② Equipment maintenance cost

Although equipment maintenance costs are low for roughly five years from date of construction completion, replacement of parts and equipment is required after that. Provisionally calculating the mean yearly reconditioning cost over a ten-year span based on a cost of 0.5% of equipment cost yields the following figure.

Rs49,954,000 × 0.5%/year = Rs2,497,700/year ≈ Rs2,500,000

4) Provisional calculation totals

①	Personnel costs	Rs1,326,000/yr
②	Facility operating costs	Rs1,010,000/yr
③	Facility/equipment maintenance costs	Rs2,685,000/yr
④	Consumer goods (fuel, etc.)	Rs300,000/yr
	Total	Rs5,321,000/yr

Which yields a provisional yearly operating and maintenance cost of Rs5,321,000; converting this figure to Japanese yen yields a cost of approximately ¥11,700,000. Since the project will not provide equipment, the whole picture is unclear, thus the equipment maintenance cost and consumable cost have not been estimated.

According to DPTC's budget plan, the operating cost of the project plan is as shown below. DPTC operation cost and the 1995/1996 budget based on the operating cost of the new facility after the center begins operations in March 1995 are assumed as follows. The technology development cost is not included in the operating cost.

① DPTC operating & maintenance costs (excludes cost of seminars)

1991/1992	[1st year]	1,500,000.00 / yr	(budgeted)
1992/1993	[2nd year]	1,829,765.59 / yr	(budgeted)
1993/1994	[3rd year]	2,071,000.00 / yr	
		+1,380,000.00 / yr	KR II (budgeted)
		3,451,000.00 / yr	(budgeted)
1994/1995	[4th year]	2,508,000.00 / yr	
		+1,380,000.00 / yr	KR II (proposed)
		3,888,000.00 / yr	(proposed)
1995/1996	[5th year]	3,144,000.00 / yr	
		+1,380,000.00 / yr	KR II (proposed)
		4,524,000.00 / yr	(proposed)

② Technology development cost (rough estimate)

Rs5,924,000.00/yr (assumed)

The DPTC will have activities expenses for such things as training, technology development, etc. that are above and beyond operating and maintenance costs. In the current stage, though the activity contents are not specified, it is assumed that these costs will run roughly Rs1,400,000.00/year. Because the sum of the operating and maintenance costs and technology development cost will rise to Rs6,000,000.00/yr, twice that budgeted in 1993/1994, it has been suggested that MOWR will need to make an approach so that the budget can be secured.

Estimated total 1995/1996 fiscal year project operating costs:

Rs5,924,000.00/yr (assumed)

CHAPTER 4 BASIC DESIGN

CHAPTER 4 BASIC DESIGN

4-1 Design policy

Maintaining a vigilant eye on environmental conditions at the planned building site, the design policy has been positioned mainly on the establishment of functionality, durability and economy in accordance with the provisions established by the Project plan as described below.

(1) A multiple-site facility configuration by which activities can be performed effectively

The DPTC will consist of three sites, the Pulchouk site upon which the main building and the trainees' dormitory are to be built, the Godawari site which will be home to the research building, and the Baneswar site with the garage for heavy equipment. A hydraulic laboratory has already been built at the water-rich Godawari site; because of this, a facility configuration will be established that reduces considerably the number of trainees and staff that must be moved and which is based on a clear delineation of functional components.

(2) A facility configuration that is functionally easy to use

The Pulchouk site comprises two buildings: a main building and a trainees' dormitory. The main building will be used by the four divisions of the DPTC, the administrative, research, technology development and information divisions. Of these divisions, because it is envisioned that use of the training division by non-center persons will be great, its configuration will be made easy to understand through clear flow and layered planning to prevent such traffic from impeding regular activities of other divisions. In addition, the dormitory canteen shall be located next to the main building, so that it will be easy to use not only by trainees but by staff members as well.

(3) A design in harmony with the environment

To the extent possible, natural lighting and breezes will be utilized, without depending on machines, and a design which establishes a pleasant room environment will be formulated.

In addition, with a view to leaving as many trees as possible and building greenery-rich facilities, the current stringent tree felling restrictions in Nepal will be strictly adhered to.

(4) Compatibility with Project Type Technical Cooperation

Project Type Technical Cooperation with the DPTC has been ongoing since October 1991, and full scale activities are continuing. Accompanying this, much equipment has already been furnished. A facility plan that not only fully incorporates equipment that has already been furnished by Project Type Technical Cooperation but also equipment that is to be furnished by Project Type Technical Cooperation into its design with the aim of facilitating activities in conformance with these equipment shall be drawn up.

(5) An easy to maintain facility that reduces maintenance costs

With the aim of creating a facility that can economize operating costs, a plan that stresses energy conservation, simplification of facility systems, and durability of equipment and materials shall be formulated. In selecting the architectural materials, strong, easy to maintain materials, as well as construction methods appropriate for building techniques of the area will be employed.

(6) Project standards

Although, in principal, the plan will conform to the laws and standards of Nepal, for the structures and equipment that are not fully provided for in said codes and standards, the codes and standards of either India or Japan will be employed.

4-2 Study and examination of design criteria

4-2-1 Facility configuration

The facilities will be configured in accordance with the requests described in the overview of facilities in 3-3-4, with the main building and the trainees' dormitory to be laid out on the Pulchouk site, the technology development building to be laid out on the Godawari site, and the garage for heavy equipment to be laid out on the Baneswar site. In consideration of the fact that, as mentioned earlier, the facility configuration will span multiple sites, the configuration detailed below for each division was established by concentrating rooms related by function and directing sufficient consideration to the convenience afforded by the facilities as a whole with the aim of averting frequent movement of trainees and staff.

(1) Pulchouk site

1) Main building

- Administrative division : Offices, director's room, experts' room, meeting room

- Technology development division : Researchers' room, design room, etc.
- Training division : Offices, lecturers' room, training room, seminar hall, seminar room, etc.
- Information division : Office, data processing room, library, etc.
- Others : Carport, machine room, etc.

2) Trainees' dormitory : Bedrooms, pantry, canteen, laundry room, etc.

(2) Godawari site

1) Technology development bldg. : Concrete testing laboratory, soil testing laboratory, test equipment storeroom, workshop, equipment storeroom

(3) Baneswar site

1) Industrial garage : A total of ten units including bulldozer, dump truck, loader, backhoe, truck with crane, etc.

4-2-2 Establishment of room size

Based on the requests submitted by Nepal, the size of each room was established taking into account the function and the number of personnel to be placed in each room. The main function(s) and size of each room are described below.

(1) Offices

Individual office spaces, both public and private, are widely evidenced throughout the area; however, the offices of this facility shall be large, open-style offices, which facilitate communication among staff members and permit a flexible layout.

With regard to office size, taking into consideration the manner in which furniture is laid out in the local area (spacing between furniture is large) and referencing to the personnel placement plan, the sizes of the offices were calculated so as to provide 8.5 m^2 per person. It is planned to permit the director's and experts' areas to be separated by means of a low, movable partition.

(2) Researchers room

Because the Godawari site upon which the technology development building is to be built is approximately 10 kilometers from the Pulchouk site, in addition to collection and compilation of field work data, all general office work will be performed in the researchers' room. In consideration of the multi functional use of the room, with the aim of allocating 9.0 m^2 per person, the floor area was calculated to be slightly larger than that of the ordinary offices.

(3) Training rooms

Training consists of a general course (10 persons), an advanced course (5 persons) and an intensive course (5 persons). Although the number of students are as stated above, because the classes will be attended by both a Japanese expert and

his or her counterpart from Nepal, 14 to 15 persons will be required for the general course, and 7 to 8 persons for each of the other two courses. Because the time allotted for the intensive course overlaps the times allotted for the general and advanced courses and often the advanced course and intensive course join to perform training, two rooms with space for 14 to 15 persons are required.

Because, to deepen understanding, a method which makes repeated use of group discussion (three groups) is employed, three seminar rooms are to be built.

Moreover, because ceremonies and lectures such as two-way lectures, ESCAP and disaster prevention seminars attended by approximately 50 to 60 persons are held four or five times each year, it is planned to install movable partitions in the seminar hall divide the room as training rooms. The required floor area was calculated with the objective of providing 2.0 m^2 floor space per person during seminars and 1.5 m^2 during lectures.

(4) Library

The library has been positioned to be not only an information centre for employees, trainees and instructors based in the DPTC, but also a place where related persons from outside the DPTC can access materials and information. Archived materials will include books and periodicals, databases created by the Information Division, promotional materials, training materials, and others. In the plan, Nepal requested open book stacks (150 ~ 170 copies/m^2) containing a total of roughly 10,000 books and periodicals. Including reading space with seating for approximately ten persons, a carrel with seating space for two to three persons, and reception counter space, a library floor space of approximately 80 to 100 m^2 has been established.

In addition, to supplement library functions, a preparation room for creating materials and performing supplemental training will be attached.

(5) Bedrooms

Although the training plan envisions a maximum of around 15 ~ 20 trainees, because not all participants will be from other localities, ten rooms will be sufficient to accommodate both the trainees and guest instructors. Based on the conditions at similar facilities, it was decided that the room configuration would include eight rooms without shower facilities (shower facilities will be in a common room) and two rooms with showers and toilet facilities. Taking into account the furniture layout, the floor area of the two types of rooms will be 18 m^2 and 27 m^2, respectively.

(6) Canteen

Due to the fact that, with 24 employees and 15 trainees, the number of persons are few, a cafeteria is not planned. Instead, in keeping with the custom in the area of taking frequent tea breaks, a canteen will be built which can provide light, easy to prepare snacks.

The canteen is to be a semi-outdoor space that anyone can freely use. This space will also be able to be used as a gathering place for trainees and instructors.

(7) Testing laboratories

Because all testing instruments in the soil and concrete testing laboratories located within the technology development building are provided for through Project Type Technical Cooperation, based on the equipment layout draft studied at the DPTC, the plan specifies that the floor areas of the testing laboratories be approximately 100 m^2 each.

Table 4-2-1 below shows the scale of each room classified by division.

Table 4-2-1 Sizes of each room according to division

[Main building]

Room name	No. of persons	Area calculation criteria and remarks	Planned area (m^2)
• Administrative division		Includes visitor receiving space	
Director room	1	Includes visitor receiving space	33
Chief Adviser room	1	1 secretary + waiting space	32
Secretarial room		Visitor receiving space for use by Director & Chief Advisor	16
Meeting room (1)		6 persons x 4 m^2/person = 24 m^2	25
Meeting room (2)		30 persons x 2.5 m^2/person = 75 m^2	70
Office(1)	4	4 persons x 8.5 m^2/person = 34 m^2	36
Office(2)	4	For coordinators, 4 persons x 8.5 m^2/person = 34 m^2	36
• Technology development division			
Researchers room	8	8 persons x 9.0 m^2/person = 72 m^2	72
Designing & drawing room		2 seats x 10.0 m^2/person = 20 m^2	21
• Training division			
Office	7	7 persons x 8.5 m^2/person = 60 m^2	64
Lecturers room		2 persons x 7.0 m^2/person x 2 rooms = 28 m^2	25
Fieldwise training room		7 persons x 2.0 m^2/person x 3 rooms = 42 m^2	40
Lecture / seminar hall		60 persons x 1.5 m^2/person = 90 m^2 By dividing with movable partitions, can be used as two labs	94
• Information division			
Office	6	6 persons x 8.5 m^2/person = 51 m^2	50
Data processing room		3 computers	32
Library		10,000 books, seating ten readers	95
Preparation room		For library use	11
• Miscellaneous			
Machine room		According to layout of facility equipment	75
Carport		6 cars	96
Drivers waiting room		6 persons x 2.0 m^2/person = 12 m^2	11
Hall, corridor			1073.3
Stairwell, storeroom			
Kitchen, porch, etc.			
Total			2,006.3

[Training building]

Room name	No. of persons	Area calculation criteria and remarks	Planned area (m^2)
Bedroom (A)		18 m^2 (1-person rooms) x 8 rooms = 144 m^2	144
Bedroom (B)		27 m^2 (1-person rooms w/showers) x 2 rooms = 54 m^2	54
Office		Reception room	5
Canteen		60 persons x 1.8 m^2/person = 108 m^2 To be used as a gathering place for staff and trainees as well.	127
Balcony			
Hall, restrooms			
Stairwell, corridor			3546
Laundry room, pantry, other rooms, etc.			
Total			684.6

[Technology development building]

Room name	No. of persons	Area calculation criteria and remarks	Planned area (m^2)
Soil testing laboratory		According to equipment layout	105
Concrete testing laboratory		According to equipment layout	141
Material storeroom		For storage of equipment and material	60
Workshop		For equipment maintenance	35
Stairwell, hall			
Storeroom etc.			219.9
Total			560.9

[Garage for heavy equipment]

Room name	No. of persons	Area calculation criteria and remarks	Planned area (m^2)
Garage		3.0 m x 6.5 m = 19.5 (10 units)	195.0
Total			195.0

[Total area]

	Main building	Trainees' dormitory	Technology development building	Garage for heavy equipment	Total
Totals	2006.3	684.6	560.9	195.0	3,446.m^2

4-3 Basic plan

4-3-1 Site and layout plan

(1) Pulchouk site

Facilities of the Ministry of Local Development and the Division of Roads exist on the Pulchouk tract. Because, at time of the Basic Design Survey, the Ministry of Local Development proposed that an access road for use by the three parties be constructed between the site for the DPTC and the facilities of the Division of Roads, no building construction will be permitted on the land that the road is to be built. However, because continued use of the facing existing access road is anticipated, the buildings were planned to be easily accessible from either of the two roads.

The southern side of the site faces the five story Narayani Hotel, which has prompted the plan to specify that the four-story main building be laid out on a north-south axis so as not to impede the visual sweep of the hotel. This layout tends to emphasize the alignment the building has with Pulchouk Street as well.

In contrast, because, at two stories, the dormitory is low, and its effect on the visual sweep of the hotel should be small, it has been laid out at a right angle to the main building. Although the guest rooms of the hotel and the bedrooms of the dormitory face each other, the fact that the existing trees on the southern side of the site are to be left intact readily ensures privacy as well.

In addition, an open café terrace is to be laid out facing the garden area between the main building and the trainees' dormitory in such a fashion that an alluring ambiance can be enjoyed by staff and trainees alike.

(2) Godawari site

Because the hydraulic laboratory, common use building and other structures have already been built on the tract, and a big tree is situated on its southwestern side, usable land is limited to the area on the western side of the common-use building.

Although, to lay out the required facilities produces a building on the order of three stories high, by utilizing the level differences of the tract, a plan that permits vehicular access from both the north and south sides has been drafted.

(3) Baneswar site

Construction will take place in a vacant lot at the back of the maintenance building of the Machine Section of the Department of Roads of the Ministry of Works and Transport. A concrete slope which used to be used for machine maintenance must

be removed to construct the garage. Since the garage is for heavy machines, a sufficiently wide road will be secured around the building.

4-3-2 Architectural design

(1) Floor plan

In consideration of the limited land area on the planned site and the surroundings and natural environment at the site, it is planned that the main building be a four-story structure, the dormitory a two-story building, the technology development building a three-story structure, and the garage for heavy equipment be a single story building. A soil survey confirmed that, even with the above number of stories, pile driving would not be necessary.

It is planned that the main building and the dormitory will be central corridor grade level, and the technology development building will be staircase type grade level, and the line of traffic between the rooms will be short and configured for efficient use.

The configuration of the buildings will be as described below.

1) Main building

A library, which is envisioned for use by non-center persons as well, will be located on the first floor of the main building. Management and common rooms such as the machine room, carport, and guard room will also be located on this floor. On the second floor will be located administrative rooms such as the office of the Administration Division, the Director's room, and data processing room. Rooms of the Training, Technology Development and Information Divisions are located on the third floor. Training rooms, such as the training rooms and the seminar room, will be located on the fourth floor.

2) Trainees' dormitory

The first and second floors of the trainees' dormitory will each comprise five rooms: one room with a shower and four rooms without showers.

3) Technology development building

Because the first floor basement directly abuts the hydraulic laboratory's flank, the materials storeroom and workshop will be located there to increase convenience. The soil and concrete testing laboratories will be located on the first and second floors, respectively.

4) Garage for heavy equipment

Since bulldozers, dump truck, backhoes, loader and trucks with crane are of all different sizes, the garage will have sufficient floor space to handle them.

(2) Elevation and section plans

In principal, the buildings will have a sloping roof, which is widely evidenced in the area, and the main rooms will have double ceilings. In consideration of such items as the height of the ceilings of the main rooms, the facility space above the ceiling, and the cross-sections of the structural beams, the height of each floor has been established as presented below.

	Main building				Trainees' dormitory		Technology Development Building			Garage
	1st floor	2nd floor	3rd floor	4th floor	1st floor	2nd floor	B1 floor	1st floor	2nd floor	Single story
Ceiling height	3.0 m	2.7 m	2.7 m	2.7 m	2.7 m	2.7 m	–	2.7 m	2.7 m	5.0 m
Floor height	4.0 m				3.5 m		3.0 m			4.0 m

Although the main building and the trainees' dormitory will have a central corridor, to ensure natural ventilation and light, a transom will be located on the corridor side. In addition, it is planned to attach balconies to the dormitory bedrooms to ensure privacy.

Keying on ordinary brick facing, the most popular exterior facade in the area, the outside walls will be harmonized with the sloping metal roof to create a relaxed atmosphere.

(3) Architectural materials plan

In principal, architectural materials to be selected for the buildings of the DPTC will be appropriate for the meteorological and natural features of the site, and locally accepted materials and building methods will be employed. In consideration of accommodating the content of the facilities, creating facilities of superior economics and durability and facilitating maintenance, it is planned to utilize the materials and equipment described below.

1) Exterior finishing materials

Sprayed tile, which possesses excellent durability and workability, will be used together with brick facing, which is the most widely used exterior finishing material in the area, to create an exterior facing of relaxation acclimatized to the meteorological and natural features.

In addition, although clay tile roofing, which is seen widely on sloping roofs in the area, could be used, because of problems clay tile roofing has with water resistance and durability, with its excellent durability and workability, it was decided to use metal roofing material.

In consideration of ease of maintenance and privacy, aluminum sash will be used for the windows. As a crime prevention measure, use of a security grill or wire-glass windows will be examined.

2) Interior finishing materials

Interior finishing materials appropriate for the functions of each room shall be selected.

Table 4-3-1 Main finishing materials

Name of room	Floor	Walls	Ceiling	Selection criterion
Offices, seminar room, library, lobby	Parquet flooring	Paint finish	Acoustic rockwool board	Durability
Director's room, meeting room (1), chief advisor's room	Carpet	Vinyl cross-hung	Acoustic rockwool board	For administrative personnel and guests
Data processing room, design room	Carpet	Paint finish	Acoustic rockwool board	Sound absorption
Secretarial room, waiting area	Parquet flooring	Vinyl cross-hung	Acoustic rockwool board	For guest use
Seminar hall	Parquet flooring	Sound absorbing board, paint finish	Sound absorbing plaster board	Sound absorption, durability
Entrance hall	Polish terrazzo	Paint finish, section of brick facing	Plaster board paint finish	Durability
Canteen	Brick, tile veneer	Sprayed tile, and brick facing	Hardwood	Durability
Bedrooms	Parquet flooring	Paint finish	Facing plaster board	Durability, livability
Dormitory entrance hall	Parquet flooring, section of Polish terrazzo	Paint finish	Acoustic rockwool board	Durability, livability
Testing laboratories	Polish terrazzo	Paint finish	Facing plaster board	Durability
Workshop, materials storeroom, machine room	Anti-dusting floor paint	Mortar finish, paint finish for coping only	Fair-faced concrete	Durability
Storeroom	Anti-dusting floor paint	Paint finish	*Keikaru* board paint finish	Durability,
Toilets and pantries	Asphalt water, tile finish	Tile finish	*Keikaru* board paint finish	Durability
Corridors	Parquet flooring	Paint finish	Acoustic board	Durability

(4) Structural plan

1) Basic items

a. The main structures, including the main building, the trainees' dormitory and the technology development building, will be of reinforced concrete construction with a rigid frame structure. In principal, the exterior partition walls will be of brick construction.

b. Because it is thought that the soil bearing capacity at both the Pulchouk and Godawari sites is adequate for it to be used as the supporting surface, it has been decided to adopt a direct soil bearing foundation.

c. Although earthquakes occur infrequently in Nepal, it has experienced large earthquakes in the past, and anti-earthquake reinforcement of all buildings was examined.

2) Structural design policy

Although the structural design of this Project is based on Japanese structural design standards, to accommodate the conditions on the site, Indian standards will be applied effectively.

a. Dead load

The dead load is calculated in accordance with actual building conditions, such as the weight of the structure and finishing materials

b. Live load

The live load is calculated based on Japanese structural standards and construction directives taking into account the purpose of the building, the type and actual conditions of the room.

Table 4-3-2 Dead load and Live load

Unit : kg/cm^2

Type of room	Flooring & small beams	Beams, columns and foundation	Earthquake resistance
Offices/laboratory	300	180	80
Library	600	500	400
Bedrooms	180	130	60
Testing laboratories	500	400	200
Workshop, material storeroom, others	500	400	200

c. Resistance to earthquakes

According to Indian standards (National Building Code of India), Kathmandu is located in an area designated as Earthquake Zone V, and its basic lateral seismic coefficient is 0.08.

d. Wind load

$P = c \times q$	P = wind force in kg/cm^2
	c = wind pressure, coefficient
	q = velocity pressure
According to Indian Standard,	q = 150 kg/cm^2 (c = 1.0)
	c = according to Japanese Architectural Standard Code

e. Soil bearing capacity

According to the results of the soil survey conducted during the Basic Design Survey, the soil at the Pulchouk site consists of clay and sandy silt. With the ground upon which the building will rest being sandy silt, and taking into account the strength and sinkage of the ground, the design soil bearing capacity has been judged to be 6.0 t/m^2. Because of this, it was determined not to perform pile driving work.

According to the results of test bores, the soil at the Godawari site consists of a layer of stone. In accordance with the foundation of the hydraulic laboratory, the soil bearing capacity has been established to be 10.0 t/m^2.

3) Structural materials and miscellaneous considerations

The structural materials presented below were determined to be appropriate for the Project upon consideration of the scope, structure and use of the buildings, the local supply capabilities, product quality and building methods, as well as import terms and conditions and prices of materials from other nations.

a. Concrete

Although Nepal can supply the cement, importing of cement has also been considered in light of problems with Nepal's cement producing capacity. Fine and rough aggregate will be procured through local production.

The concrete will be ordinary concrete, and will exhibit a design reference strength of 210 kg/cm^2. In consideration of the quality of locally-produced aggregate and construction accuracy, it is planned to add construction deviation in order to achieve this strength.

b. Reinforcing bars

Considering Nepal's production capability for twisted bar, most steel bar will employ Japanese Deformed Steel Bar Standard SD30 and SD35.

Because main materials will be of Japanese manufacture, the reference values prescribed by the Japan Architectural Association will be applied as the permissible unit stress of the material.

(5) Facility plan

1) Basis of electrical facility plan

Although in principal the Project shall be executed in accordance with the electrical facility codes and standards of Japan, the conditions in Nepal will also be considered.

Although Japan Industrial Standards (JIS) will in principal be applied to the equipment, in consideration of maintenance after construction, products that are made of materials deemed to not reduce functional performance may be purchased locally.

2) Plan overview

• Pulchouk site

① Trunk facility

a. Main distribution frame (MDF)

Commercial electrical power will be supplied from an overhead distribution line running alongside the site road, and stepped down from a site utility pole.

Because the voltage fluctuation is large, an automatic voltage regulator (AVR) will be installed to prevent the equipment from becoming burnt or otherwise damaged. A surge arrestor will be installed to protect the MDF from voltage fluctuations brought on by lightning strikes.

MDF voltage : 3 ϕ, 3-line, 11kV, 50Hz
Transformer capacity : 200kVA x 1 unit

b. Generator

This generator is designed to be a backup power facility with enough capacity to maintain center activities.

Generator : Diesel engine generator (radiator cooled type)
3 ϕ, 4-line, 30kVA x 1 unit

c. Telephone

Three direct lines will be dropped from the telephone distribution board, and push-button (tone) telephones will be used.

• Godawari site

a. Electrical power supply facilities

Low voltage electricity (3-phase, 4-line, 440V/254V) will be received at the distribution panel board from the existing facility. The fire alarming device will be installed. And as a measure to prevent to damages the machinery, an under-current/over-voltage relay will be installed to implement a system that will cut off the current when a voltage fluctuation occurs. Because the soil and concrete testing laboratories contain numerous pieces of Japanese-made equipment, 100V power will be supplied as well.

b. Telephone facilities

An extension line will be laid from the existing facility.

c. Light fitting facilities

Mainly fluorescent lights will be used.

3) Ordinary electrical facilities

① Trunk power facilities

Cables will be laid from the main power distribution room to the each lighting panel board and power panel board.

Distribution voltage : 3 ϕ, 4-line, 440V/254V and 100V

② Light fitting facilities

Below is presented an overview of light fitting for each division.

Management / training divisions	FL40W x 2 recessed type	3 ~ 500 lx
Storeroom	FL40W x 2 direct month type	150 lx
Bedrooms	FL60W + table lamp	150 ~ 2000 lx
Exterior and parking lot	Mercury lamps	10 lx

③ Other facilities

Television antenna (cabled throughout compound), lightning arrestor (rod type), etc. are also planned.

4) Water supply and drainage, sanitary, ventilation, and air conditioning facility plan

Although, as detailed standards and codes for equipment facilities have yet to be established in Nepal, in principal, Japanese domestic standards will be applied to the equipment facility design, sufficient consideration shall be directed to conditions within Nepal in applying said standards.

• Pulchouk site

① Water supply facilities (see Fig. 4-3-1 Water supply system)

a. Water supply system

There are three ways to supply water to DPTC; city water, water truck and deep well. A comparison was made of the estimated running cost of each method.

Water supply condition	Amount of water used per day	10 m^3/day
	Amount of water use per month	250 m^3/month

a. City water

Charge 100,000L (100 t) or more : 8Rs/m^3

250 m^3 x 8Rs/m^3 = 2,000Rs/month

During the rainy season (July to October), it is assumed water will be supplied, but it may not be during the dry season.

b. Purchasing of water from water trucks ① NWSC's water truck

5m^3/one truck	400Rs/per truck : 80RS/m^3 50 times the water supply is needed	20,000Rs/month
8m^3/per truck	500Rs/per truck : 69Rs/m^3 32 times the water supply is needed	17,600Rs/month
10m^3/per truck	650Rs/per truck : 65Rs/m^3 25 times the water supply is needed	16,250Rs/month

If water is requested from NWSC's truck, it usually takes about 2 weeks to be supplied because there are many places waiting for the service.

c. Purchasing of water from water trucks ② Privately run Kavko Company

9m^3 ~ 10m^3/per truck	800Rs/per truck : 80RS/m^3 25 times water supply is needed : 20,000Rs/month

Water is supplied one or two days after application. However, where the water actually comes from is not identified, thus it is questionable whether it is drinkable.

d. Deep well water supply

The following table is a cost estimate for deep well water treatment facilities.

Table 4-3-3 DPTC water supply maintenance cost list

[Unit : Rs]

Maintenance item	Maintenance control period		
	5th year	10th year	Total
Filtration material (removal of iron, activated carbon)	120,000	180,000	300,000
Improvement of well (including inspection of underwater pump)	100,000	150,000	250,000
Filter pump back wash pump equipment	30,000	60,000	90,000
Dispatching of engineers (local)	10,000	20,000	30,000
Miscellaneous expenses and consumables	30,000	50,000	80,000
Total	290,000	460,000	750,000

1. Water processing equip. maintenance control cost — 750,000 Rs ÷ 10 years = 75,000 Rs/year
2. Chemical (bleaching powder) — 10 m3/D × 25 g x 0.17 RS/g × 300 days = 12,750 Rs/year
3. Electric fee — 8 hr/day × (1.1kw + 1.5kw) × 2.45Rs x 300 days = 15,288Rs/year

Total — 103,038 Rs/year = 343Rs/day (8,600Rs/month)
Charge per m^3 = 103,038 ÷ (300 x 10) = 34Rs/m^3

Obtaining water from the city water supply is the most economical method but there are time restrictions on the supply of water and it is supposed that the amount available will differ depending on the season, rainy or dry. A deep well can be relied on to make up the shortfall in city water, and, if the initial outlay is not included, it is found that it will be cheaper than buying water from a water truck, even after factoring in all costs, including maintenance, chemicals and electricity. With this approach water needs can be met immediately and it is certain that it will be a tremendous advantage for facility operation. In accordance with the results of this analysis, a combination of city water and a deep well shall be proposed as the water supply method.

- City-sourced water supply system for drinking water

  The city-sourced water supply system will draw water through 25 A branch lines from the main 400 A water line to the on site receiving tank.

After it passes through a chlorine sterilizing chamber, a storage pump will pump the city water held in the storage tank up to an elevated tank for city water. The water supply system will supply water to the drinking water system and to the sinks and shower water system. (See Appendix 11 "City Water Quality Analysis Table.")

- Well sourced water supply system
  For the well-sourced water supply system, a deep well pump will draw up water, pass the water through a sand separator and an aeration tank, and fill the raw water tank where the remaining sediments will settle. The well water held in the water tank will be pumped up to an elevated tank for well water. The well water supply system will supply water for washing instruments, cleaning, and the water sprinkler system. The well water system will not supply drinkable water. (See Appendix 11 "Well Water Quality Analysis Table.")

b. Estimated water consumption volume

[Estimated city water consumption volume]

Trainees'	10 persons x 300 L/person·day	=3,000 L/day
Office workers	25 persons x 100 L/person·day	=2,500 L/day
Total	5,500 L/day x a 1.2 safety factor = 7 m^3/day	

[Estimated well water consumption volume]

Trainees'	10 persons x 300 L/person·day	=3,000 L/day
Office workers	25 persons x 100 L/person·day	=2,500 L/day
Water sprinkling	2,000 m^2 x 0.05 L/m^2	= 100 L/day
Total	5,600 L/day x a 1.2 safety factor = 7 m^3/day	

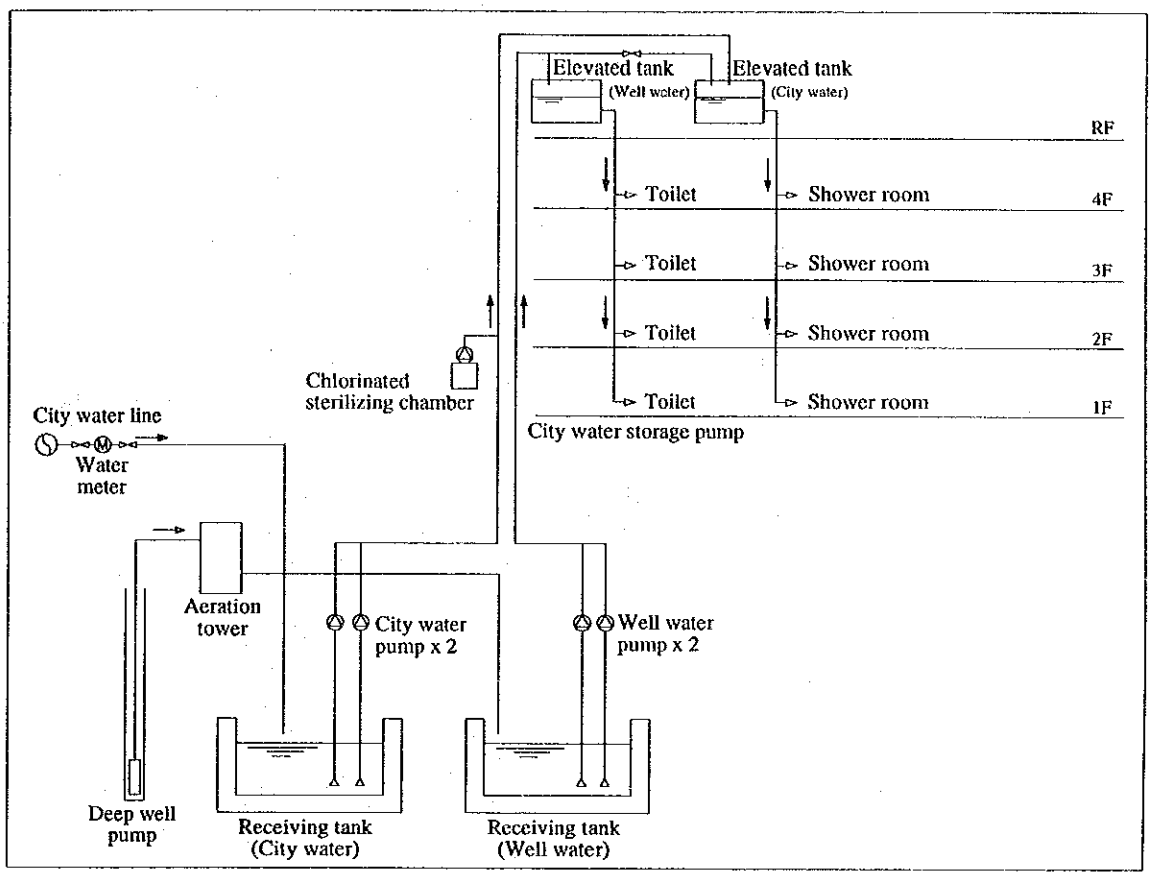


Fig. 4-3-1 Water supply system

c. Volume of elevated water tanks

- City water system

  It has been established that the receiving water tank shall be able to hold two-days worth of water, and the elevated tanks shall hold one-half of the water volume held by the receiving tank.

  Receiving tank $7\ m^3/day \times 2\ days = 14\ m^3 \rightarrow 20\ m^3$

  Elevated tank $20\ m^3 \div 2 = 10\ m^3$

- Well water system

  Raw water tank $7\ m^3/day \times 2\ days = 14\ m^3 \rightarrow 20\ m^3$

  Elevated water tank $20\ m^3 \div 2 = 10\ m^3$

② Waste water system

A waste water plan has been established in which the in-building waste water is separated into sewage water and mixed waste water systems. Because this site is not fully-equipped with a sewage treatment facility, both the sewage water and the ordinary waste water are treated in the sewage

water and mixed waster water systems and in the purification tank (septic type), and discharged through a filtration cup for filtration treatment.
Because the site is lower than the fronting road, rainwater runoff will be collected in one place, diverted to a rainwater tank, and saturated in the tank.

a. Sewage treatment tank

In consideration of maintenance, the treatment method of the sewage treatment tank will be appropriate for the local conditions. The capacity of the sewage treatment facilities is 144 persons as calculated by the sewage tank calculation method below.

Treatment method	Septic type		
Treatment Capacity (persons) (By the sewage tank calculation method)	Dormitory	422 m^2 x 0.07	= 30 persons
	Offices	1,887 m^2 x 0.06	= 114 persons
Total			144 persons

③ Hot water supply equipment

The hot water supply equipment will be rooftop solar panels (tank unitized body), which will supply the showers on each floor with hot water in the dormitory. In cases that solar panels cannot be used, this equipment will be used in conjunction with electric heaters to supply hot water.

a. Planned hot water volume

Trainees : 10 persons x 100L = 1,000L x a 1.2 safety margin = 1,200 L

b. Solar panels

Heat collecting panels	:	Flat panel type
Model	:	Natural circulation type w/irradiated panels (w/electric heater)
Effective working volume	:	400L
Number of units	:	3 sets

④ Sanitary equipment

To economize on water resources, water saving sanitary equipment will be employed. Toilets, sinks, cleaning basin, faucets, and showers will be installed in the required places.

⑤ Fire extinguishing equipment

Portable ABC fire extinguishers will be mounted in areas where the outbreak of fire is likely.

⑥ Air conditioning equipment

For cooling, ceiling fans will be mounted in each room, and a heat-pump type package will be installed in the data processing room.

⑦ Ventilation equipment

In principal, the buildings will be ventilated by natural air circulation, however, the following rooms will employ machine ventilation:

Offices, training rooms, dormitory, concrete test room, soil test room, machine room, restrooms, pantry, storage, etc.

• Godawari site

① Water supply facilities

a. Water supply system

Because the city-supplied water near the hydraulic laboratory is supplied 24 hours per day, it is planned to use only city water.

The line drawn off the water supply line running to the training building shall be one-half of its size. A pump shall supply water to the third-story elevated storage tank, and, from there, the water shall be supplied to the water faucets on the various floors.

b. Estimated water supply volume

Planned water supply volume	No. of faucets	Water vol/use	No. of uses/hr	Hours used	Total
1st floor concrete testing lab	4	15L	3	4	720
Equipment storage	2	15L	2	4	240
2nd floor soil testing lab	4	15L	3	4	720
Equipment storage	2	15L	2	4	240
Outside sprinkler faucets (w/box)	2	25L	3	2	300
Total	14				2,220 x 1.1* = 2.5 m^3

* Safety factor

c. Elevated water tank

2.5 m^3/day x 1/2 water volume = 1.25

② Waste water equipment

Waste water from the various floors will be connected to the training building waste water treatment tank.

③ Sanitary equipment

Faucets for flushing water will be installed in rooms and sprinkling faucets will be installed outside.

④ Fire extinguishing equipment

Portable ABC fire extinguishers will be mounted in areas where the outbreak of fire is likely.

⑤ Ventilation equipment

Using ventilation fans, number I type ventilation will be performed in the testing rooms on both floors and in the machine room.

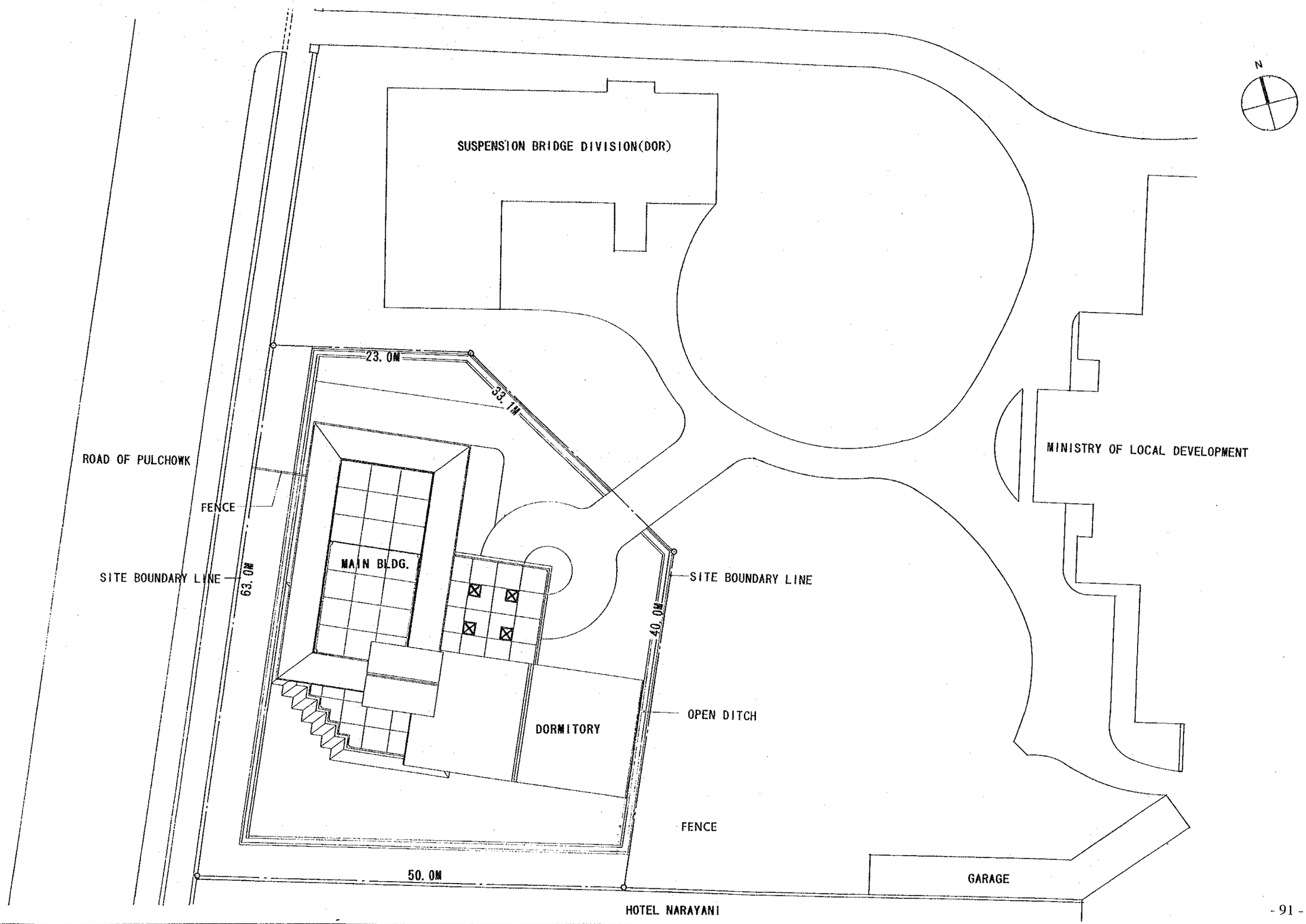
(6) Equipment Plan

The equipment that is being furnished to this Project through Project Type Technical Cooperation will be excluded from the scope of Grant Aid cooperation.

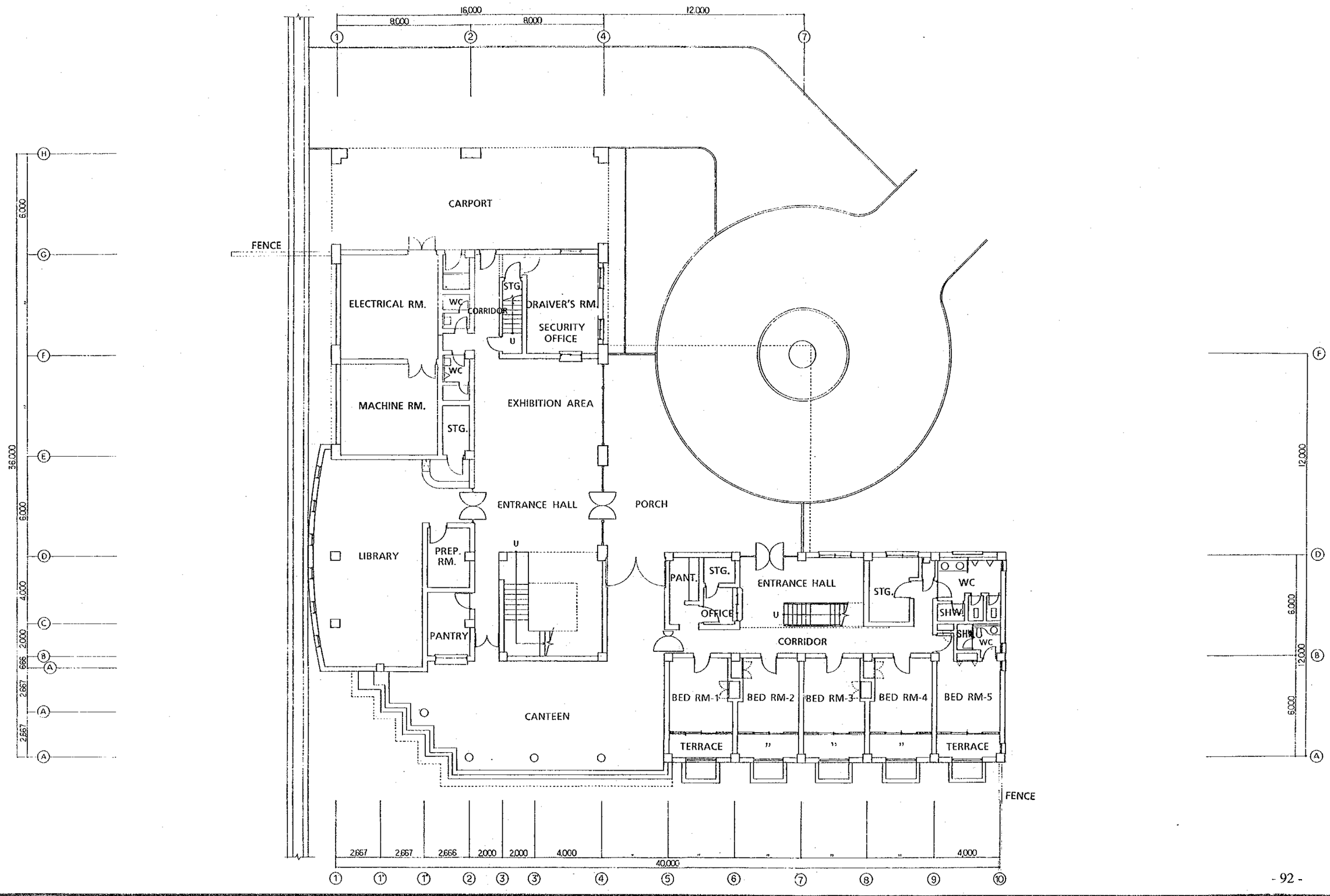
The equipment presented in Appendix 7, List of Equipment Supplied, lists the equipment furnished through Project Type Technical Cooperation through 1992. Because the apportionment for 1993 has also already been approved by the Japanese government, the plan reflects the provisioning of this equipment as well. Through detailed discussions with persons concerned on the Nepal side, the equipment layout was determined for the equipment to be furnished for the concrete testing and soil testing laboratories that are closely related to the building.

(7) Basic Design Drawings

1. Main bldg. & dormitory site plan
2. Main bldg. & dormitory 1st floor plan
3. Main bldg. & dormitory 2nd floor plan
4. Main bldg. 3rd floor plan
5. Main bldg. 4th floor plan
6. Main bldg. penthouse floor plan
7. Main bldg. & dormitory roof plan
8. Main bldg. & dormitory elevation
9. Main bldg. & dormitory elevation
10. Main bldg. & dormitory section
11. Technology development building site plan
12. Technology development building basement and 1st floor plan
13. Technology development building 2nd floor plan and roof plan
14. Technology development building elevation
15. Technology development building section
16. Garage for heavy equipment, floor plan, elevation plan
17. Main bldg. & dormitory infrastructure line plan
18. Technology development bldg. infrastructure line plan



特記	訂正	株式会社 久米設計 KUME SEKKEI	日付 / PA / 担当	WATER-INDUCED DISASTER PREVENTION TECHNICAL CENTRE IN THE KINGDOM OF NEPAL	図面番号 1
				MAIN BLDG. & DORMITORY SITE PLAN 1:400	設計番号



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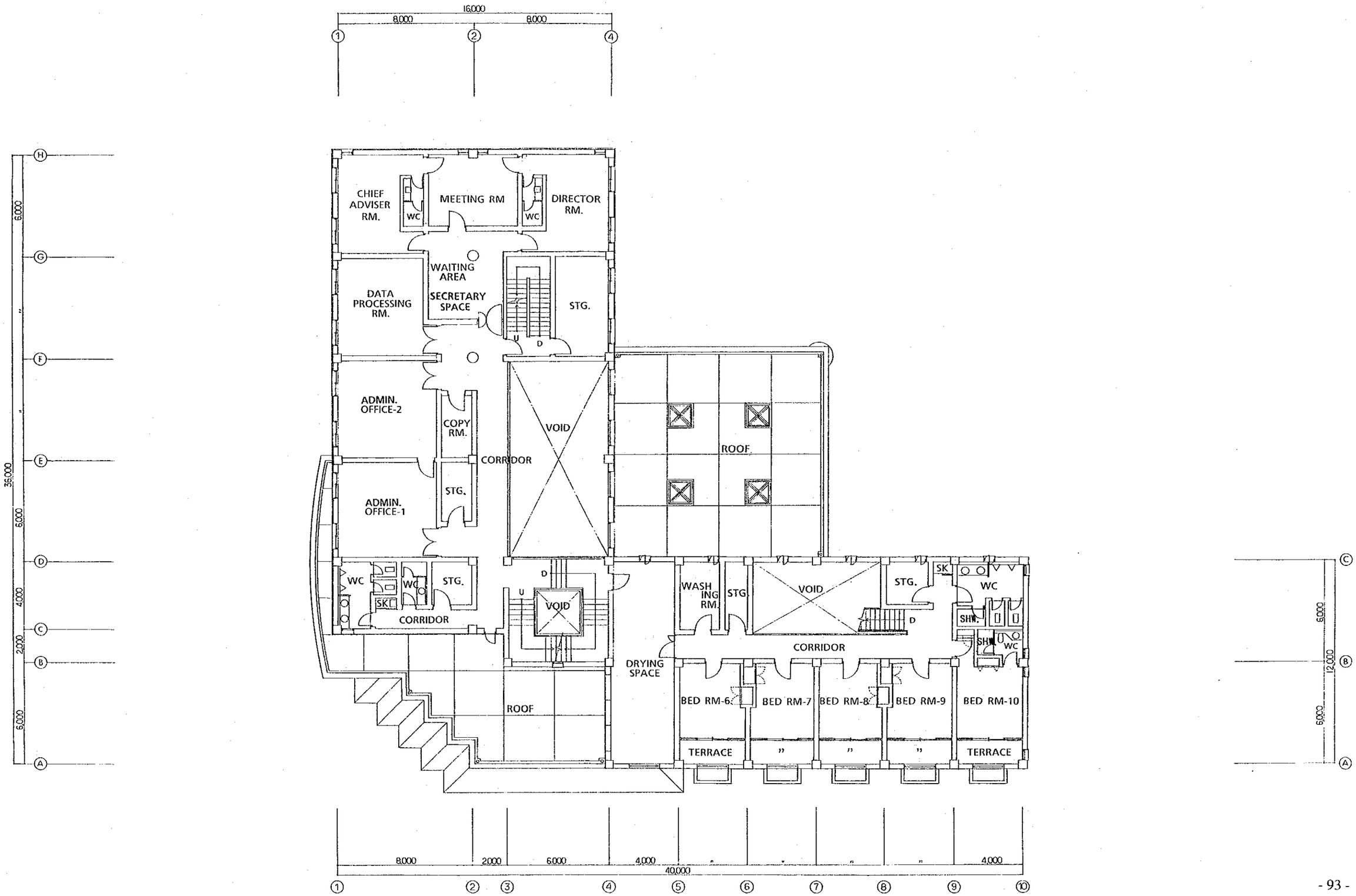
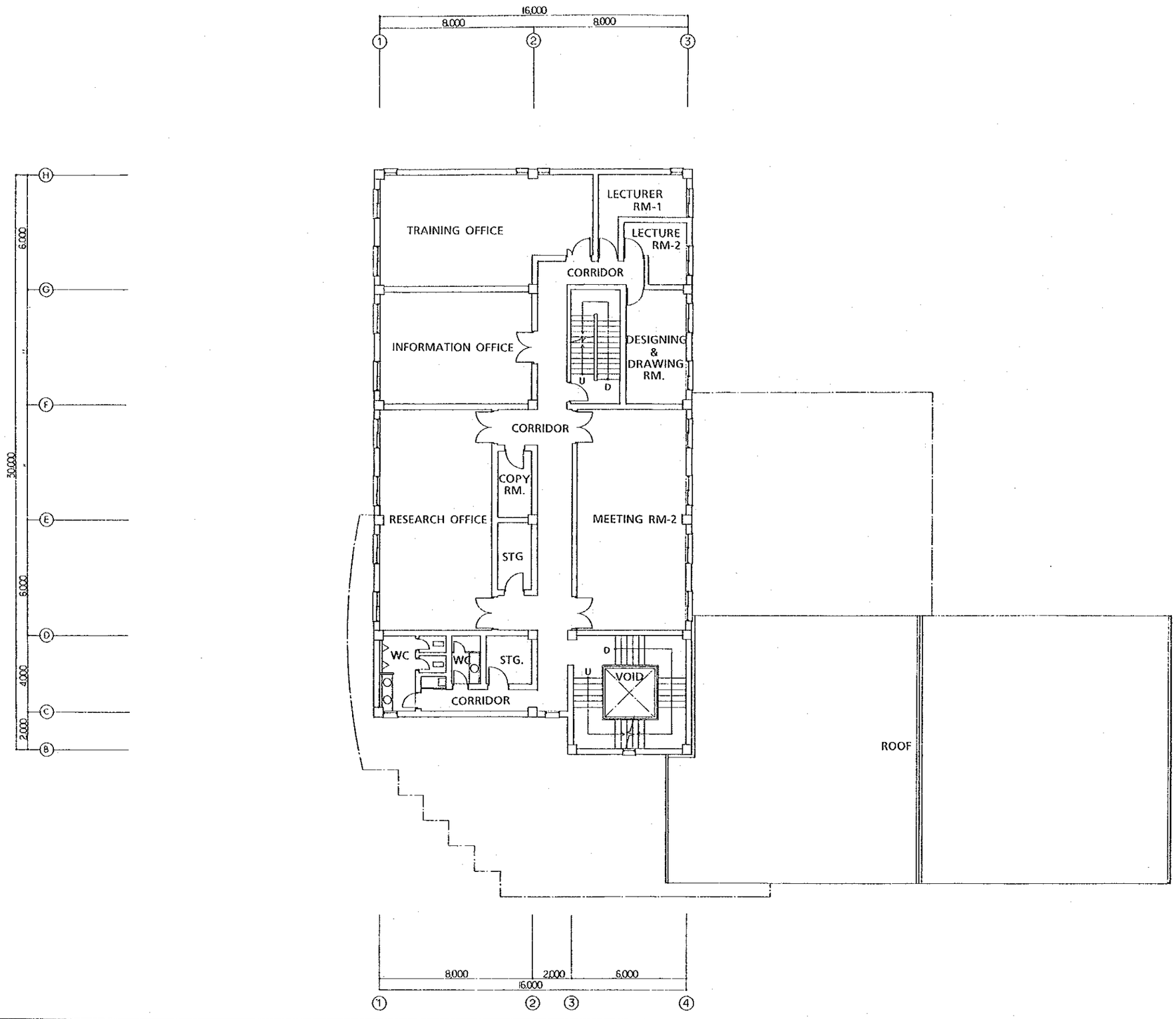


特記	訂正	株式会社 久米設計 KUME SEKKEI	日付 PA	WATER-INDUCED DISASTER PREVENTION TECHNICAL CENTRE IN THE KINGDOM OF NEPAL	図面番号 3
			担当	MAIN BLDG. & DORMITORY 1ST FLOOR PLAN 1:200	設計番号



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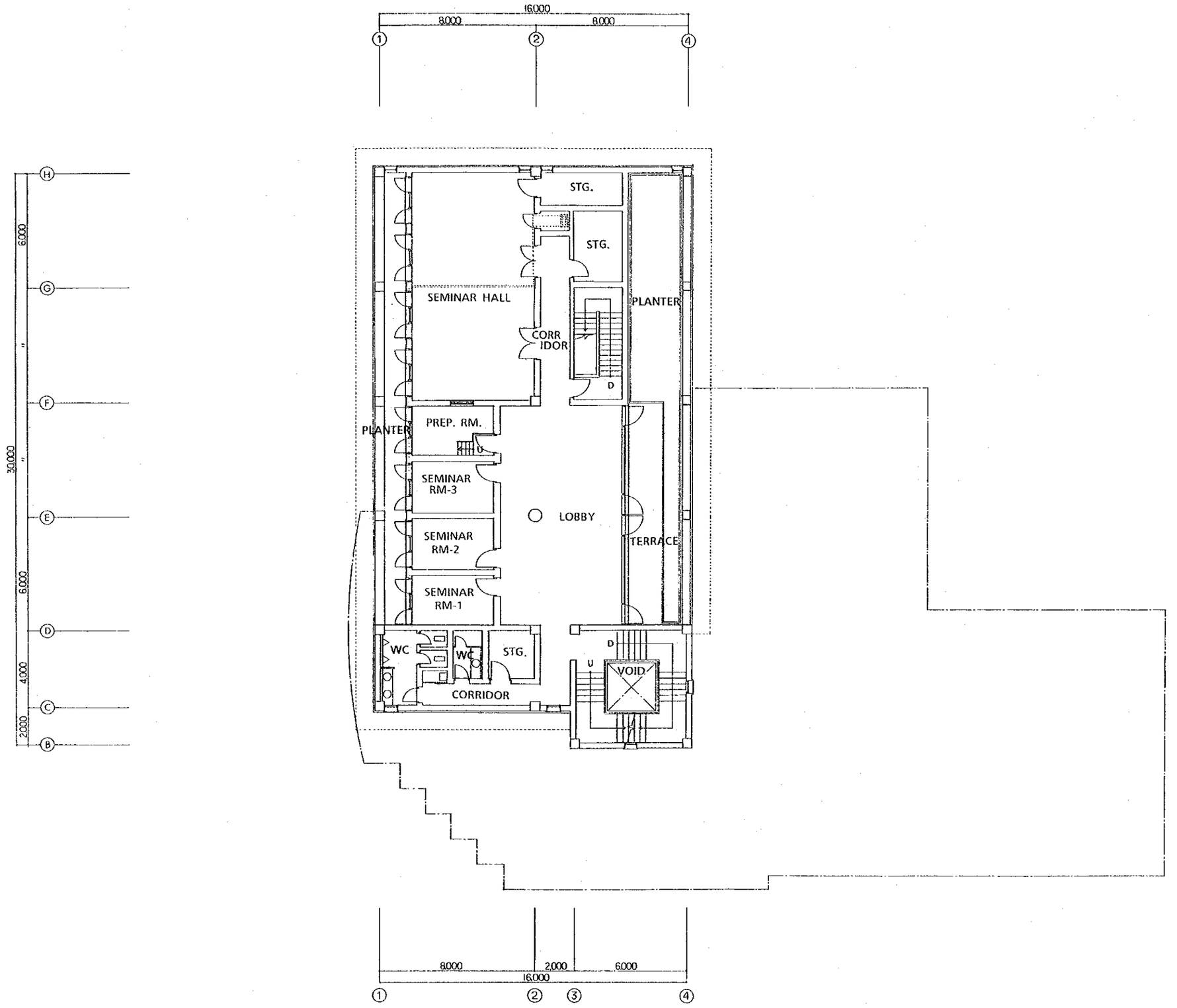

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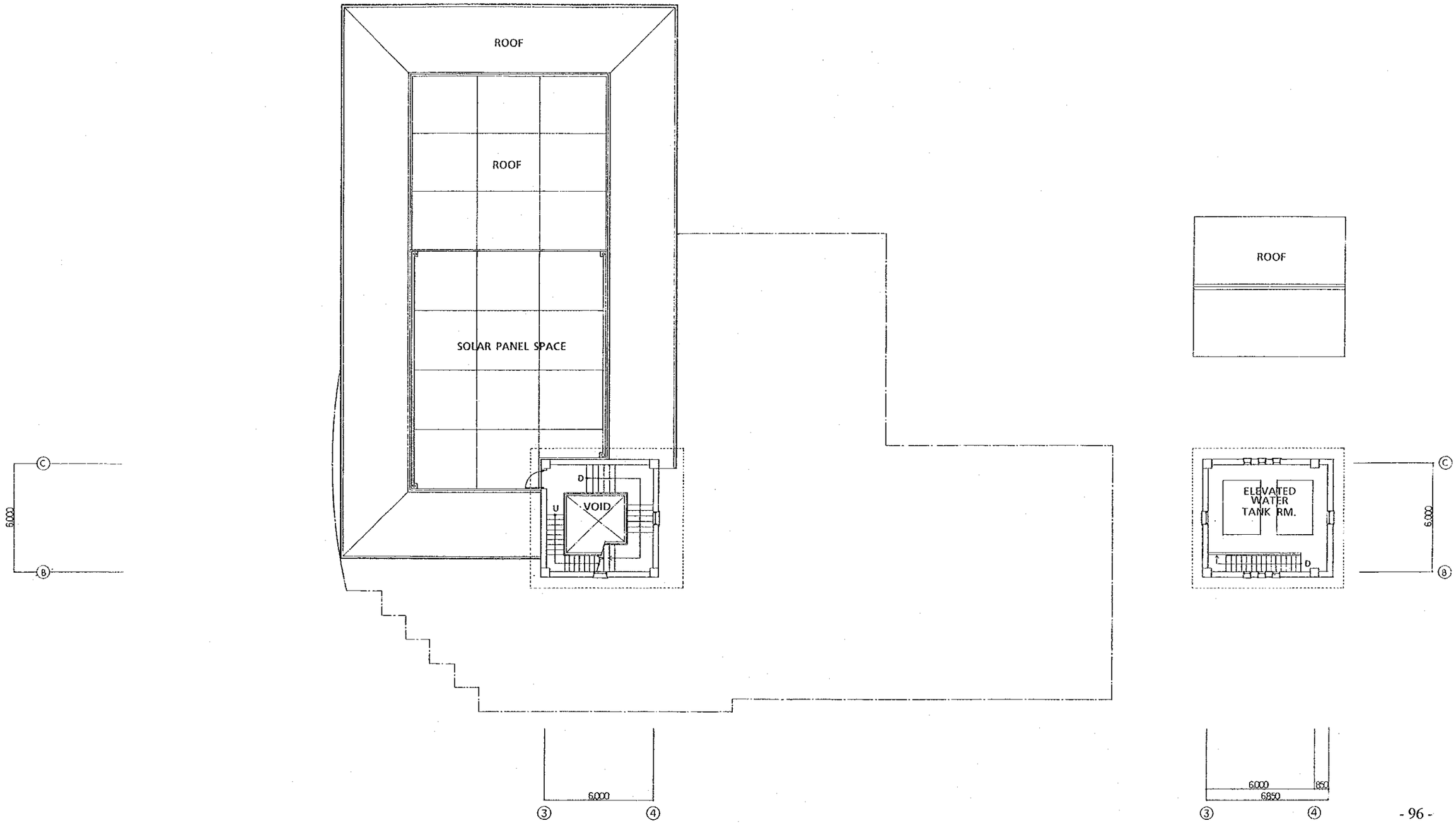

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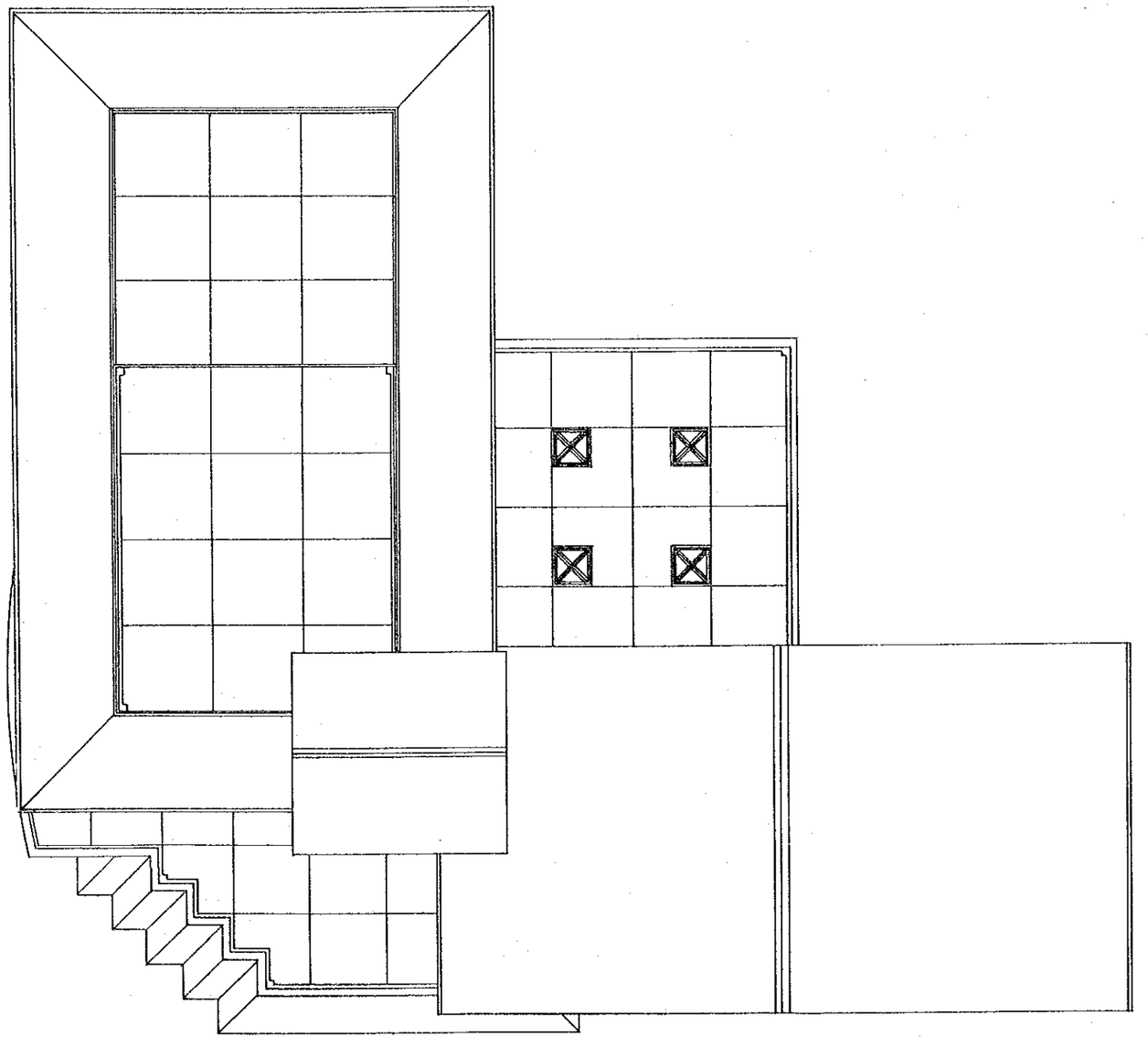
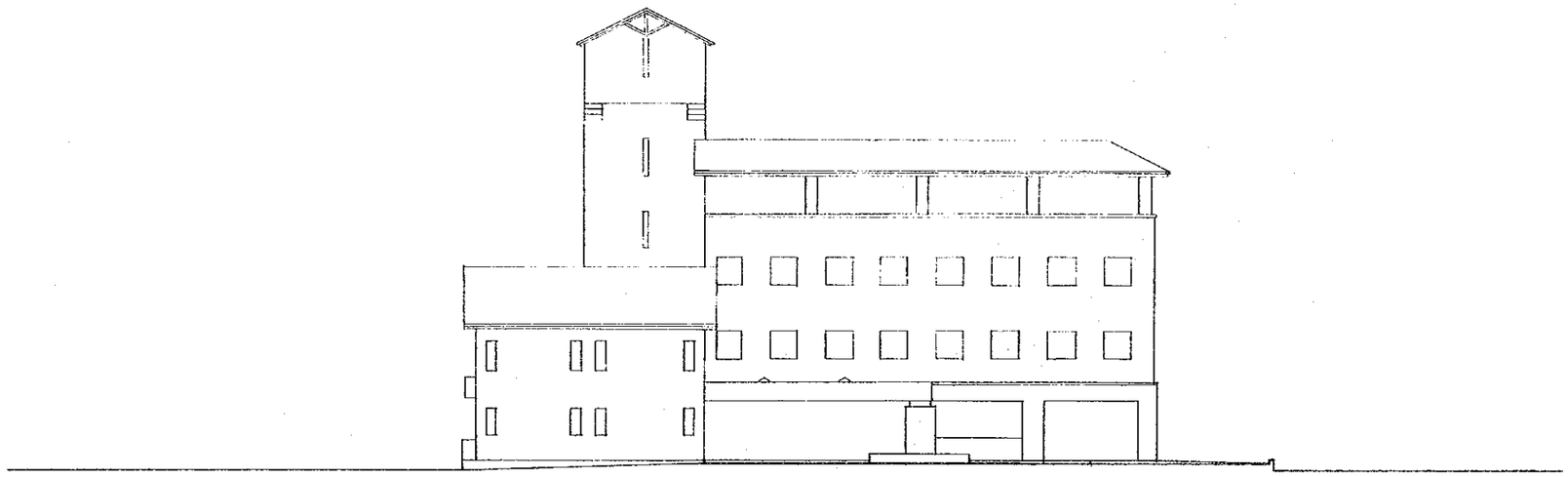
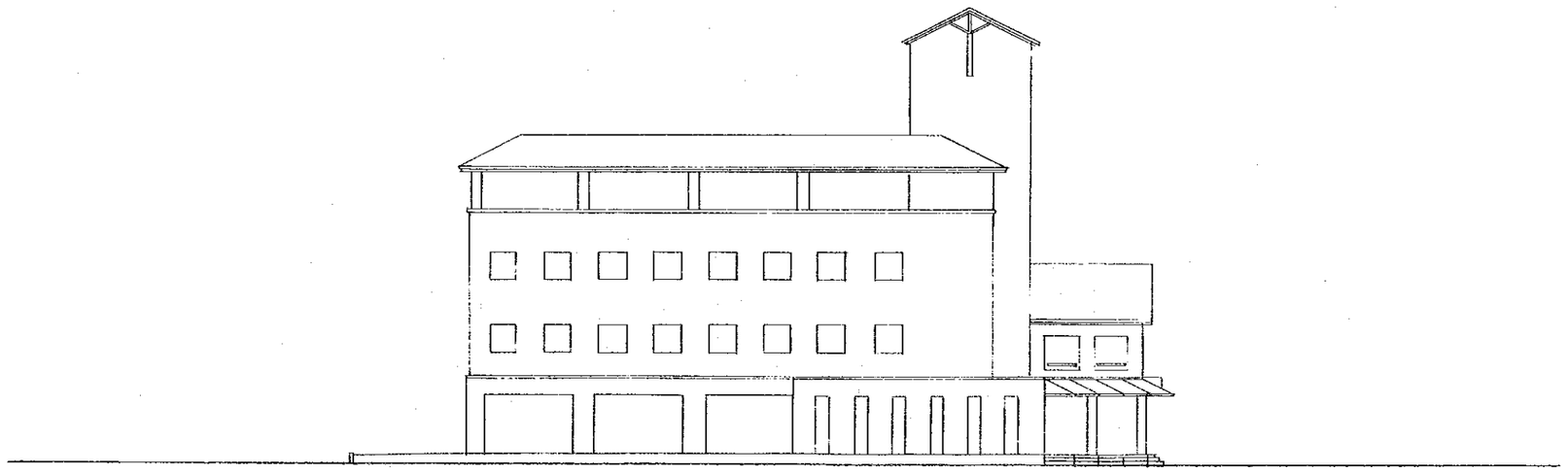


特記	訂正	株式会社 久米設計 KUME SEKKEI	日付 PA	WATER-INDUCED DISASTER PREVENTION TECHNICAL CENTRE IN THE KINGDOM OF NEPAL	図面番号 7
			担当	MAIN BLDG. & DORMITORY ROOF PLAN 1:200	設計番号



EAST ELEVATION



WEST ELEVATION

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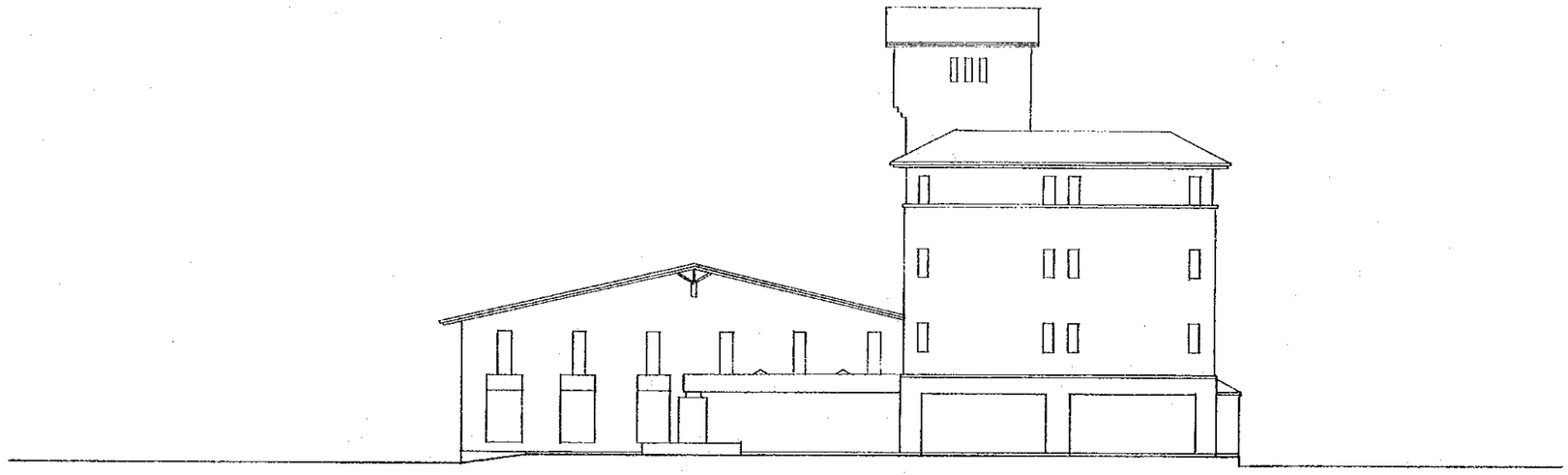
			PA	MAIN BLDG. & DORMITORY ELEVATION 1:300	



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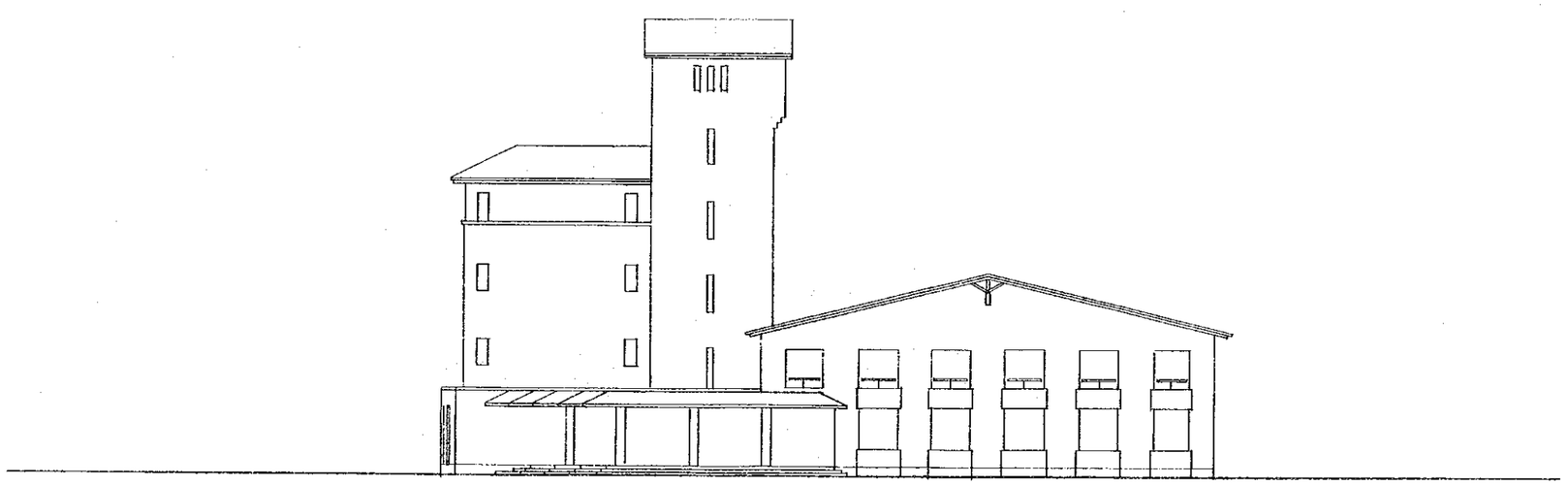

SOUTH ELEVATION

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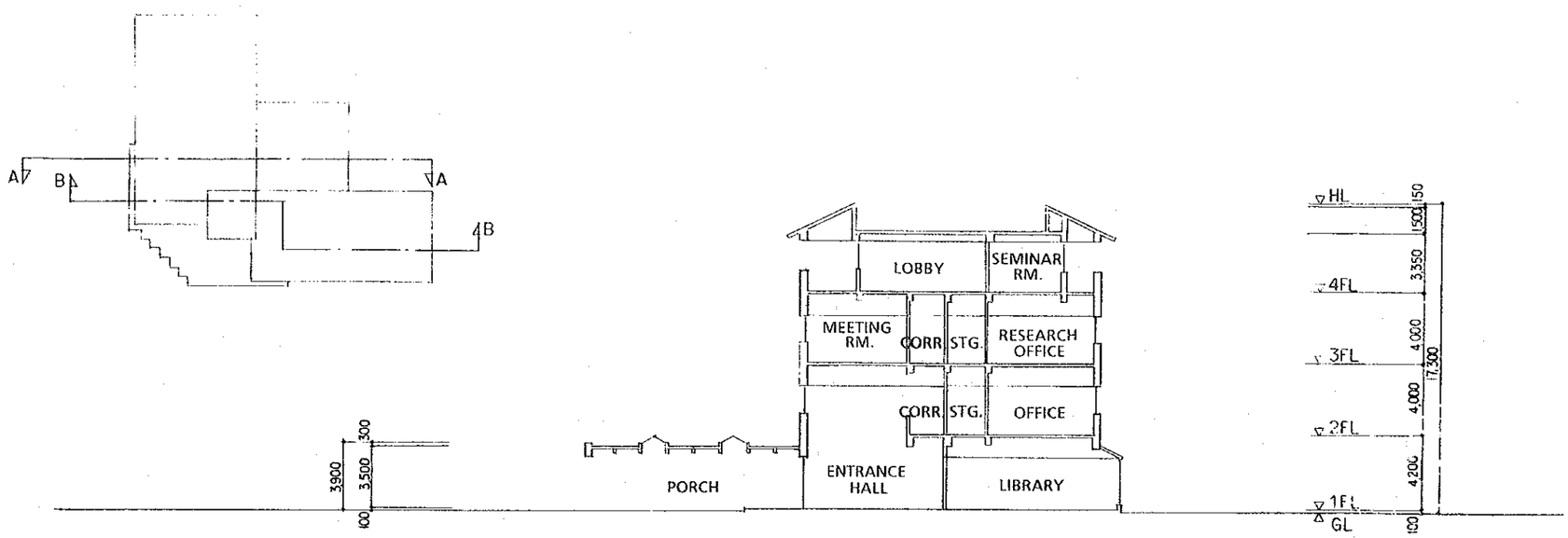
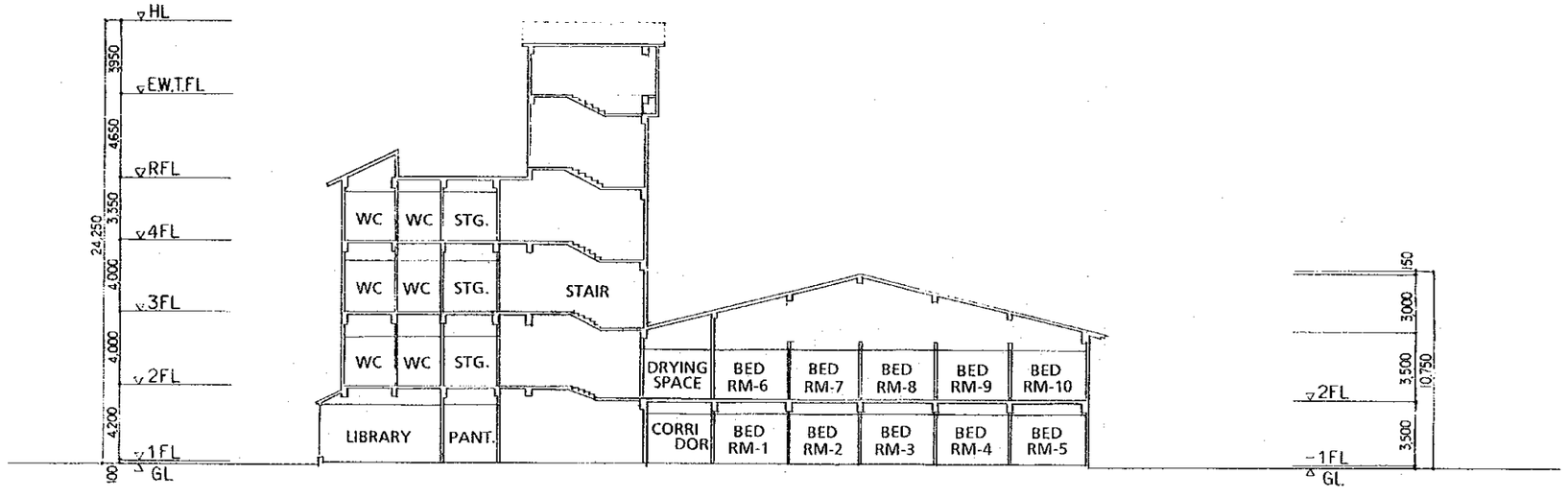


A~A SECTION



B~B SECTION

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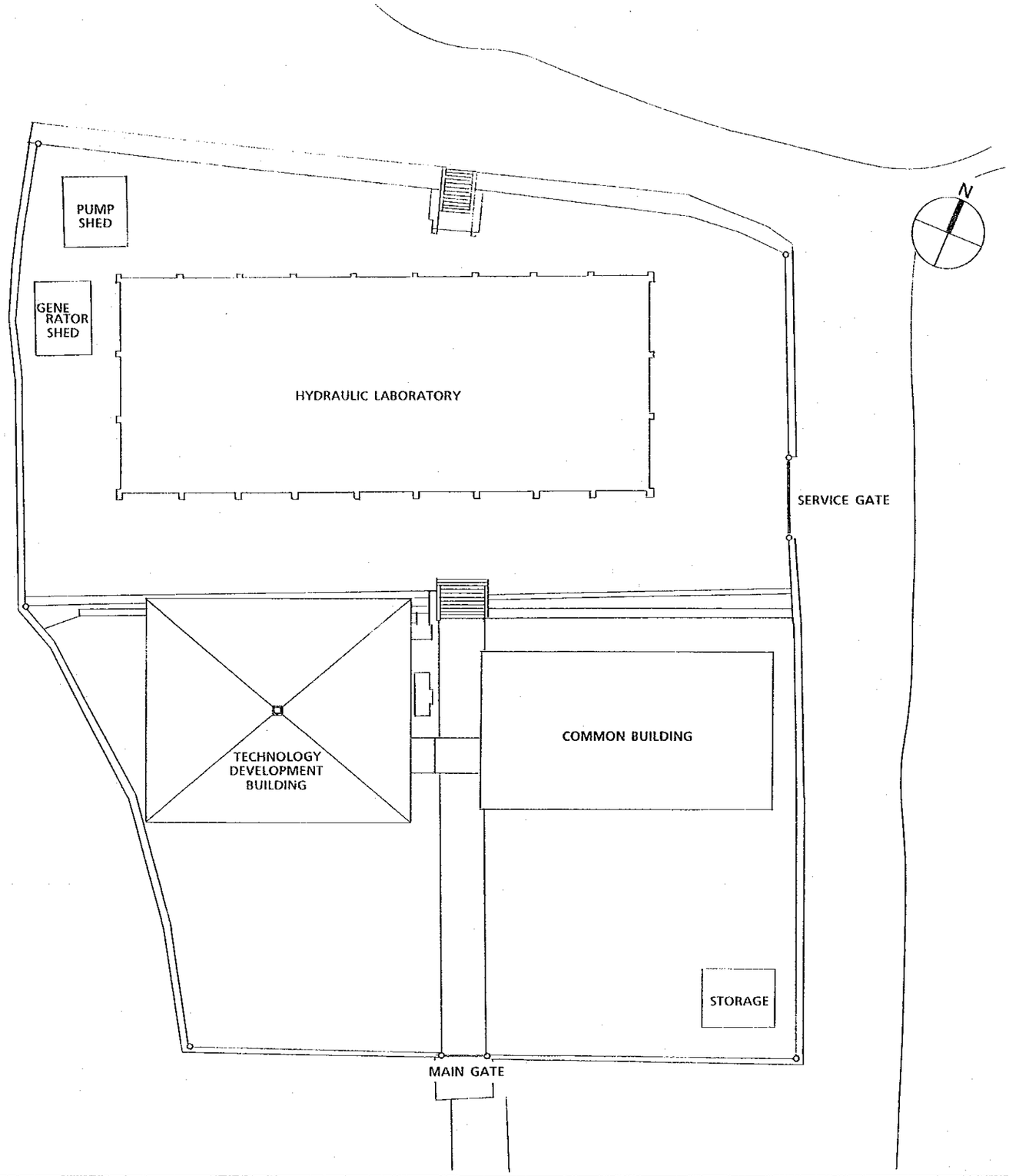

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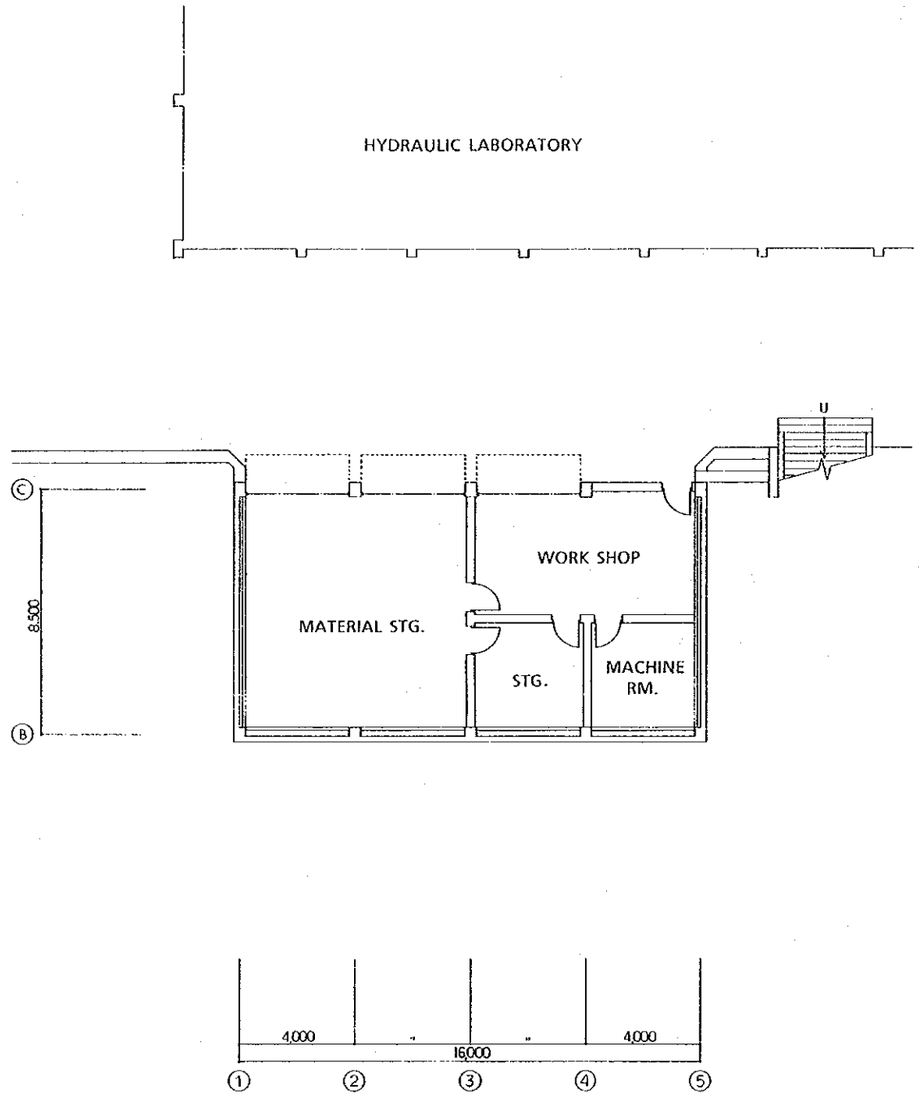
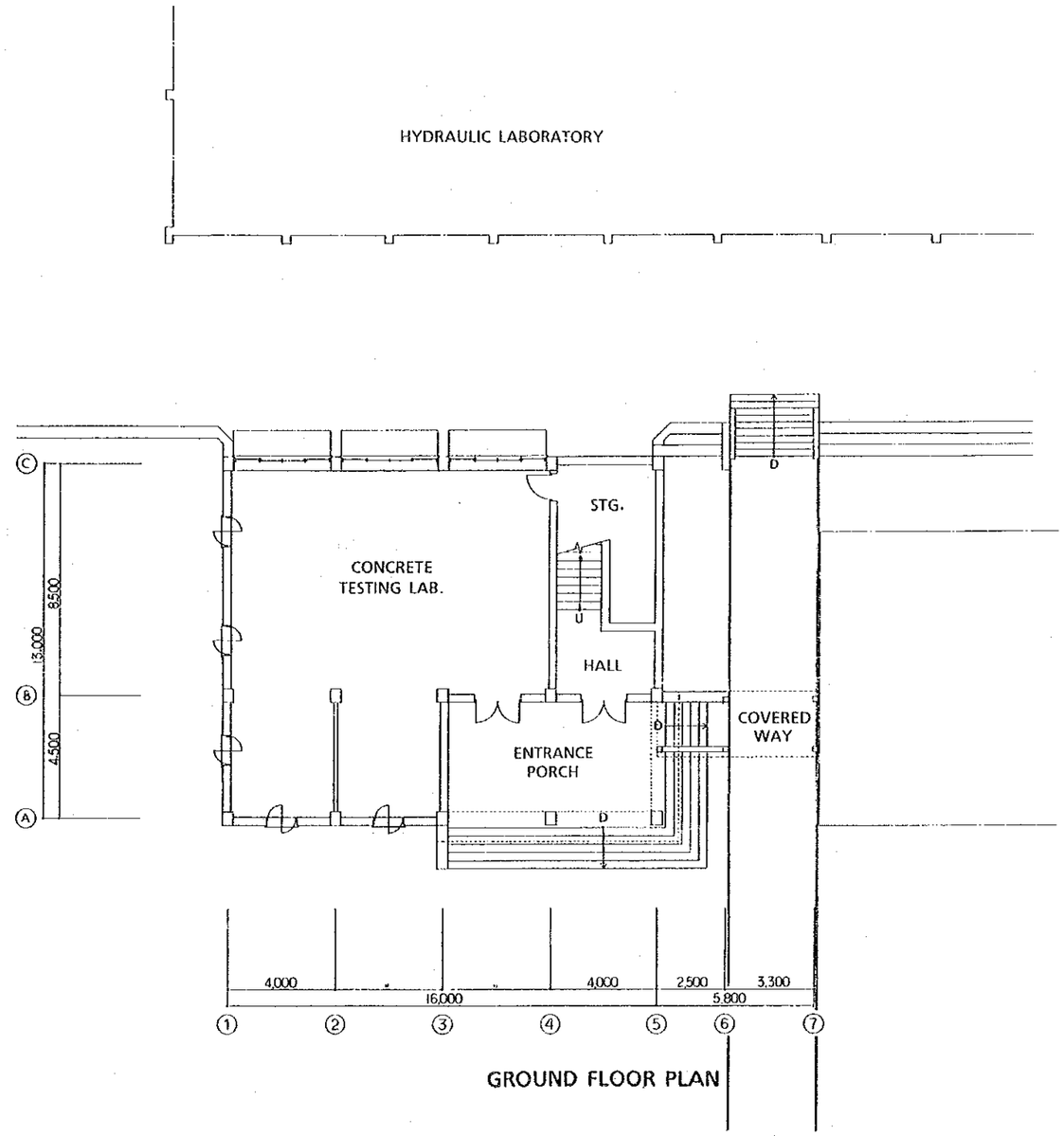
				TECHNOLOGY DEVELOPMENT BUILDING SITE PLAN 1 : 300	



BASEMENT FLOOR PLAN



GROUND FLOOR PLAN

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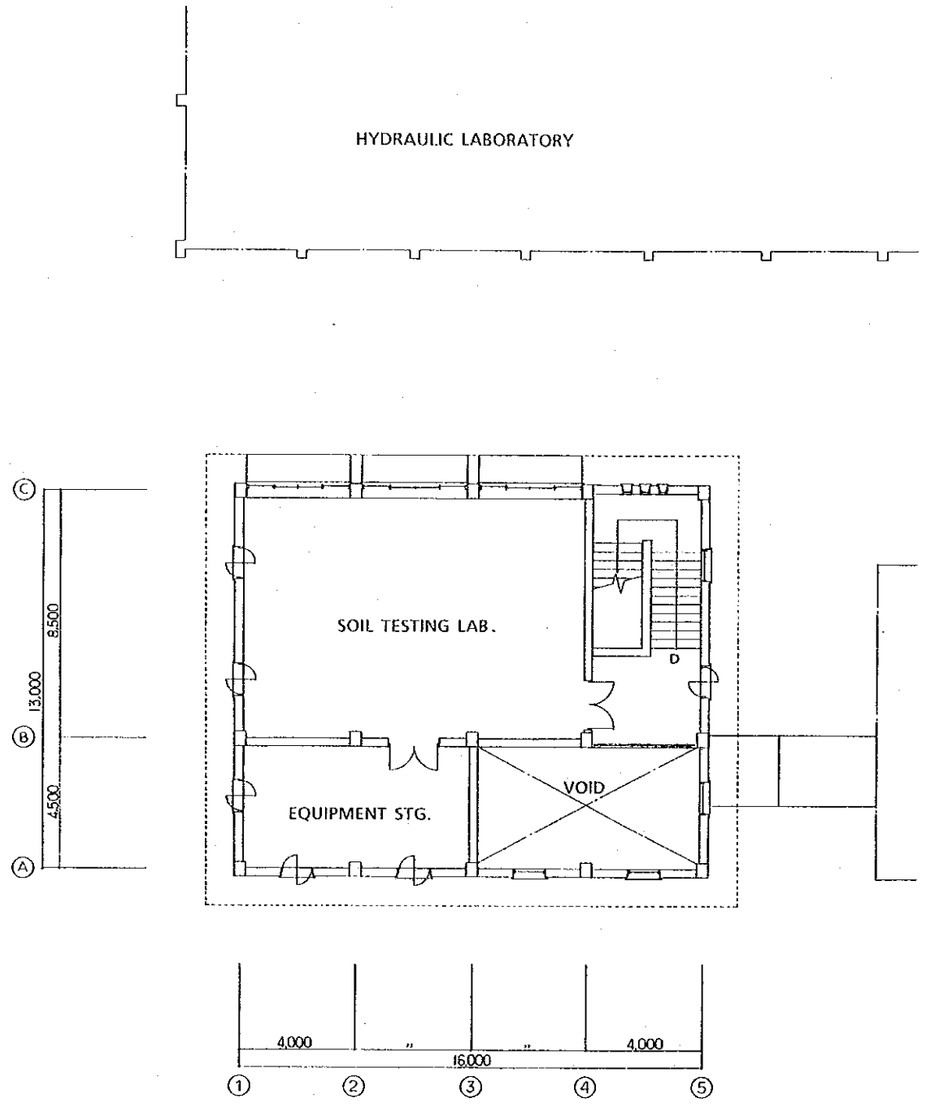
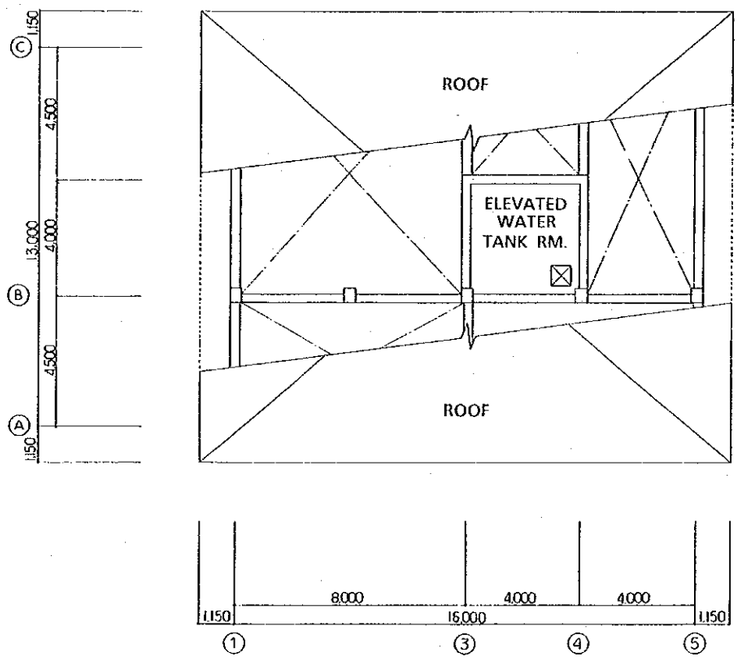


1ST FLOOR PLAN



ROOF PLAN

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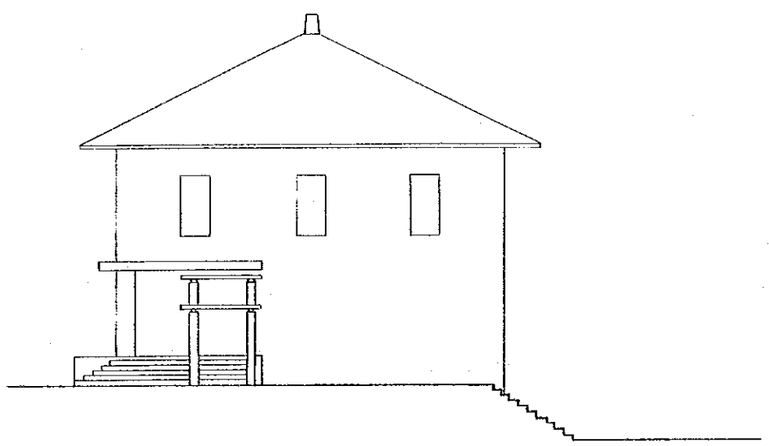
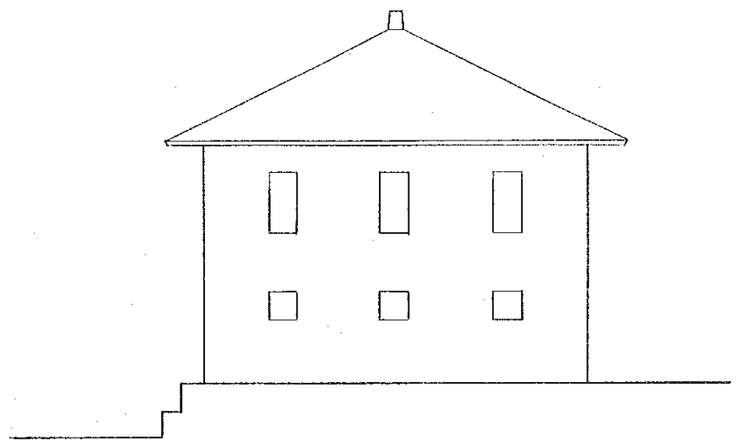


EAST ELEVATION



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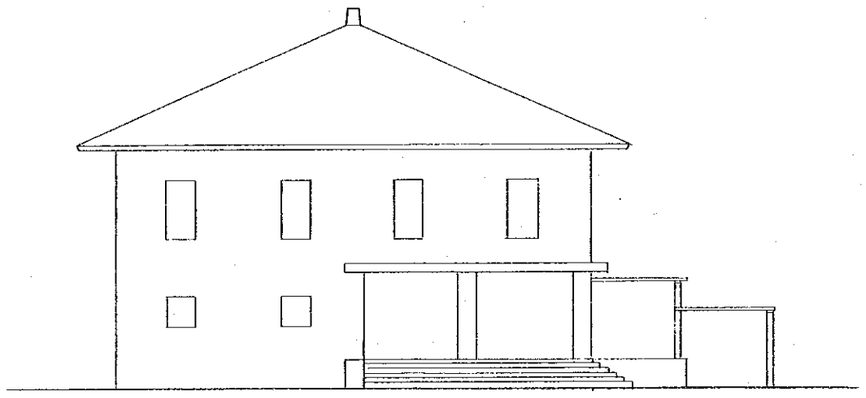
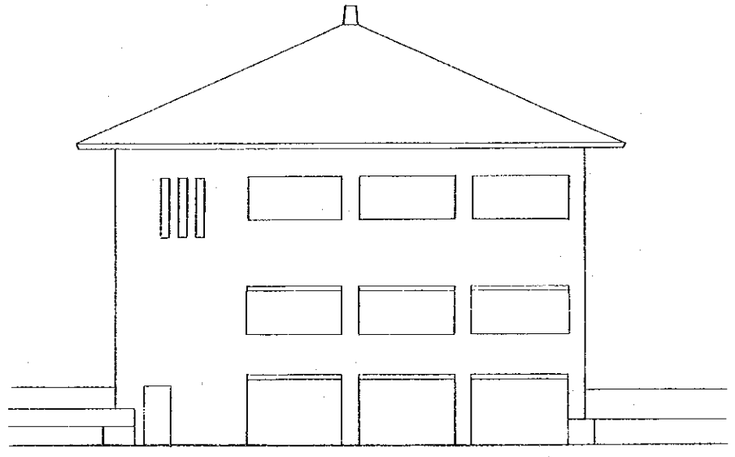


SOUTH ELEVATION



NORTH ELEVATION

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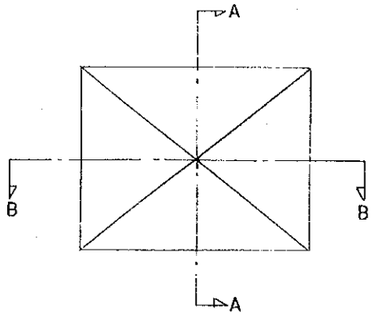
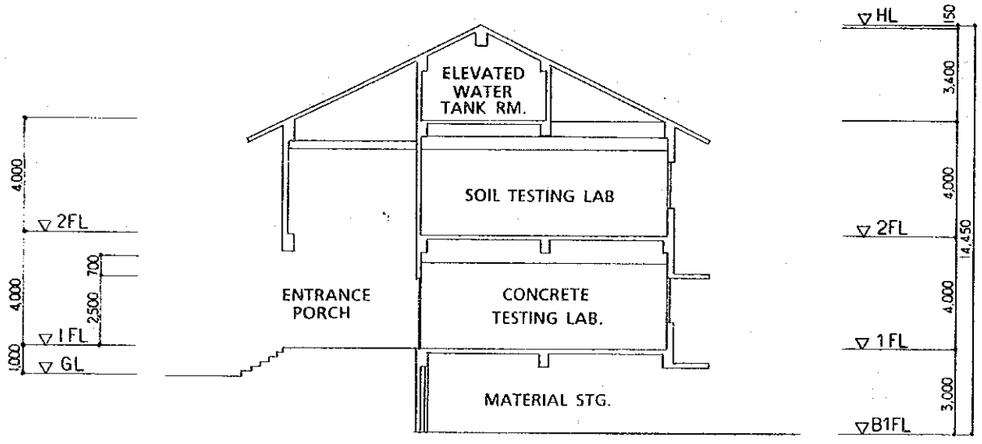
				TECHNOLOGY DEVELOPMENT BUILDING ELEVATION 1 : 200

14





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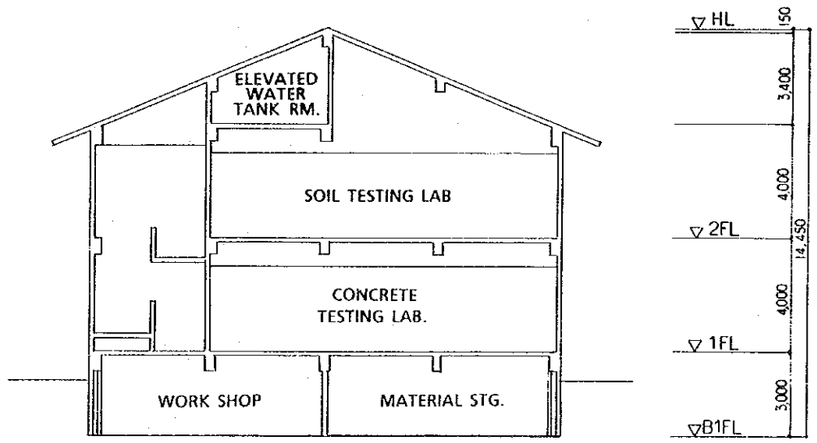


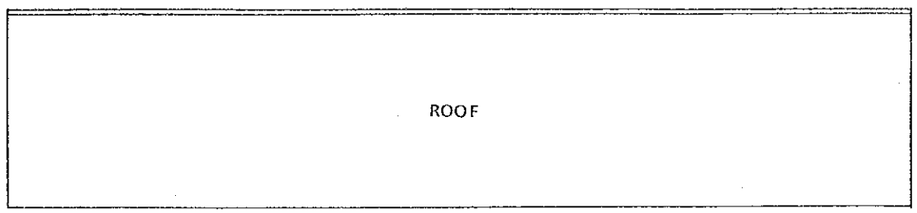
B~B SECTION

株式会社 久米設計
KUME SEKKEI

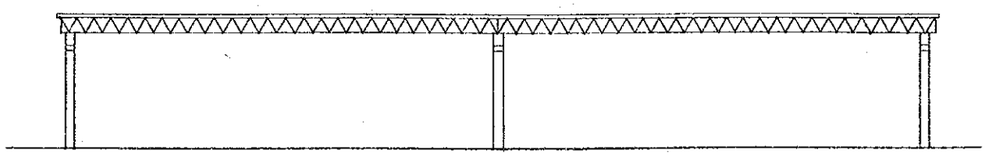
WATER-INDUCED DISASTER PREVENTION TECHNICAL CENTRE IN THE KINGDOM OF NEPAL

TECHNOLOGY DEVELOPMENT BUILDING
SECTION 1 : 200

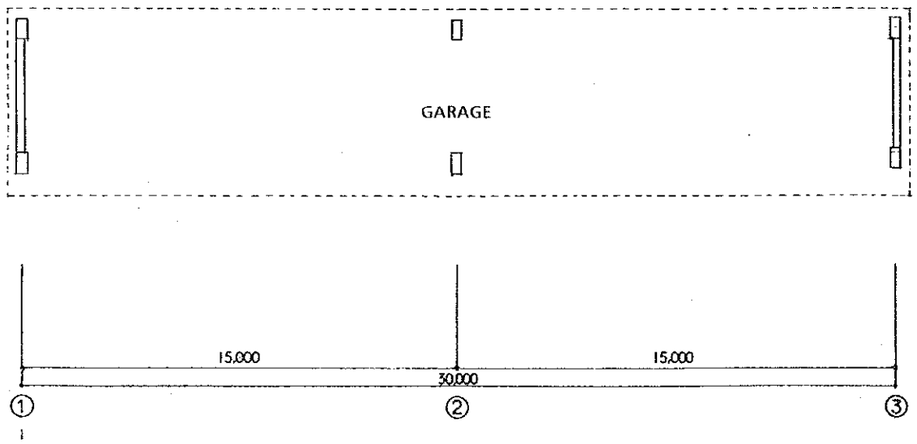
1 5



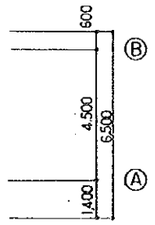
ROOF PLAN

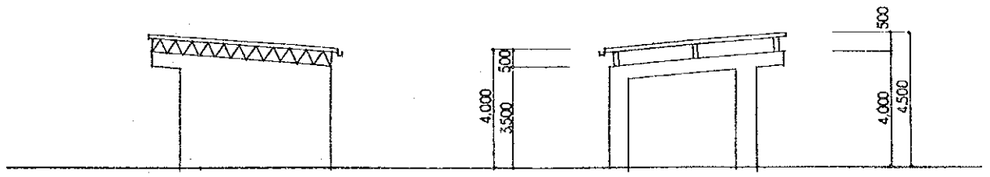


FRONT ELEVATION



PLAN

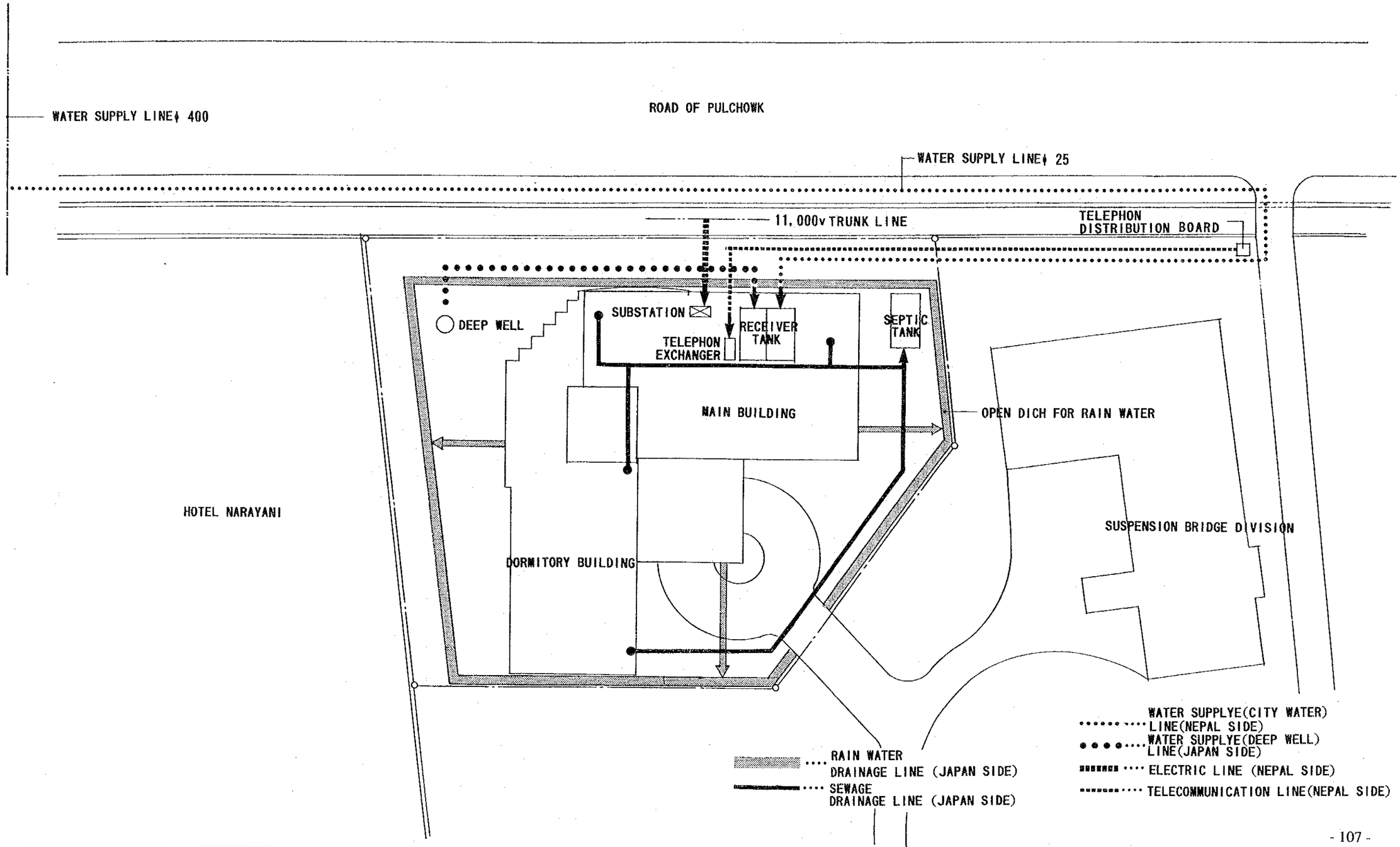




SIDE ELEVATION

SECTION

附記	訂正	株式会社 久米設計 KUME SEKKEI	日付 PA	WATER-INDUCED DISASTER PREVENTION TECHNICAL CENTRE IN THE KINGDOM OF NEPAL	図面番号 16
			担当	GARAGE FOR HEAVY EQUIPMENT 1 : 200	設計番号



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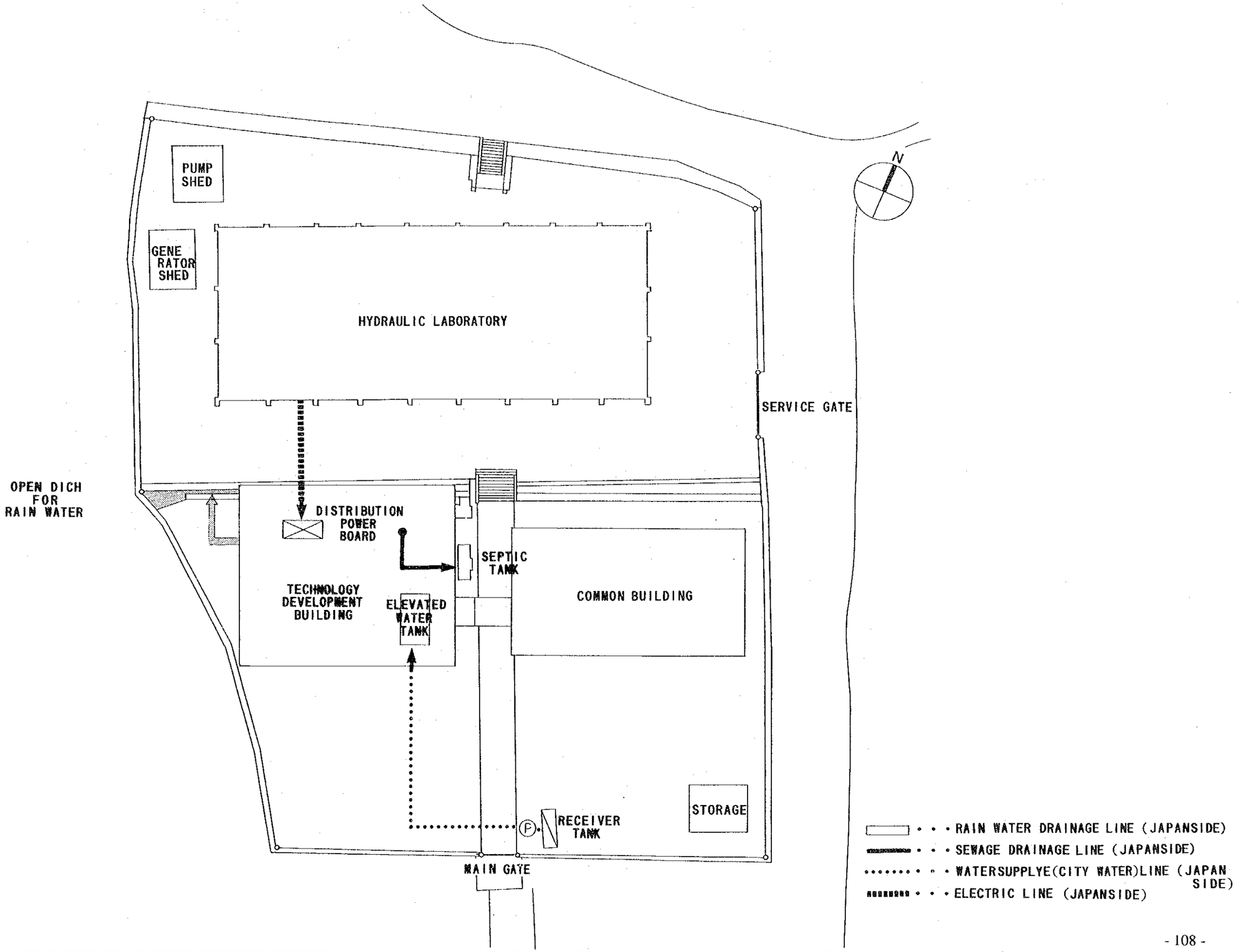


株式会社 久米設計 KUME SEKKEI		WATER-INDUCED DISASTER PREVENTION TECHNICAL CENTRE IN THE KINGDOM OF NEPAL	18
		TECHNOLOGY DEVELOPMENT BLDG. INFRASTRUCTURE LINE	

4-4 Construction plan

4-4-1 Project implementation procedure

The construction of the Centre under the Project will be conducted within the framework of the grant aid system of the Government of Japan. The Project will officially commence with the signing of the E/N upon approval of the Government of Nepal and the Government of Japan. The Government of Nepal will then select the Consultant (a Japanese company) to conduct the detailed design work for the facilities. The actual construction work will be conducted by the Contractor which will be a Japanese company and the successful bidder of the tender held following the completion of the detailed design documents. The basic issues and points to note in implementing the Project are explained below.

(1) Project implementation body

The government body responsible for the implementation of the Project on the Nepal side is the MOWR which will represent the Government of Nepal in the consultancy and construction agreements, etc. The MOWR has established the Joint Committee to manage the DPTC and the Project Type Technical Cooperation, operation of which has already commenced, with the Under-Secretary of the MOWR acting as the Chairman of the Joint Committee. The Director of the DPTC and managers of the various sections of the MOWR have begun their respective work in relation to the implementation of the Project and have established the Working Group to ensure the proper implementation of the Project.

(2) Consultant

A Japanese consultancy company will conclude a consultancy agreement with the Government of Nepal to become the Consultant for the Project and will be responsible for the detailed design for the Centre's buildings and supervision of the construction work to ensure the proper construction of the planned facilities using grant aid provided by the Government of Japan. The Consultant will also prepare the tender documents and will conduct the tender on behalf of the project implementation body.

(3) Contractor

The Contractor directly responsible for the construction of the facilities will be a Japanese construction company which is the successful bidder of the open tender as required by the grant aid system of the Government of Japan.

(4) Construction plan

During the detailed design stage, the Consultant and Working Group must maintain close contact and discuss the commencement timing of the construction work and the construction method to be employed for all types of the work to be completed by the Japanese and Nepal sides in view of the smooth implementation of the actual construction work.

In the case of the work described in 4.4.6 to be conducted by the Nepal side, commencement of the work prior to the construction of the Centre is essential in view of site preparation, including banking, and other earth work. It is desirable for the earth work and foundation work to be completed during the dry season (October to May) and, therefore, the construction schedule must be based on the local climatic conditions. Further attention should be paid planning the appropriate order of the various construction processes, taking the time required to transport the equipment to be procured in Japan to the site and the planning timing of work involving locally procured equipment and materials into consideration, so that idle waiting and repetition of earlier processes do not occur.

4-4-2 Implementation method

(1) Building

Although there are numerous construction companies in Kathmandu and the surrounding area, the number of technically skilled personnel that can be mobilized for this Project is limited. Accordingly, depending on the construction work but, at minimum, for steel framing and waterproofing work, technical guidance by specialized Japanese workmanship is required.

In recent years, good quality raw materials for brick, one of the main construction materials used in Nepal, have become difficulty to obtain. Thus, in addition to making early arrangements, care must be exercised to secure better quality through product inspection.

Aggregate, which is used as an ingredient of concrete, is likely to adversely effect the strength of the concrete because its particle size is generally too fine due to reasons of the nature of the soil and the flatness of the stones, and, so, care must be exercised when performing mixture ratio planning and trial concrete mixing testing. With respect to supplying concrete, because no ready mixed concrete plant exists in Kathmandu, concrete will be made by mixing the concrete in small mixers on-site. With respect to imported materials/equipment, in recent years, products from not only India, but from Thailand and Singapore have appeared in the Kathmandu area. The use of high quality products from whatever source should be vigorously promoted.

4-4-3 Construction and supervisory plan

In accordance with the policy on Grant Aid by the Government of Japan, an appointed consultant needs to organize a project team to carry out detail design and supervising services in accordance with the basic design policies. This ensures appropriate coordination among concerned parties, and the smooth construction of planned facilities.

At the construction stage, the consultant should allocate resident supervisors with ample technical capabilities to issue instructions to contractors and to communicate with them. Also, the consultant should assign technical experts on a short-term basis in accordance with the progress of the work, in order to carry out inspection, attendance, and instructions.

(1) Basic policies of supervision plan

- To keep close communication with the responsible agencies to complete the facilities on schedule.
- To direct and assist construction contractors.
- To give priority to local equipment, materials, and construction methods.
- To carry out technology transfer in relation to construction methods and technologies.
- To provide facility management agencies with appropriate advice and guidance for efficient operation and management.

(2) Scope of supervision

- Assistance in construction contract
  Selection of contractors, determination of construction contract method, preparation of contract forms, evaluation of cost estimates, and attendance at signing of contract.
- Inspection and approval of shop drawings.
  Inspection and approval of shop drawings materials, finished samples, equipment, and machinery submitted by contractors.
- Instruction on contract
  Evaluation of construction plan an schedule, instructions to contractors, and progress reporting to the owner.
- Assistance in payment approval procedures
  Evaluation of bills to be payable during or after the construction, and assistance in payment procedures.
- Inspection and approval
  Inspection and approval of work from commencement to completion, and ordering to remedy defects.

The consultant mission confirms the completion of work in accordance with the conditions of the contract, attends delivery of the completed work, and obtains acceptance from the owner. Also, they report to the Government of Japan any matters related to the progress.

The construction supervising system and related agencies considered above are depicted in the following figure.

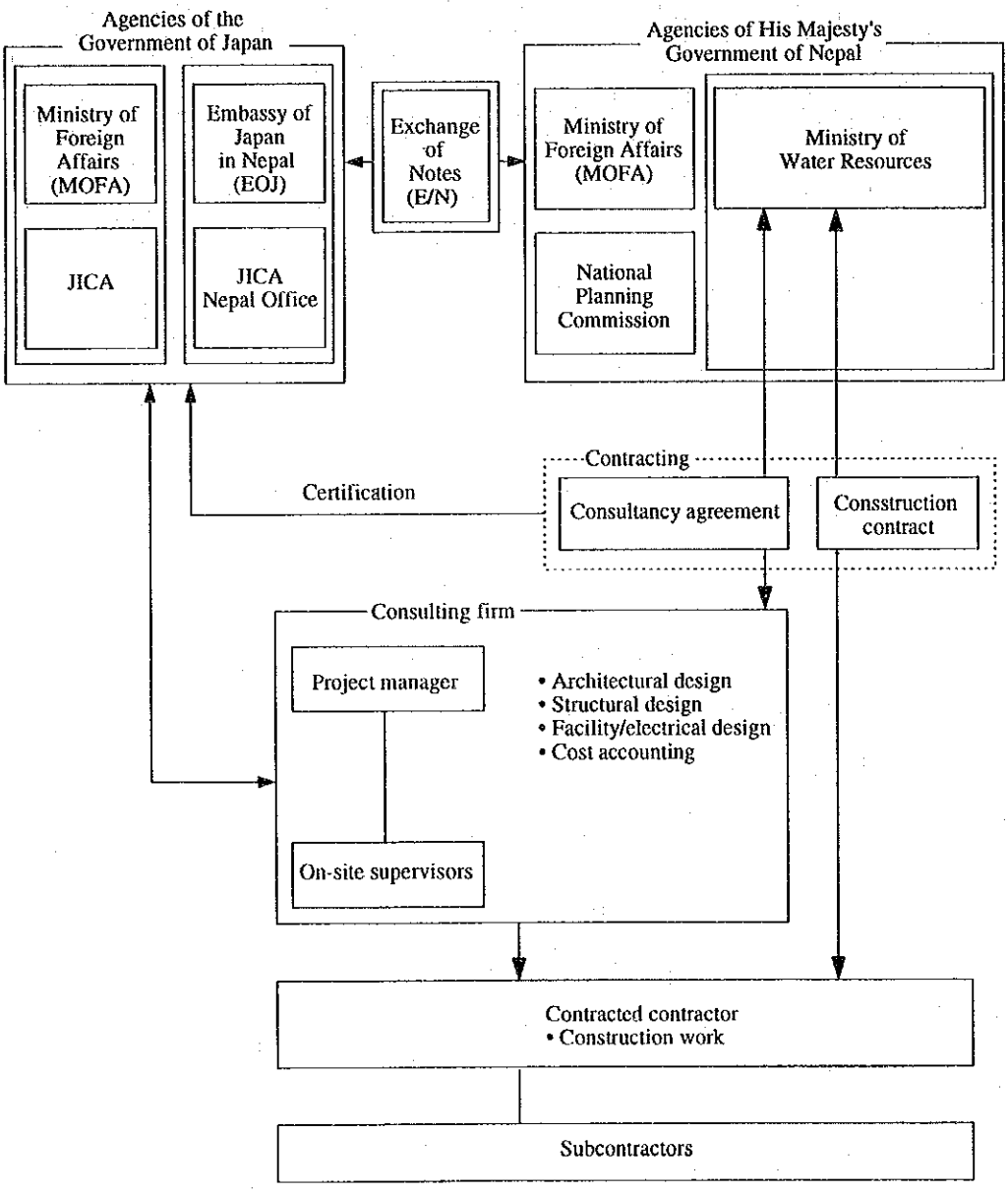


Fig. 4-4-1 Construction management system

(3) Construction supervisors

In order to complete construction of facilities as per the design documents within the period scheduled for construction, the ability to smoothly administer operations undertaken in collaboration with local representatives of Nepal based construction firms and the ability to provide technical guidance appropriate to local construction firms is required. In order to ensure the best quality possible, it is recommended that construction supervisors who already understand the character of the DPTC and who possess experience in constructing research and training facilities be employed.

The number and type of on site supervisors required from the standpoint of the scope and content of the facilities of this centre are presented below.

• Facilities

Director, head architect	: 1 person	Overall management, architectural guidance, construction management
Head architect & draftsman	: 1 person	Work management & construction diagram drafting guidance
Facility & electrical foreman	: 2 persons	Facility and electrical guidance
Office manager	: 1 person	Management of imported equipment/ materials, labor and office work

4-4-4 Procurement plan

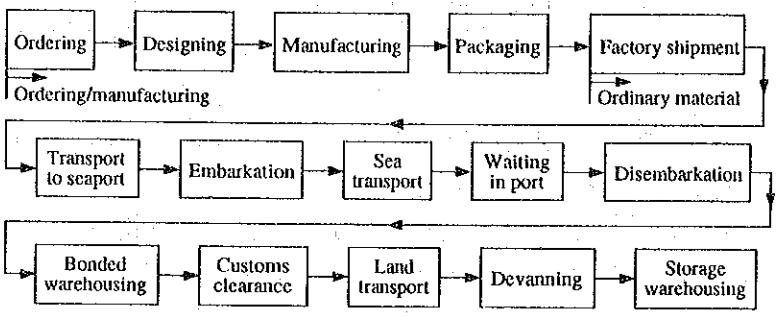
(1) Building construction

Special attention will be directed to the following points in procuring the equipment and materials to be used in the DPTC.

1) Procurement from Japan

The construction materials to be procured from Japan will be ordered and manufactured. Because the number of days required to manufacture materials such as steel fittings, transformers, and power receiving and distribution panels is greater than that for material that is routed through the ordinary market channels from ordering → design (approval) → manufacture → packaging → shipping, the ordering must be performed in accordance with the state of construction progress. (See material order flow)

• Material order flow



Materials other than those procured locally will be disembarked at the Port of Calcutta, and transported by road to Nepal. Customs clearance procedures are performed at the border between India and Nepal, that is, between the cities of Raxaul and Birgunj. Although there are two routes from Birgunj to Kathmandu, the mountain road route from Hetauda is unsuited for transporting material and equipment during the monsoon season, and, although a bit longer, the route passing through Bharatpur is the route that is normally used.

As it may require more time than expected to complete local port disembarkation and clearance customs procedures, close contact with the executing agencies of this Project must be maintained to effect the smooth performance of these procedures.

2) Local procurement

Because obtaining equipment and materials and facility maintenance becomes easy and prompt repair of equipment also becomes feasible, local procurement shall be utilized as much as possible. However, if performance or supply capability is determined to be insufficient, equipment and materials shall be procured from Japan.

3) Study of the procurement from third countries

We studied the possibility to procure some of the construction materials from India and South-East Asia (third country), however considering the short term of the construction period, i.e., 12 months, and the material quality, production quantity and term of those products, it is prospected the difficulty to procure them. We concluded that this project will not procure any construction materials from third country.

4) Cost

In principle, procurement will be based on whichever of the two options turn out to be cheapest : local procurement, or procurement from Japan. When the difference is not significant, after checking performance factors, local procurement will be used because maintenance is greatly simplified. When

equipment and materials are to be obtained from Japan, note that packing, transportation and insurance costs must be added and the tax shall be exempted by grand aid project rules.

Based on these conditions, procurement of equipment and materials to be used for the DPTC is as follows. (See Table 4-4-1, "List of countries from which materials may be procured.")

Table 4-4-1 List of countries from which materials may be procured

Work	Material / equipment	Procure locally	Procure in Japan	Remarks
Structural work	Sand, gravel	○		Rich in materials
	Cement	○		Problem with supply volume, procurement from Japan will also be considered.
	Concrete	○		Locally mixed concrete obtainable
	Reinforcing steel	○		Although easier to break than Japanese-made, it is usable
	Forms	○		Lower number converted than in Japan
	Steel framing	○		Heavy framing to be imported from Japan
	Concrete block	○		Use as weight bearing wall cannot be expected
Architectural work	Wood	○	○	Prices have risen steeply due to a ban on tree felling. The usage volume will be minimized.
	Steel fittings		○	Locally produced is inferior in airtightness & watertightness. To be used as a replacement for wood products.
	Aluminum sash		○	Although inferior in airtightness and watertightness compared with Japanese-made products, it is usable
	Plaster	○		Both materials and workers available
	Washed terrazzo	○		Both materials and workers available
	Synthetic grind finishing	○		Both materials and workers available
	Tile	○	○	Few colors or designs
	Stone	○		Marble. Few colors
	Slate	○		More breakable than Japanese-made
	Paint	○	○	Although rich in colors, durability is poorer than Japanese-made products
	PVC tile	○	○	Few colors or designs
	PVC sheets		○	No locally made product suitable for floors of testing laboratories exists
	Rock wool sound absorption board		○	Can be used together with locally made product depending on room application
	Glass	○	○	6 mm or less thickness
	Furniture	○	○	Furniture other than specialty furniture will be purchased locally.

Work	Material / equipment	Procure locally	Procure in Japan	Remarks
Air conditioning & sanitary work	Coolers		○	Because no large units exist, to be used together with Japanese made product
	Exhaust fans	○	○	Locally made products are for household use only. Centrifugal fans to be Japanese-made
	Pumps		○	No high-performance types produced locally, all products will be imported
	Sanitary fixtures		○	No specialty types are produced locally. Wash basin will be Japanese-made.
	Vinyl chloride resin tubing	○		Two types, one for supply and one for waste
	Kitchen fixtures	○		Obtainable except for specialty items
	Septic tank	○		Considering maintenance, a treatment method suited to the site is recommended
	Solar Panel	○		Easy maintenance
	Deep well facilities		○	Stability of the equipment
Electrical work	Transformers		○	No locally-produced high capacity types
	Receiving / distribution panel		○	Not produced locally
	Power/lighting panel	○	○	In-box breakers not produced locally
	Lighting fixtures	○	○	To use together with locally made products depending on type
	Telephone switchboard		○	No high-performance product produced locally, will be imported only
	Close-circuit broadcast facility		○	No system type locally produced product exists
	Emergency warning devices		○	Not produced locally
	Telephone/ power cables	○		Indian-made products obtainable
	Conduit tube	○	○	Locally produced product is low performance. Concrete buried type will be Japanese-made.
	Generator	○	○	Reliability of the generator.

4-4-5 Implementation schedule

In the event that construction of the DPTC is performed through the assistance of Grant Aid from Japan, following conclusion of the exchange of notes (E/N) between the two countries, construction of facilities will be performed in three stages: creation of detailed design documents, tendering and work contraction, and facility construction. Upon completion of the exchange of notes (E/N), the responsible agency of His Majesty's Government of Nepal will be the MOWR.

(1) Detailed design work

Tender documentation will be drawn up based on the Basic Design. The content thereof shall comprise the detailed design diagrams, the specification document, calculation sheets, budget sheets, etc. Detailed discussions will be conducted with the concerned agencies on the Nepal side at the beginning, middle and ending stages of facility design, and approval of the final design product obtained prior to proceeding to the tendering stage.

An estimated three and a half months will be required to complete detail design and preparation of tender documents.

(2) Tender processing

Beginning one month before completion of the detailed design, preliminary examination of the qualifications for participation (P/Q) in the work tender will be conducted in Japan by public notice. Based on the examination results, the executing agency will summon the tender participating firms and conduct the tender based on discussions with the persons concerned. Provided the content of the bid submitted by the tenderer with the lowest estimate is deemed reasonable, the tender will thereto be awarded, and a work contract with the Kingdom of Nepal executed.

An estimated two months will be required to complete this process through conclusion of work contract.

(3) Construction work

Upon affixture of signatures on the work contract, approval of the Japanese government will be obtained, and work commenced. Provided procurement of construction materials as determined by the scope of the DPTC and the content of the facilities proceeds favorably, and the preparation work to be borne by the Nepal side is performed smoothly, the period required to construct the DPTC is projected to be 12 months. It is desired, however, that site grading and foundation work will be completed before the rainy season begins in June, that main upper structure work be conducted during the rainy season (from June to September), and that finishing and outside perimeter work be performed after the rainy season has passed.

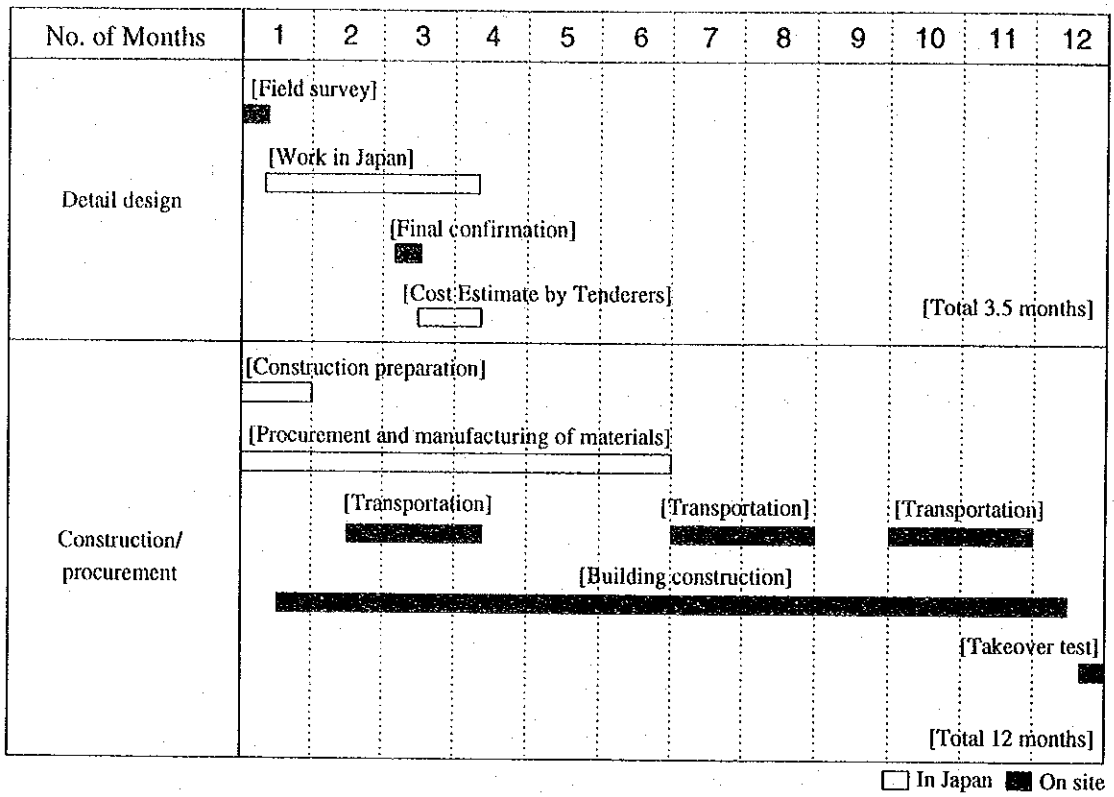


Fig. 4-4-2 Implementation schedule

4-4-6 Scope of work

(1) Work demarcation

It is considered reasonable to divide the work required to construct the DPTC between the two countries as described below.

1) Work to be undertaken by the Japanese side

Facility-related work

- DPTC Main Building
  - Administration division : Director's room, chief adviser's room, secretarial room, meeting rooms, offices, etc.
  - Technology development division : Researchers' room, design and drafting room, etc.
  - Training division : Seminar room, seminar hall, lecture room, office, etc.
  - Information division : Offices, data processing room, library, etc.
  - Others : Machine room, carport, etc.
- Trainees' dormitory : Bedrooms, canteen, offices, etc.
- Technology development building : Soil testing laboratory, concrete testing laboratory, workshop, etc.
- Garage for heavy equipment : Bulldozer, dump truck, loader, backhoe, etc.
  - Others : Storeroom

Furniture work

- DPTC Main Building : Lobby, library, exhibition space, seminar hall, canteen, design/drafting room
- Trainees' Dormitory : Bedrooms, canteen
- Technology Development Building : Concrete testing laboratory, soil testing laboratory

Infrastructural work

- Water supply facilities (on-site), including deep well and equipment
- Power receiving and transformer facilities
- Telephone switchboard facilities

Outside perimeter work

- Site road, parking lot
- Waste water facility (on-site)
- Sewage/waste water treatment facilities
- Exterior lighting
- Retaining wall

Related procedural work

- Transport of materials and equipment from Japan to Nepal
- Transport from port of disembarkment to construction site

2) Work to be undertaken by His Majesty's Government of Nepal

- Remove objects buried on site, and grade and otherwise prepare land before commencement of construction.
- Perform landscaping and fence/gate work.
- Provide electrical power, water, telephone and waste water facilities to the construction site.
- Provide general office furniture and utensils.
- Bear commissions to a Japanese foreign exchange bank for required banking services based upon the Banking Arrangement.
- Ensure prompt unloading, tax exemption, and customs clearance of goods for the Project at the port of disembarkation.
- Exempt Japanese nationals whose services are required in connection with providing materials, equipment and/or services to the Project from customs duties, internal taxes and other fiscal levies which may be imposed in the Kingdom of Nepal.
- Accord Japanese nationals whose services may be required in connection with the supply of products and services under the verified contracts such

facilities as may be necessary for their entry into the Kingdom of Nepal and stay therein for the performance of their work.

- Properly and effectively maintain the facilities and equipment constructed and/or furnished under the framework of Grant Aid.
- Bear all expenses other than those to be borne by Grant Aid that are necessary to execute the Project.
- Secure the budget and personnel required to properly and effectively maintain the facilities and equipment constructed and/or furnished under the framework of Grant Aid.

(2) Costs to be borne by Nepal side

Estimated project cost for the works and related matters to be borne by His Government of Nepal

(Unit: Rs)

	Pulchouk	Godawari	Baneswar
External work	300,000	40,000	200,000
Water supply work (City water)	300,000	–	–
Telephone work	30,000	–	–
Electrical work	400,000	–	–
Furniture	400,000	30,000	–
Subtotal	1,430,000 (¥3,146,000)	70,000 (¥154,000)	200,000 (¥440,000)
Total	1,70,000 (¥3,740,000)		

Rough estimate

Total amount of construction cost to be borne by Nepal side is Rs1,700,000.00 (¥3,740,000).

3) Calculation criteria

① Estimated starting date : September 1993;

② Exchange rate : 1 US$ = ¥109
1 Rs = ¥2.2

③ Construction period : The Project shall be executed in one phase as shown in Figure 4-4-2, "Project Schedule."

④ Others : The Project shall be executed under the frame-work of the Grant Aid of Japan.

CHAPTER 5 EVALUATION AND CONCLUSION

CHAPTER 5 EVALUATION AND CONCLUSION

5-1 Benefits of the Project

With the commencement and smooth performance of activities being carried out by Project Type Technical Cooperation (See Table 3-3-2, "1992/93 short-term experts dispatch schedule."), the construction of DPTC will enable the training of engineers in the fields of sabo and flood control, of whom there is an insufficient number in Nepal. It is anticipated that the implementation of the Project will enable the prevention, prediction, and emplacement of anti-disaster measures to avert the natural and man-made water induced disasters that occur frequently in the land area enclosed by the borders of Nepal. The extent to which human and financial losses caused by land sedimentation/erosion (sedimentation of irrigation facilities and dams, washing away of fields and rice paddies, interruption to the traffic, etc.) with its adverse effect on the economy of Nepal can be prevented has become an important issue to His Majesty's Government of Nepal in view of the ongoing economic restructuring that is taking place, and the activities of the DPTC are expected to bring great benefits.

Table 5-1 describes some benefits that will be garnered from the implementation of the Project.

5-2 Feasibility of the Project

Accompanying discussions with the MOWR on the requests of His Majesty's Government of Nepal, field surveys and analyses were performed, and the content of the plans described in Chapter 3 compiled. Based on the content thereof, upon examination of the feasibility of executing the plan for construction of DPTC from the aspects of the use of public funds and the operating and maintenance system, it has been confirmed that the Project can be implemented, without problem, as described below.

(1) Public Funding

Project Type Technical Cooperation is already in place for the Project, and work has already been commenced by Nepalese staff who have been dispatched from the implementing organizations and government agencies concerned. The operating costs for the DPTC, including the salaries of these local staff, is

disbursed from the MOWR (see Table 3-2-2, "Operating Budget") of the DPTC, and a plan that secures moneys for the operating costs, including increase in staff members once the DPTC is completed, has been formulated. No problems are foreseen in securing the operating budget.

Because training and technology development will be put into full-scale operation once the DPTC is completed, the budget for these activities will have to be incorporated into the preceding year's budget requests. This point has been explained to the executing agency MOWR, who has been requested to perform the budget measures.

Table 5-1-1 Current sabo and flood control situation in Nepal and benefits to be brought about by implementation of the Project

Current situation and problems	Project-initiated measures	Extent of benefits & improvements produced by the Project
1. A country in which both natural and human induced water related disasters occur frequently, Nepal possesses far to few sediment/erosion control engineers, and has established no disaster prevention or restoration measures.	By providing general , advanced, and intensive courses for sediment/erosion-induced disasters, the Project will enhance the knowledge and skills of flood and sediment/erosion control engineers in Nepal	By understanding the mechanism behind sediment/erosion related disasters, prevention, prediction, and disaster countermeasures will become possible.
2. Sabo and flood control technologies and methods appropriate for Nepal have not yet been developed	Through implementation of the pilot project, the Project will develop flood and sediment/erosion control methods appropriate for the local area in the fields of civil engineering structures, vegetation and land usage.	With the cooperation of local residents, implementation of disaster prevention and disaster restoration measures become possible.
3. Because flood/erosion control technical standards are disorganized, no flood/erosion control master plan covering the entire water system has been formulated	As preparation for flood and sediment/erosion control technical standards, data on water induced disasters that have occurred will be collected and, as required, hydraulic experiments will be performed and the data recorded.	By compiling basic data, preparation for flood and sediment/erosion control technical standards can be started.
4. Possesses no information dissemination mechanism to disburse flood/water control techniques that have been developed or researched.	Instructing trainees on new technical information through training sessions will become possible. Booklets and other documentation can also be issued.	Through training and booklets, new technology and information can be propagated widely.
5. No space large enough for research exists.	The Project will construct research room, trainees' dormitory, etc.	Easy-to-pursue research will become possible, and the acceptance of trainees from other localities will be facilitated
6. Because no soil or concrete testing laboratories for flood/erosion control exists, experiments in these fields cannot be conducted.	The Project will construct soil and concrete testing laboratories	The nature of soil and concrete required to prevent sabo and flood can become known. Through training, proficiency in operating the testing devices can be acquired.

(2) Operating and maintenance management system

The DPTC staff members are listed in Table 3-3-1, DPTC staff list. In addition to the regular staff listed in this table, it is planned to add four members to this staff so that the increase in facility scope will not adversely affect the administrative system.

Having been planned with an eye to minimizing maintenance costs and with moneys adequate for building, mechanical and electrical spare parts that are difficult to obtain in Nepal having been allocated in advance during the planning stage, the DPTC facilities have been designed to facilitate ready maintenance after

completion, and no problems in the area of maintenance are foreseen for the time being. With respect to furnished equipment, few post transfer problems are foreseen because all equipment furnished for the Project are being provided through Project Type Technical Cooperation while experts from Japan are stationed in Nepal so that Nepalese C/P can acquire proficiency in their operation through training and practical exercises in developing technology.

(3) Pertinence

Construction of the DPTC will provide a training centre for sabo and flood control engineers – training that was heretofore nonexistent in Nepal. It is envisioned that the assistance the DPTC will provide to the smooth administration of Technical Cooperation, which has already commenced activities, and the fostering of engineers in the meagerly human resources field of sabo and flood control that the DPTC will make possible will enable the following activities to be performed.

1. Creation of sediment/erosion related disaster records
2. Prevention and prediction of sediment/erosion related disasters
3. Providing sediment/erosion-related disaster restoration measures
4. Development of sabo and flood control technology suited to local technologies
5. Dissemination of information on new sabo and flood control technologies
6. Commencement of preparation of sabo and flood control standards
7. Provision of advice for sabo and flood/erosion control master plan
8. Provision of coordination services among the various ministries for administration of sabo and flood control activities

The main industries in the Kingdom of Nepal are agriculture and forestry. It is anticipated that the prevention of farming land and forest erosion, the long term use of irrigation facilities, the prevention of floods, etc. through the use of sabo and flood technology for farming land and forest will greatly benefit the Nepalese economy, as well as prove of great assistance to persons employed in the fields of agriculture and forestry.

Although Nepal is a land-locked country bordering no sea so that all material goods must be transported by truck, the many roads for which the road construction method consists merely of grading out a flat surface tend to be easily subject to the effects of landslides, slope failure, and riverbank erosion, causing frequent disruption and cut off of through traffic. This traffic disruption greatly affects the economy of Nepal, and it is expected that the sabo and flood control technology educed from the DPTC will contribute to this field as well.

Because the Project is especially closely related to the four items listed below from the development strategies of the Eighth Plan determined in 1992, and it will have

a great impact on the future prospects of Nepal in concert with its contributions to the improvement of the lives of the Nepalese citizens, the implementation of the Project is judged to hold great significance.

- Strengthening and diversifying agriculture
- Developing local social infrastructures
- Development of industry and tourism
- Strengthening the domestic economic base

(4) Suggestions

When the Project is implemented and construction of the facility is completed, it is supposed there will not be any problems with the operation of the DPTC while Project Type Technical Cooperation continues its activities. However, operation of the DPTC may become difficult unless appropriate measures are taken for the following items before termination of Project Type Technical Cooperation.

1) Technology development costs

Although no problems are evidenced with the current system in which the DPTC operating costs are covered by MOWR budget allocation, the costs of the pilot project and the costs associated with various experiments are expected to produce large changes in the budget, the activity schedule must be fully understood and budget requests submitted to the MOWR.

Although the Technical Cooperation budget will supplement the cost of activities to a certain extent while Technical Cooperation is in effect, once Technical Cooperation is completed, all activity costs will be allocated from the MOWR budget. This point must be taken well into consideration, and effort exerted to obtain a budget.

2) Minimization of staff turnover

The fact that, due to the Nepalese economic system, high staff turnover rates are experienced in the workplace, and this is forecast to greatly impede DPTC operations. The high turnover rates are experienced because the employees tend to move easily to workplaces which offer higher wages. Because the loss of skilled staff would be a great impediment to DPTC activities, some way will have to be found to curb this tendency.

3) Development of sabo and flood control technologies which citizens can join

Nepal is an agricultural country in which more than 90% of the population is engaged in agriculture, but a lot of farming areas are subject to natural and human disasters. Therefore, most farmers need access to some kind of sabo and flood control technology. In this situation, if staff who took training at the DPTC can provide technical advice to farmers or transfer sabo and flood

control technologies to farmers, with the result that the farmers can implement the concerned technologies on their own, it will be possible to increase agricultural production in villages as well as contribute to the improvement of sabo and flood control technologies, thus, eventually the various activities of the DPTC can be recognized. This will contribute to the creation of an environment in which a great deal of cooperation is extended to DPTC's activities.

4) Information supply from related organizations

With regard to records of disasters occurring in Nepal, there is only data collected by the Disaster Section of the Ministry of Home National (see Appendix 8, History of Disasters in Nepal) and this data cannot be thought to be a comprehensive compilation of the whole of Nepal's disasters. Planned data collection by the DPTC is very important to the creation of technical standards and is also important for disaster prevention and the drafting of appropriate countermeasures. Therefore, it is important to prepare an environment in which the DPTC can obtain disaster records and relevant data from ministries concerned with sabo and flood control technologies and other foreign supporting organizations. In order for the activities of the DPTC to be properly recognized, the DPTC must organize the collected data, becoming a base for the provision of information about sabo and flood control technologies in Nepal.

APPENDIX

1 MEMBER LIST OF SURVEY TEAM

2 SURVEY SCHEDULE

3 MEMBER LIST OF CONCERNED PARTIES

4 MINUTES OF DISCUSSION

5 NOTICE OF CABINET DECISION ON USING PROPOSED CONSTRUCTION SITE

6 LIST OF EQUIPMENT FURNISHED BY PROJECT TYPE TECHNICAL COOPERATION

7 MASTER PLAN OF PROJECT TYPE TECHNICAL COOPERATION

8 DISASTER RECORD IN NEPAL

9 SURVEY MAPS

10 PROJECT SITES PHOTOS

11 WELL AND CITY WATER QUALITY ANALYSIS TABLES

12 WRITTEN CONSENT FROM DEPARTMENT OF ROADS

APPENDIX 1 MEMBER LIST OF SURVEY TEAM

1-1 Basic Design Study Team (for 21 days from June 5 ~ 25, 1993)

Name	Assignment	Position
Akira Kumakura	Team leader	Examiner of Grant Aid. Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs
Takeshi Hamajima	Architectural planner (Chief implementor)	Kume Sekkei, Co. Ltd.
Makoto Nagatomi	Architectural designer	Kume Sekkei, Co. Ltd.
Osamu Hamano	Facility planner	Kume Sekkei, Co. Ltd.

1-2 Draft Final Report Explanation Team (for 9 days from October 1 ~ 9, 1993)

Name	Assignment	Position
Kuniyuki Nakahara	Team leader	Examiner of Grant Aid. Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs
Takeshi Hamajima	Architectural planner (Chief implementer)	Kume Sekkei, Co. Ltd.
Osamu Hamano	Facility planner	Kume Sekkei, Co. Ltd.

APPENDIX 2 SURVEY SCHEDULE

2-1 Basic Design Study Team (for 20 days from June 5 ~ 25, 1993)

	Date (day)	Itinerary	Activities
1	June 5 (Sat)	Tokyo → Bangkok	Traveling from Tokyo to Bangkok (TG641)
2	June 6 (Sun)	Bangkok → Kathmandu, Lalitpur	Traveling from Bangkok to Kathmandu (TG321) • Pre-Study discussion with DPTC experts (distribution of Inception Report) • Inspection of DPTC main building construction site
3	June 7 (Mon)	Kathmandu Lalitpur Kathmandu	• Courtesy visit to and discussion with JICA office • Pre-study discussion with DPTC experts (explanation of Inception Report) • Courtesy visit to Ministry of Water Resources (MOWR) • Courtesy visit to Embassy of Japan
4	June 8 (Tue)	Godawari Kathmandu Lalitpur	• Inspection of Godawari Hydraulic laboratory & Technology development building Inspection and/or hearings at the following: • NTC Tuberculosis Centre • Staff College (E/C) • Ministry of Local Development • UNDP • ICIMOD • DOR Workshop • DPTC Discussion
5	June 9 (Wed)	Kathmandu	• Discussion of Draft Minutes with MOWR • Revision of Minutes
6	June 10 (Thu)	Kathmandu Lalitpur	• Reporting of Minutes Progress Report to DPTC and JICA • Signing of Minutes (DPTC)
7	June 11 (Fri)	Kathmandu Lalitpur	• Return of Team Leader (TG312) • Discussion with surveying company • Study of construction costs
8	June 12 (Sat) (Local public holiday)	Kathmandu Lalitpur	• Market Survey • Compilation of Data

9	June 13 (Sun)	Lalitpur Kathmandu	• Discussion with DPTC (Adjustment of Study Schedule) • Market survey • Discussions with surveying company
10	June 14 (Mon)	Lalitpur Kathmandu	• Surveying meeting at site of DPTC main building • Verification of questionnaire reply (DPTC) – ① • Collection of data from Department of Statistics, others
11	June 15 (Tue)	Lalitpur Godawari	Hearing of progress reports from the following: • Department of Water Works • Department of Electricity • Department of Telephones • Reinspection of Godawari Hydraulic laboratory and survey witnessing
12	June 16 (Wed)	Lalitpur Kathmandu	• Inspection and hearing of Sohja Bas project • Inspection of Soil Testing Laboratory of Department of Roads (DOR) • Inspection of Tribhuvan University campus • Inspection and hearing of Tribhuvan University Teaching Hospital
13	June 17 (Thu)	Kathmandu Lalitpur	• Study of current building material supply situation • Discussion of facility content of centre main building with DPTC
14	June 18 (Fri)	Lalitpur Kathmandu	• Discussion of facility content of technology development building with DPTC • Reception of questionnaire replies (DPTC) – ② • Compilation of collected data
15	June 19 (Sat) (Local public holiday)	Kathmandu	• Market survey • Compilation of collected data

16	June 20 (Sun)	Kathmandu Lalitpur	• Architectural regulations hearing (Dept. of Housing, Town Planning Commission) Study of activity content at the following: • Consulting with A&E • Building design association • Nepal Consult (P) LTD. • Confirmation of boundaries of center main building site • Discussion of national building code project architectural standards
17	June 21 (Mon)	Kathmandu Lalipur	• Reception of drawings from surveying company • Discussions with consulting A&E • Verification of questionnaire replies • Inspection of brick factory, etc.
18	June 22 (Tue)	Kathmandu Lalitpur Kathmandu	• Meeting at site of centre main building to determine location of soil survey bore holes • Preparation of draft of technical notes • Explanation of technical notes to DPTC • Market survey
19	June 23 (Wed)	Lalitpur Kathmandu	• Final discussion with DPTC • Technical notes • Reporting of survey overview (JICA) • Reporting of survey overview (EOJ)
20	June 24 (Thu)	Kathmandu Kathmandu → Hong Kong	• Supplementary survey of collected materials Traveling from Kathmandu to Hong Kong (RA409)
21	June 25 (Fri)	Hong Kong → Tokyo	Traveling from Hong Kong to Tokyo (CX508)

2-2 Draft Final Report Explanation Team Schedule (for 9 days from October 1 ~ 9, 1993)

	Date (day)	Itinerary	Activities
1	Oct. 1 (Fri)	Tokyo → Bangkok	Traveling from Tokyo to Bangkok (TG641)
2	Oct. 2 (Sat)	Bangkok → Kathmandu • Kathmandu • Lalitpur • Godawari	Traveling from Bangkok to Kathmandu (TG311) • Meeting with E.O.J., JICA, DPTC Experts at hotel • Site observation (Pulchouk, Godawari)
3	Oct. 3 (Sun)	Kathmandu Lalitpur	• Discussion with DPTC experts and staff
4	Oct. 4 (Mon)	Kathmandu Lalitpur	• Courtesy visit to JICA • Discussion with DPTC experts and staff • Courtesy visit to E.O.J.
5	Oct. 5 (Tue)	Kathmandu Lalitpur	• Courtesy visit to MOWR • Garage site observation at DOR • Discussion with DPTC experts and staff on draft report and draft minutes
6	Oct. 6 (Wed)	Kathmandu Lalitpur	• Discussion with NEA Lalitpur branch • Courtesy visit to Ministry of Finance • Discussion with DPTC experts and staff on draft report and draft minutes
7	Oct. 7 (Thu)	Kathmandu Lalitpur	• Signing on Minutes of Meeting • Market observation
8	Oct. 8 (Fri)	Dhulikhel Kathmandu → Bangkok	• Observation of water induced disaster sites • Traveling from Kathmandu to Bangkok (TG640)
9	Oct. 9 (Sat)	Bangkok → Tokyo	• Traveling from Bangkok to Tokyo (TG312)

APPENDIX 3 MEMBER LIST OF CONCERNED PARTIES IN THE RECIPIENT COUNTRY

Government Ministries of the Government of Nepal

Ministry of Water Resources (MOWR)

Mr. S.N. Upadhyay.....Secretary
Mr. K.B. Chand.....Superintending Engineer
Mr. R.L. Kayastha .....Joint Secretary

Ministry of Finance

Mr. R.B. Bhattarai.....Joint Secretary for Foreign Aid Division

DPTC

Mr. S.P. Rimal.....Project Director of DPTC
Mr. N.P. Bhattarai.....Division Chief of Training Division
Mr. B.G. Rajkarnikar.....Division Chief of Information Division
Mr. G.R. Joshi.....Division Chief of Technology Development Division
Mr. A.K. Pradhan.....Administration Chief of Administration Division

Nepal Water Works Public Company (Lalitpur Municipality)

Mr. S. Rane.....Chief Engineer (supply water)
Mr. S. Adikari.....Engineer (supply water)
Mr. I.R. Maharjan .....Engineer (supply water)
Mr. P.M.S. Shrestha.....Engineer (waste water)

Nepal Electrical Power Department (Lalitpur Municipality)

Mr. H.R. Shreatha.....District Manager
Mr. D.S. Paudel.....District Manager

Nepal Telecommunications Department (Lalitpur Municipality)

Mr. B.K. Dhakhal .....Chief Engineer

Department of Roads, Laboratory

Mr. G. Karanjeet.....Chief of Laboratory

International Centre for Integrated Mountain (ICIMOD)

Dr. E.F. Tacke ..... Director General
Dr. S.R. Chalise ..... Director

Embassy of Japan

Mr. Chuichi Itoh ..... Ambassador
Mr. Masao Ishikawa ..... Minister Council
Mr. Mikio Ishiwatari ..... Second Secretary

JICA Nepal Office

Mr. Yasuyuki Kobori ..... Resident Representative
Mr. Hiroshi Murakami ..... Deputy Resident Representative
Mr. Toshikazu Masaki ..... Assistant Resident Representative
Mr. Hiromichi Murakami ..... Assistant Resident Representative

JICA DPTC Experts

Mr. Hidetomi Oi ..... Team Leader
Mr. Takashi Inoue ..... River Engineering Expert
Mr. Kiyoshi Amao ..... Land slide engineering expert
Mr. Atsushi Okamoto ..... Sabo engineering expert
Mr. Hidetake Esaki ..... Coordinator

JICA WECS Experts

Mr. Tsutomu Kadota ..... JICA Expert

JICA Sajha Bas Experts

Mr. Chiaki Ogawa ..... JICA Expert

JICA Teaching Hospital Experts

Mr. Kenzo Sasagawa ..... JICA Expert
Mr. Tadashi Miyazaki ..... Coordinator

UNDP Deputy Director

Mr. Yoshihiro Kishi ..... Assistant Resident representative

APPENDIX 4 MINUTES OF DISCUSSION

4-1 Minutes of Discussion (Basic Design Stage)

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY ON THE PROJECT
FOR
CONSTRUCTION OF INSTITUTIONAL FACILITIES
OF
WATER-INDUCED DISASTER PREVENTION TECHNICAL CENTRE
IN
THE KINGDOM OF NEPAL

In response to the request from His Majesty's Government of Nepal, the Government of Japan decided to conduct a Basic Design Study on the Project for Construction of Institutional Facilities of Water-induced Disaster Prevention Technical Centre (hereinafter referred to as "the Project") and entrusted study to the Japan International Cooperation Agency (JICA).

JICA sent to Nepal a study Team, headed by Mr. Akira Kumakura, Senior Assistant for Grant Aid, Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs. The Team is scheduled to stay in Nepal from June 6 to June 24, 1993.

The Team conducted a field survey and held discussions with His Majesty's Government officials concerned on the Project. As a result of discussions, both parties have confirmed the matters as mentioned in the ATTACHMENT.

The Team will proceed to further works and prepare the Basic Design Study Report.

Kathmandu, June 10, 1993

Mr. Akira Kumakura
Leader
Basic Design Study
Team

Mr. K. B. Chand
Superintending Engineer
Ministry of Water
Resources, His Majesty's
Government of Nepal

ATTACHMENT

1. Objective

The objective of the Project is to improve the Water-induced Disaster Prevention Technical Centre by constructing institutional facilities such as main building, technology development building and trainees' dormitory, thus contributing to the improvement of the quality of training for Nepalese personnel, development of engineering methods, and establishing of data base.

2. Project Site

The Project site is located at Pulchouk for main building and dormitory, and Godawari for technology development building in Lalitpur, with the total land area of approximately 3,800 ㎡ as shown in ANNEX I.

3. Executing agency

Ministry of Water Resources His Majesty's Government of Nepal is responsible for the administration and execution of the Project.

4. Items requested by the Nepal side

After discussions with the Basic Design Study Team, the Nepal side requested the Team for the construction of the Project's components/facilities described in ANNEX II.

The Team mentioned that the Project's components/facilities are subject to further studies in Japan.

5. Japan's Grant Aid system

1) The Nepal side understands the system of Japan's Grant Aid as explained by the Team.

2) The Nepal side will take necessary measures, as described in ANNEX III for the smooth implementation of the Project on the condition that the Grant Aid by the Government of Japan is extended to the Project.

6. Schedule of the Study

The overall schedule of the Basic Design Study is as shown in ANNEX IV and its main items are described below:

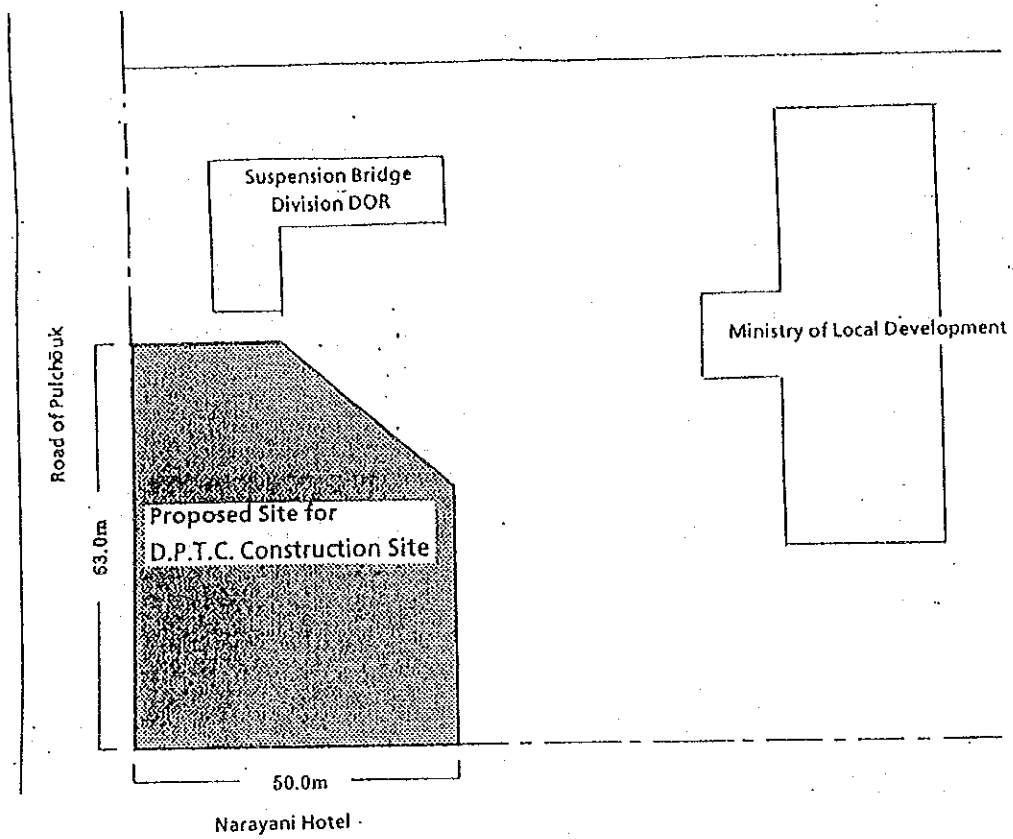
1) Based on the Minutes of Discussions and the results of the study, JICA will compile a draft report and dispatch a mission to Nepal in order to explain, discuss and finalize its contents in October 1993.

2) JICA will complete the final report incorporating the suggestions, if any, made by His Majesty's Goverment of Nepal and it will be sent to His Majesty's Government of Nepal around December 1993.

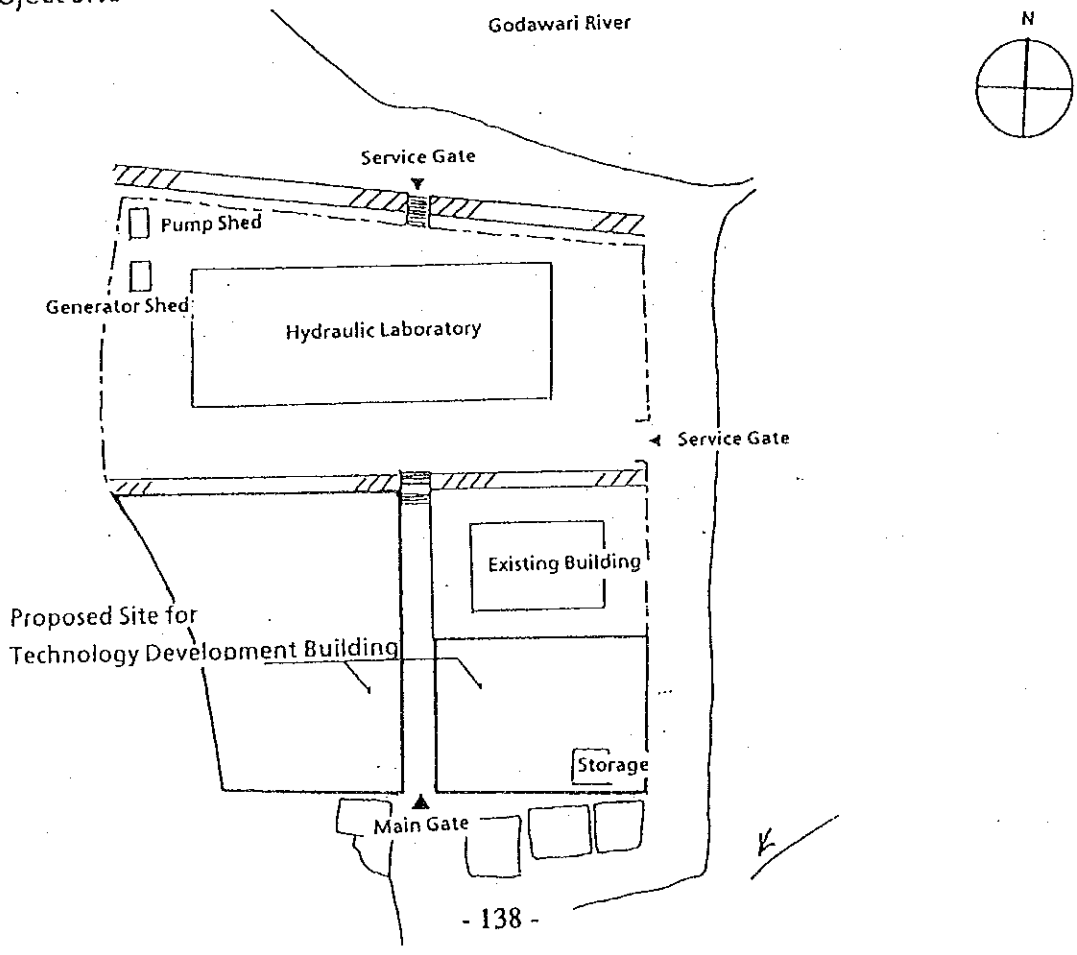
ANNEX 1 - (1) Location of the Project Sites

ANNEX 1 - (2) Project Sites

■ Project Site - Pulchouk



■ Project Site - Godawari



Annex II

Construction of the institutional facilities

1. Main building

(1) lecture room

(2) meeting room

(3) designing & drawing room

(4) library

(5) office

(6) guard room

(7) computer room

(8) others including well

2. Technology development building

(1) material testing laboratories (soil & concrete)

(2) material store

(3) equipment store

(4) maintenance work shop

(5) others

3. Trainees' dormitory (for 10 rooms)

Annex III

Necessary measures to be taken by the Government of Nepal on condition that Japan's Grant Aid is extended;

1. To secure the site for the Project

2. To clear and level the site prior to the commencement of the construction

3. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lighting within and around the site

4. To provide the following facilities:
   1) Power distribution line to the transformer of the site
   2) City water distribution main to the site
   3) Drainage main from the site
   4) Telephone trunk line to the main distribution frame/panel (MDF) of the building
   5) General furniture such as carpets, curtains, etc.

5. To exempt taxes and to take the necessary measures for customs clearance of the materials and equipment brought for the Project at the port of disembarkation

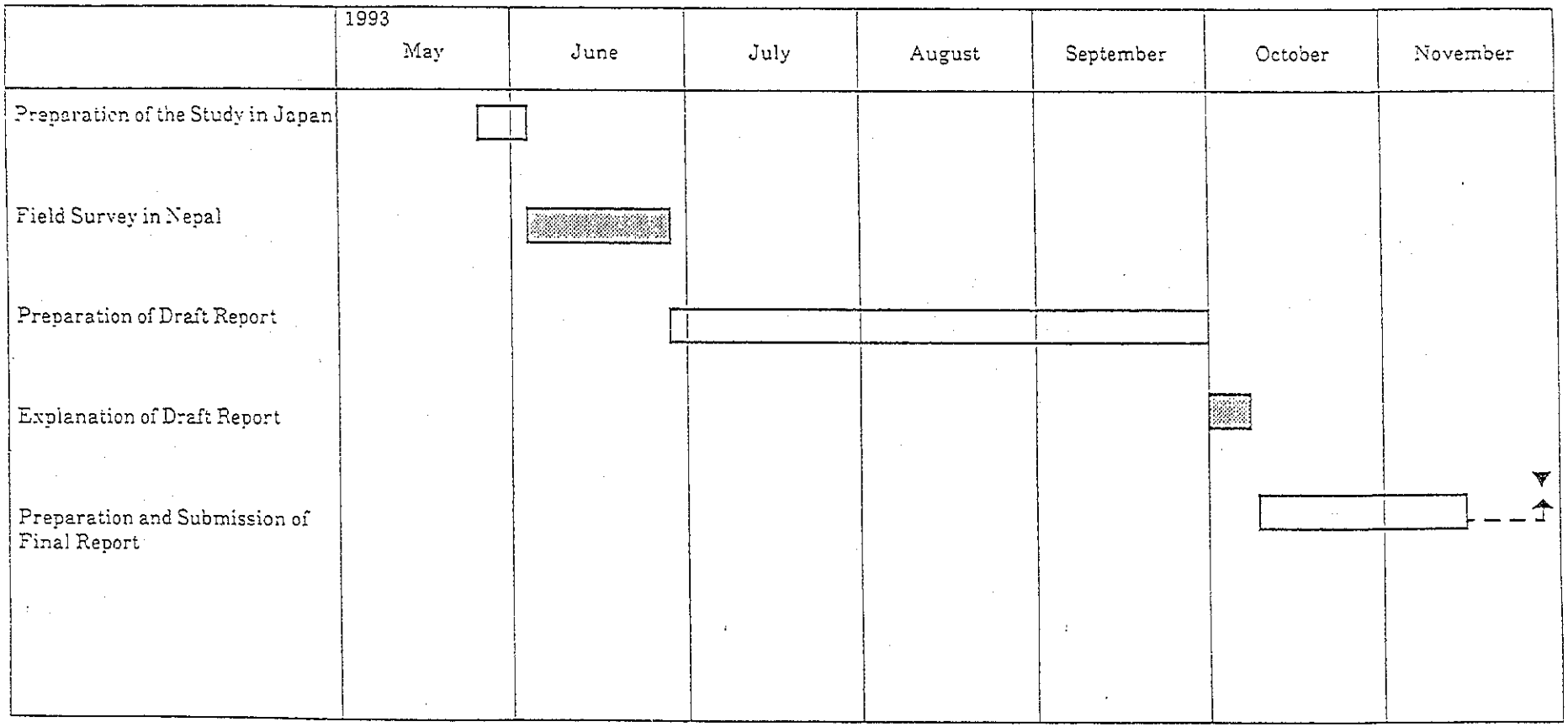
6. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Nepal with respect to the supply of the products and services under the verified contracts

7. To accord Japanese Nationals, whose services may be required in connection with the supply of products and the services under the verified contracts, such facilities as may be necessary for their entry into Nepal and stay therein for the duration of their work

8. To use and maintain properly and effectively all the facilities constructed and equipment purchased under the Grant

9. To bear all the expenses other than those to be borne by the Grant

ANNEX IV Tentative Study Schedule



4-2 Technical Note (Basic Design Stage)

TECHNICAL NOTES

ON

THE BASIC DESIGN STUDY ON THE PROJECT

FOR

CONSTRUCTION OF INSTITUTIONAL FACILITIES

OF

WATER-INDUCED DISASTER PREVENTION TECHNICAL CENTRE

IN

THE KINGDOM OF NEPAL

JUNE 23, 1993

BASIC DESIGN STUDY TEAM

Itemized hereunder are our main technical notes for the captioned project confirmed up to 23rd June, 1993, through further studies such as field surveys and discussions with the Nepalese Officials concerned, after our Team Leader, Mr.Kumakura, left Kathmandu for Japan on 11th June, 1993.

1. Essential Rooms in the Centre:

   As a result of study of the activity and organization in the Centre, essential rooms necessary for the Centre were requested by Nepal side as shown in Annex-1.

2. Dormitory:

   The capacity of the dormitory was originnaly requested to accommodate 30 persons. However, as a result of discussion, final request made by the Nepalese side were as follows:

   - Number of bed rooms to be ten.
   - Two bed rooms furnishing with toilet and shower while the rest eight bed rooms furnishing no toilet and shower.

   - Cafeteria as gathering room attached with pantry room instead of a dining room.

3. Layout of Soil and Concrete Testing Lab:

   Conceptual layout of the soil and concrete testing equipment is further studied and planned by the Disaster Prevention Technical Centre (DPTC) taking into consideration the activity and function of the lab, with the assumption of room size to be 100m2 approximately and number of the room to be two. Its result will be sent to Japan as soon as the equipment layout is completed by (DPTC).

4. Number of Staff in the Centre;

   After confirmation of the essential rooms necessary in the Centre, it was assumed that two more staff, one secretary and one librarian, were necessary for the Centre in addition to the originally requested 22 staff. As a result, total number of the staff became 24.

5. Site Survey:

   Site survey was conducted in both Pulchowk and Godawari sites. Its result is shown in the attached site survey drawings. The boundary for both sites were confirmed in the presence of DPTC staff.

6. Space for Access Road in Pulchowk Site:

Such request was made by the Ministry of Local Development as to provide a new access road in front of the existing Suspension Bridge Building directly from the Pulchowk road. After confirming this matter with the DPTC Officials their final request was that no building be allocated in front of the Suspension Bridge Building.
Further confirmation is desired to be done in the Nepalese side including the Ministry of Local Development especially in the following two points:

1. Confirmation of the existing road to be used as access road for DPTC.

2. Possibility of temporary use of the compound of the Ministry of Local Development for the temporary and workshop during the building construction.

7. Acquisition or Utilization of the land for a Garage of Heavy Equipment:

The DPTC is planning to acquire some land to build a garage for the heavy equipment in the compound of the Heavy Equipment Division of the Department of Road (DOR). In order to forward the basic design of the Centre, it is necessary for the Japanese Government to receive the following documents in order to justify whether the said land is appropriate or not for the Grant Aid Facililties:

- Agreement or memorandum between MOWR and DOR for the construction of the garage in the land.

- The ownership and/or administrative incharge for the garage.

The above Technical Notes and other important data collected in Kathmandu will be reported to the Japanese Government by the Basic Design Study Team and staff base design report will be prepared.

23rd June, 1993

TAKESHI HAMAJIMI
Basic Design Study Team

ANNEX-1

1 MAIN BUILDING

ROOM NAME	ACCOMMOCATION & FUNCTION
1 Administrative Div Director Rm Chief Adivser Rm Secretary Rm Meeting Rm(1) Meetng Rm(2) Office(1) Office(2)	 1 secretary + waiting space for the use of director and chief adviser 30 persons 4 p.(Syaff) 1 p (Expert) + 3 p
2 Technology Dev. Div. Research Rm Designing & Drafting Rm	 7 p (Staff) + 1 p (Expert) 2 seats
3 Training Rm Office Lecturer Rm Lecture/Seminar Rm Seminar Rm.	 6 p (Staff) + 1 p (Expert) 2 p (Outside lecturer) + 2 rooms 60 p (Dividing into 2 rooms by movable partition) 7 seats + 3 rooms
4 Information Div. Office Computer Rm Library	 5 p(Staff) + 1 p (Expert) 3 sets of work station 10.000 books + 1 Librarian
5 Others Toilet, Pantry Machine Rm Car port, Stg etc.	

2 DORMITORY

Bed Room for Trainee Cafeteria Pantry Corridor Stg. etc.	10 rooms (Sanitary equipment is instaled in 2 room) for trainees and staff, and for gathering space

3 TECHNOLOGY DEVELOPMENT BUILDING

Room Name	Accommodation & Function
Soil Testing Lab Conc. Testing Lab Material Stg. Rm. Workshop	Approx. 100 m2 base upon conceptial layout. Approx. 100 m2 base upon conceptial layout. for material and equipment. for maintenance of equipment.

4-3 Minutes of Discussion
(Draft Final Report Explanation Stage)

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY ON THE PROJECT
FOR
CONSTRUCTION OF INSTITUTIONAL FACILITIES
OF
WATER INDUCED DISASTER PREVENTION TECHNICAL CENTRE
IN
THE KINGDOM OF NEPAL

In June 1993, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study team on the Project for Construction of Institutional facilities of Water Induced Disaster Prevention Technical Centre(hereinafter referred to as "the Project") to the Kingdom of Nepal. Based on discussions, field survey, and technical examination, JICA has prepared the draft report of the study.

In order to explain and to consult the Nepal side on the components of the draft report, JICA sent to Nepal a study team, headed by Mr. Kuniyuki Nakahara, Grant Aid Division, Economic Coöperation Bureau, Ministry of Foreign Affairs, from October 2 to 8, 1993.

As a result of discussions, both parties confirmed the items described in the Attachment.

Kathmandu, October 7, 1993.

K. Nakahara

Mr. Kuniyuki Nakahara
Leader
Draft Report Explanation
Team JICA

Mr. R. L. Kayastha
Joint Secretary
Ministry of Water Resources,
His Majesty's Covernment of
Nepal

ATTACHMENT

1. Components of the Draft Report

His Majesty's Government of Nepal has in principle agreed to the components of the Draft Report proposed by the team.

2. Japan's Grant Aid System

(1) His Majesty's Government of Nepal has understood the system of Japanese Grant Aid explained by the team.

(2) His Majesty's Government of Nepal will take the necessary measures described in Annex I for smooth implementation of the Project on the condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

3. Further Schedule

The team will make the Final Report in accordance with the confirmed items, and submit it to His Majesty's Government of Nepal by the beginning of December 1993.

4. Project Site for the Heavy Equipment Garage

The Project site for the heavy equipment garage is located at Baneswar, Kathmandu as shown in Annex II.

Annex I : Necessary measures to be taken by His Majesty's Government of Nepal.

1. To secure the site for the Project.

2. To clear and level the site prior to the commencement of the construction.

3. To undertake outdoor works such as gardening, fencing, gates and exterior lighting within and arround the site.

4. To provide the following facilities:
   1) Power distribution line to the site.
   2) City water distribution main to the site.
   3) Drainage main from the site.
   4) Telephone trunk line to the Main Distribution Frame/panel (MDF) of the building.
   5) General furniture, carpet, curtain, etc..

5. To exempt taxes and to take the necessary measures for customs clearance of the meterials and equipment brought for the Project at the port of disembarkation.

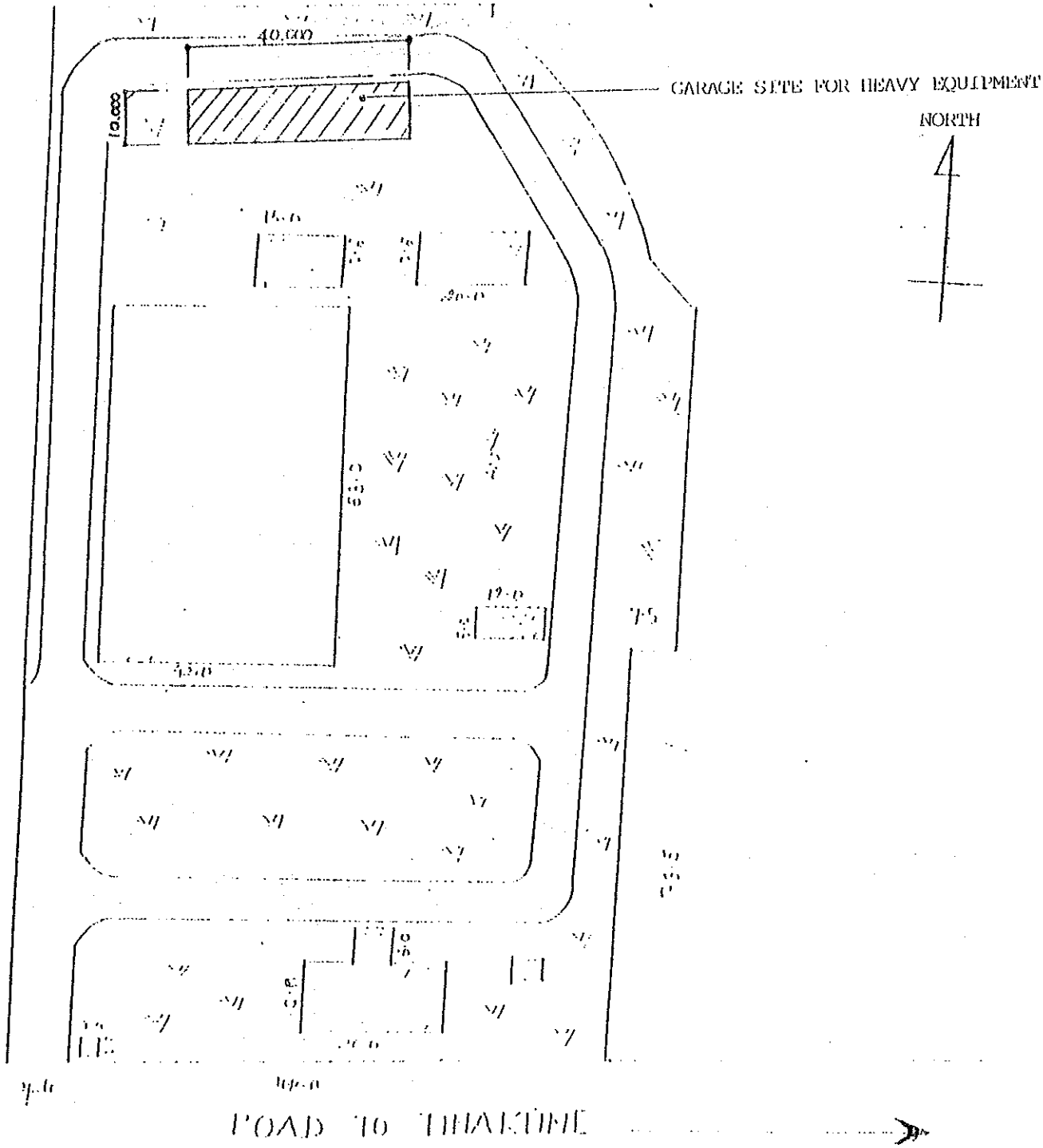
6. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Nepal with respect to the supply of the products and services under the verified contracts.

7. To accord Japanese Nationals, whose services may be required in connection with the supply of products and the services under the verified contracts, such facilites as may be necessary for their entry into Nepal and stay therein for the duration of their work.

8. To use and maintain properly and effectively all the facilities constructed and equipment purchased under the Grant.

9. To bear all the expenses other than those to be borne by the Grant.

Annex 11 LOCATION MAP OF GARAGE SITE FOR HEAVY EQUIPMENT



ALL DIMENSIONS ARE IN METRE.

SCALE : 1/200

APPENDIX 5 NOTICE OF CABINET DECISION ON USING PROPOSED CONSTRUCTION SITE

English Translation

His Majesty's Government
The Cabinet Secretariat
(..... Section)

Singh Durbar, Kathmandu,
Nepal
Date:- 03 Dec. 1992

Ref. No. 498/049

Subject:

The Secretary
Ministry of Water Resources

On submission of the request to provide land in the Cabinet meeting No. 55/049, you are notified to do according to the following Cabinet decision in accordance with rule no. 26 of Execution Regulation, 2047 of His Majesty's Government of Nepal.

CABINET DECISION

Provide land from the Government land located in front of the Ministry of Local Development in Pulchowk, Lalitpur Municipality, Lalitpur, measuring 50m East-west from the wall of main road and 63m North-south from the wall of Narayani Hotel for the construction of building for proposed Disaster Prevention Technical Centre under the Ministry of water Resources.

(Madhusudan Prasad Gorkhali)
Chief Secretary

c.c.

The Secretary
Ministry of Local Development

श्री ५ को सरकार

जलस्रोत मन्त्रालय

(.....प्रशासन तथा ..... शाखा)

२०७७

फोन नं. २-२६७९६
२-२७६५१
२-२८९२३
२-२८०४६
२-२८१०९

टेलेक्स नं. २३१२
पोष्ट बक्स नं. २१५७
सिंहदरबार
काठमाडौं नेपाल

पत्र संख्या :-

प्राप्त पत्र संख्या र मिति :-

मिति ०४९।८।३०

९८०४ विषय:-

श्री जल उत्पन्न प्रकोप नियन्त्रण प्राविधिक केन्द्र,
सुनसरी ।

मन्त्रिपरिषद् सचिवालयको पत्र ४९८।०४९ मिति ०४९।८।२८ को पत्रको फोटो कपी यसे साथ संलग्न राखी आवश्यक कारवाहीको लागि निर्देशानुसार अनुरोध गरिएको छ ।

श्री ५ को सरकार

मन्त्रिपरिषद् सचिवालय

(.....शाखा)

सिंहदरबार, काठमाडौं,
नेपाल ।

पत्र संख्या:- ४८१/८४८
च.नं.

मिति २०४९।८।१९.....

विषय:-

श्री सचिव, जलस्रोत मन्त्रालय ।

जग्गा उपलब्ध गराउने विषय मं.प.बै.सं.५५।०४९ को मन्त्रिपरिषद्को बैठकमा पेश हुँदा, त्यसमा श्री ५ को सरकार (कार्य सम्पादन) नियमावली, २०४७ को नियम २६ अनुसार श्री ५ को सरकारले देहायमा लेखिए बमोजिम गर्ने निर्णय गरेकोले सो बमोजिम गर्नु गराउनु हुन सूचना गरिन्छ---

श्री ५ को सरकारको निर्णय :-

"जलस्रोत मन्त्रालय अन्तर्गत प्रस्तावित प्राकृतिक प्रकोप रोकथाम प्राविधिक केन्द्र (डिजेष्टर प्रिभेन्शन टेक्निकल सेण्टर) को भवन निर्माणका लागि ललितपुर जिल्ला, ललितपुर नगर पालिका, पुल्चोकस्थित स्थानीय विकास मन्त्रालय रहेको भवन अगाडिको सरकारी पर्ती जग्गा मध्येवाट मूल सडकको पश्चिमबाट पूर्व-पश्चिम ५० मिटर र नारायणी होटेलको पश्चिमबाट उत्तर-दक्षिण ६३ मिटर जग्गा उपलब्ध गराउने" ।

(मधुसूदनप्रसाद गौवाली)
मुख्य सचिव

वोधार्थ तथा कार्यार्थ :-

श्री सचिव, स्थानीय विकास मन्त्रालय ।

APPENDIX 6 LIST OF EQUIPMENT FURNISH BY PROJECT TYPE
TECHNICAL COOPERATION

	1991 (H3)			1992 (H4)			1993 (H5)			1994 (H6)			Allocation	Remarks
		Nos	Item No.		Nos	Item No.		Nos	Item No.		Nos	Item No.		
1. Equipment for Hydraulic Model Test														
· Channel of gentle slope	○	1											HL	
· Channel of steep and changeable slope	○	1											HL	
· Landslide experiment equipment	○	1											HL	
· Pump	○	3											HL	
· Generator	○	1		○	1								HL	
· Transformer	△	1											HL	
· Filtration equipment for river water	○	1											HL	
· Landslide tension crack testing eq.	○	1											HL	
· Materials (Sand cement, bentonite, etc.)	◎	1											HL	
· Belt conveyer etc.	○	1											HL	
1991														
- Tools														
· Carpentry	○	1											HL	
· Machinery	○	1											HL	
· Shieves	○	1		○	1								HL	
· Current meter for hydraulic test	○	2											HL	
· Camera	○	2											MB	
· Others	○	1												
1992														
- Channel for sabo hydraulic test (small size)				○	1								HL	
- Pitot tube, etc.				○	1								HL	
1993														
- Welding machine							○	1					HL	

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	1991 (H3)			1992 (H4)			1993 (H5)			1994 (H6)			Allocation	Remarks
		Nos	Item No.		Nos	Item No.		Nos	Item No.		Nos	Item No.		
2. Equipment for Field Survey														
- Hydraulic and hydrological observation equipment														
· Water level gauge	◎	3		◎	2								MB	
· Water level gauging staff	◎	3		◎	2								MB	
· Rain gauge (tipping backet type)	◎	2		◎	4								MB	
· Data logger	◎	2		◎	6								MB	
· Ordinary rain gauge	◎	1		◎	4								MB	
· Current meter				◎	2								MB	
1993														
- Sediment sampler							○	2					MB	
- Landslide investigation equipment														
· Extensometer	○	4		○	2								MB	
· Inclinometer	○	6		○	8								MB	
· Groundwater level gauge	○	1											MB	
· Groundwater prospecting tester	○	1											MB	
· PVC pipe	○	200		○	60								MB	
1992														
- Inclinometer for borehole				○	1								MB	
- Strain gauge				○	1								MB	
- Multi layers movement gauge				○	3								MB	
- Land slide warning system				○	1								MB	
- Scale for simple extensometer				○	20								MB	
- Boxes for boring core				○	1								MB	

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	1991 (H3)			1992 (H4)			1993 (H5)			1994 (H6)			Allocation	Remarks
		Nos	Item No.		Nos	Item No.		Nos	Item No.		Nos	Item No.		
1993														
- Seismic prospecting tools							○	1					MB	
- Standard penetration test							○	1					MB or TD	
- Equipment for surveying														
· Theodolite	○	1					○	1					MB	
· Auto-level set (including leveling staff)	○	1					○	1					MB	
· Plane table surveying equipment	○	1					○	1					MB	
· Simple penetration test apparatus														
· Stereoscope	○	1											MB	
· Compass surveying eqi.	○	1					○	1					MB	
· Equipment for geological survey (hammer, clinometer etc.)	○	1											MB	
· Camera	○	1											MB	
1992														
- Stereoscope for aerial survey				○	1								MB	
- Analyzed satelite photo				○	1		○	1					MB	

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	1991 (H3)			1992 (H4)			1993 (H5)			1994 (H6)			Allocation	Remarks
		Nos	Item No.		Nos	Item No.		Nos	Item No.		Nos	Item No.		
3. Equipment for Model Project														
- Construction machine														
· Bulldozer							○	2					DOR, DOI	
· Dump truck				○	1		○	1					DOR, DOI	
· Backhoe							○	2					DOR, DOI	
1993														
- Loader							○	1					DOR	
- Concrete Mixer							○	1					DOR	
- Truck				○	1								DOR	
- Machine and appratus for drainage boring														
· Boring machine	○	1		○	1								TD	
· Boring pump	○	1		○	1								TD	
· Scaffold for boring	○	1		○	1								TD	
· Compressor etc.	○	1		○	1								TD	
· Tools for boring (casing pipe, bit, crown, rod etc.)	○	1		○	1								TD	
· Vinyl sheet etc.				○	400								TD	
· Tools (wheel borrow, hoe, pickax etc.)	◎	1		◎	1								TD	
1993														
- Diamond bit, Metal crown, Metal guide, Core tube							○	1					TD	
- Pile driver							◎	1					TD	

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	1991 (H3)			1992 (H4)			1993 (H5)			1994 (H6)			Allocation	Remarks
		Nos	Item No.		Nos	Item No.		Nos	Item No.		Nos	Item No.		
1992														
- PNC Blocks				○	440		○	2000					TD	
- Geo textile				○	3000 m^2								TD	
- Pump				○	2								TD	
1993														
- Bags for sand bag				◎	5000								TD	
- Hand rammer				◎	1								TD	
- Bolt & Nuts				◎	1								TD	
- Manual rock drill				◎	5								TD	
4. Equipment for data base														
- Personal computer	◎	2					◎	2					MB	
- Printer	◎	2					◎	2					MB	
- Word processor				○	2								MB	

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	1991 (H3)			1992 (H4)			1993 (H5)			1994 (H6)			Allocation	Remarks
		Nos	Item No.		Nos	Item No.		Nos	Item No.		Nos	Item No.		
- Software and their manuals	◎	1											MB	
- Cabinet, map case, file etc.	○	1											MB	
- Fax machine	◎	1					◎	1					MB	
- Maps	◎	1											MB	
- Satellite photographs	○	1											MB	
- Air conditioner	◎	1											MB	
5. Equipment for Soil Testing														
- Rapid Moisture meter							◎	1					TD	
- Universal permeameter							◎	1					TD	
- Penetrometer							◎	1					TD	
- Casagrande LL device							◎	2					TD	
- Pocket Penetrometer							◎	1					TD	
- Hydrometer set							◎	5					TD	
- Oven 8kw							◎	1					TD	
- Soil Lathe							◎	1					TD	
- Sieves Coarse sieves fine sieves							◎	1					TD	
- Proctor set modified standard							◎	1					TD	
- Sieves vibratior							◎	1					TD	
- Triaxial compression testing							◎	1					TD	

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	1991 (H3)			1992 (H4)			1993 (H5)			1994 (H6)			Allocation	Remarks
		Nos	Item No.		Nos	Item No.		Nos	Item No.		Nos	Item No.		
- Unconfined compression testing							◎	1					TD	
- Direct shear test machine							◎	2					TD	
- Consolidation test apparatus							◎	4					TD	
- Moisture can														
big							◎	50					TD	
small							◎	100					TD	
- Measuring cylinders														
1000ml							◎	10					TD	
250ml							◎	10					TD	
100ml							◎	10					TD	
- Sample Tray														
big							◎	10					TD	
small							◎	20					TD	
- Sample extractor							◎	1					TD	
- Micrometer gauge							◎	2					TD	
- Proving rinds														
5000 g							◎	2					TD	
1000 g							◎	2					TD	
200 g							◎	2					TD	
100 g							◎	2					TD	
50 g							◎	2					TD	
- Dial gauge							◎	10					TD	
- CBR Test Set														
CBR moulds														
Spacer disc														
Swell Plate														
Tripod attachment														
Dial indicator														
Surcharge weight														
Filter Paper, boxes														
Filter screen														
Mechanical loading press														
- Plastic Limit testing apparatus													TD	

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	1991 (H3)			1992 (H4)			1993 (H5)			1994 (H6)			Allocation	Remarks
		Nos	Item No.		Nos	Item No.		Nos	Item No.		Nos	Item No.		
- Hand Auger to get soil samples														
- Field density test apparatus							◎	2						
- Plate load test apparatus														
6. Equipment for Concrete Testing													TD	
- Biaines apparatus for fineness test of cement							◎	1						
- Constant thermal bath apparatus							◎	1						
- Compression testing machine							◎	1						
- Slump Test apparatus							◎	1						
- Shearing test							◎	1						
- Schmidt hammer							◎	1						
7. Equipment for Rock Testing													TD	
- Rock shear Test apparatus								1						
8. Audio-Visual Equipment														
- Video set (camera, deck, monitor TV, tape etc.)	◎	1											MB	
- Slide projector (projector, film, screen etc.)	○	1		○	1								MB	
- Overhead projector (Projector, OHP sheet etc.)	○	1		○	1								MB	
1992														
- Stereo radio cassette player				○	1								MB	
- White board	○	3											MB	

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