Ks
4. Outside drainage	920,000Ks
5. Septic tank and sewer	240,000Ks
(3) Building Work.....	13,258,000Ks
1. Staff quarters	12,294,000Ks
2. Guest house	300,000Ks
3. Main store	216,000Ks
4. Garage	448,000Ks
(4) Outdoor Work.....	5,200,000Ks
1. Fencing, Road pavements	3,500,000Ks
2. Storm reservoir and Pond	750,000Ks
3. Sports field	50,000Ks
4. Outdoor lighting	350,000Ks
5. Exterior drainage	550,000Ks
(5) Equipment .....	642,000Ks
1. Furniture and Fixture	500,000Ks
2. Training equipment	142,000Ks
<hr/>	
Total	22,400,000Ks

The above estimated costs of the construction work to be borne by the Burmese Government do not include taxes, charges or personnel expenses.

The Burmese side is required to prepare the budget for the above, carry out design work and complete the necessary construction work according to schedule so that the entire construction work may be implemented smoothly and the facilities to be constructed may be utilized effectively.

