2-2-2-2 Basic Plan (Building Plan)

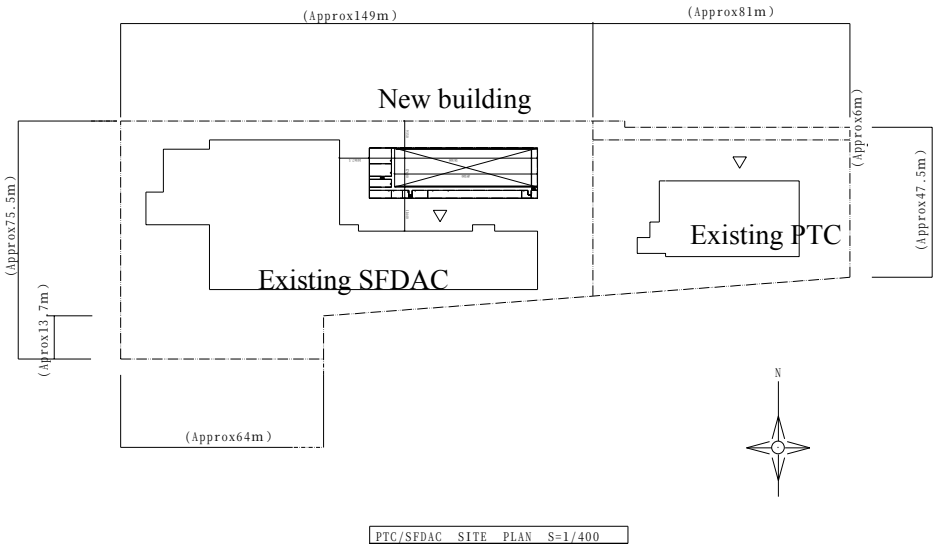
1. Site plan and building layout plan

Important elements of the site plan are how to solve the questions related to a limited space available for the buildings, and a stretched space required for consecutive process using one of the major equipment to be procured, pipe manufacturing line. Thus the first floor of the building will be designed so that the necessary length for the pipe manufacturing line is secured, and that other necessary machines are arranged in a smooth sequence of raw materials, products, mould, and so on.

(1) Site plan

In order to draw a site plan, three proposed plans were examined: the extension of the existing PTC building; construction of a new building in between the premises of the PTC and the SFDAC; and construction of a new building in the front court of the SFDAC. And because the frontcourt of the SFDAC has enough length of land for pipe manufacturing line and enough distance between new building and adjoining line regulated by building code, the area of frontcourt of the SFDAC can make clear zoning based on circulation planning. Thus, it has been determined to be used for the construction site of the new PTC building.

Figure 3 Site plan



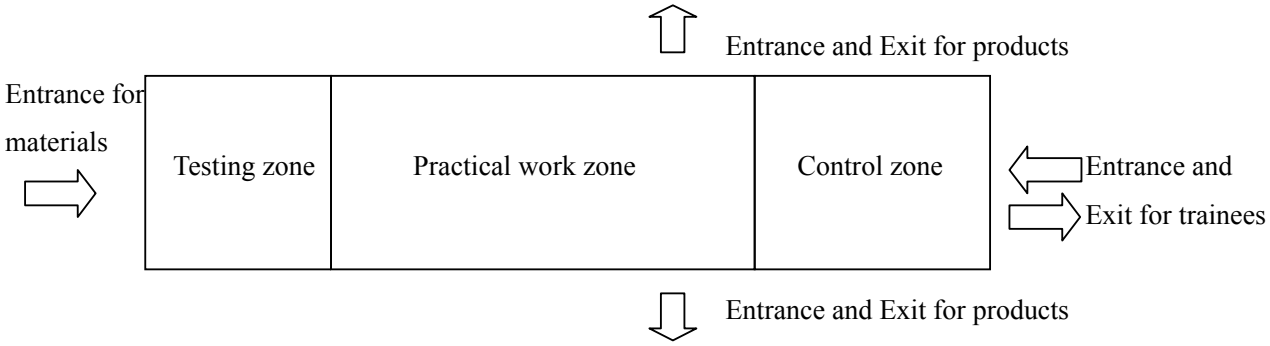
(2) Access road

The access road to the site will be a lead path to the road in the east of the site that is currently used as an approach road to the premises of the SFDAC.

(3) Zoning

Zoning (Figure 2) will be conducted in accordance with the functioning of the building. The zoning consists of three zones: control, practical work, and inspection. Apart from these, there are exterior facilities such as electrical power facilities, air-conditioning, and so on.

Figure 4 Zoning



For the management purpose, the control zone and the practical work zone will be clearly partitioned so that staff, trainees, and students cannot enter the practical work zone without going through the control zone. On the other hand, because the practical work zone and the testing zone are closely related to each other, the two zones will have a layout easy for users to go back and forth. The zoning and the rooms in each zone will be as follows.

Table 7 Names of rooms by zone

Department	Names of rooms
Control zone	office, senior engineers room, computer room, lecture room, security room, electric room, staircases
Practical work zone	Workshop, Mould storage, Recycle room
Testing zone	Material storage, Mixing room, Compound storage, 3 testing rooms, jig storage, toilet (men and women), staircases

(4) Plan for room environment

Upon consideration of the climate in Pakistan, the ceiling of the premises will be set somewhat high at 3 to 3.7 meters so as to make the volume of rooms large enough. Air conditioning will not be installed in the workshop, but in order to secure a good indoor environment, the ceiling will be set at as high as that of the existing facilities and the rooms will be designed to have sufficient air ventilation. At the same time, air supply opening will be secured with consideration of measures against dusts. The testing room will be designed so as to secure appropriate temperature and humidity by applying double doors to outdoors and double fitting because some of testing requires a setting of constant room temperature and humidity.

2. Architectural design

(1) Floor plan

(i) Control zone

The control zone consists of various rooms related to administration where there are many visitors to come. It is adjacent to the approach road and located near the entrance hall of the building so that the distance to the building is shorter than that to the existing building. On the first floor, office, security, senior engineer's rooms and other rooms will be located, whereas on the second floor, computer rooms and lecture rooms will be located. The stairs to the lecture rooms and computer rooms on the second floor will be placed behind the guards' room in the hallway so that unauthorized persons cannot enter the premises.

(ii) Practical work zone

The size of the workshop will be minimized but large enough to install the pipe manufacturing line, 45 meters in length. The width will be set 16 meters so that three production lines can be allocated and also trainees can practice and see the production processes beside the lines. For the purpose of encouraging recycling of materials, rooms for grinders as well as mould storage will be installed in the workshop. The entrance for raw materials and the exit for products will be arranged so that materials and products are not mixed up. Like the design of the existing building, no column will be placed within the workshop so as to make it easier to change the layout of equipment and the manufacturing line in future. The lighting of the workshop will rely on the natural lighting from the windows in north and south. As for the ventilation of the workshop, air supply opening will be set on the wall on the south so that fresh air can come in, while air will be exhausted outdoors through a ventilator set on the wall on the north.

(iii) Testing zone

The testing zone, closely related to the workshop, faces the practice zone and consists of various rooms. On the first floor, individual rooms will be designed so that the process of delivery, mixing, and storage of materials, can be flown smoothly. The testing room on the second floor consists of two rooms: one which is for testing and holds a consistent temperature and humidity regulated by the International Organization for Standardization (ISO); and the other which is for general testing. Also, a jig room will be designed for the maintenance of equipment used in the facility. The testing zone and the control zone are directly connected with two lines of corridors for observation.

(2) Determination of facility size

1) Criteria for calculating the facility size

The size of the facilities will be determined in accordance with the following criteria

(i) the size of the current rooms and their frequency of use

(ii) standards for buildings in Pakistan, standards for educational facilities, and standards for other buildings

in Karachi

(iii) the size of similar facilities and the social custom in Pakistan

(iv) the size of similar schools in Japan (with reference to the Handbook of Environmental Plan)

(v) The size of educational facilities in comparable countries in the past

2) Control zone

The current roles of the PTC facilities include (1) training (Basic Plastics Technology Course, Short Training Course, and Academic Course), (2) testing, (3) technology services, and (4) others. In the academic course, which makes use of the PTC facilities full time, 64 students are enrolled. But lectures are given at the facilities of the SFDAC, adjacent to the PTC, so additional class rooms will not be incorporated in the new facility. However, the number of the Basic Plastics Technology Courses and the Short Training Courses is planned to be increased, so a lecture room and a computer room which cannot be created in the existing building will be planned for the new building.

(i) Lecture room

The lecture room is designed to be used for lectures given during practical training and meetings, requiring for a capacity of 10 – 20 persons. The lecture room is expected to be in high demand. The summary of the room is shown in Table 2.

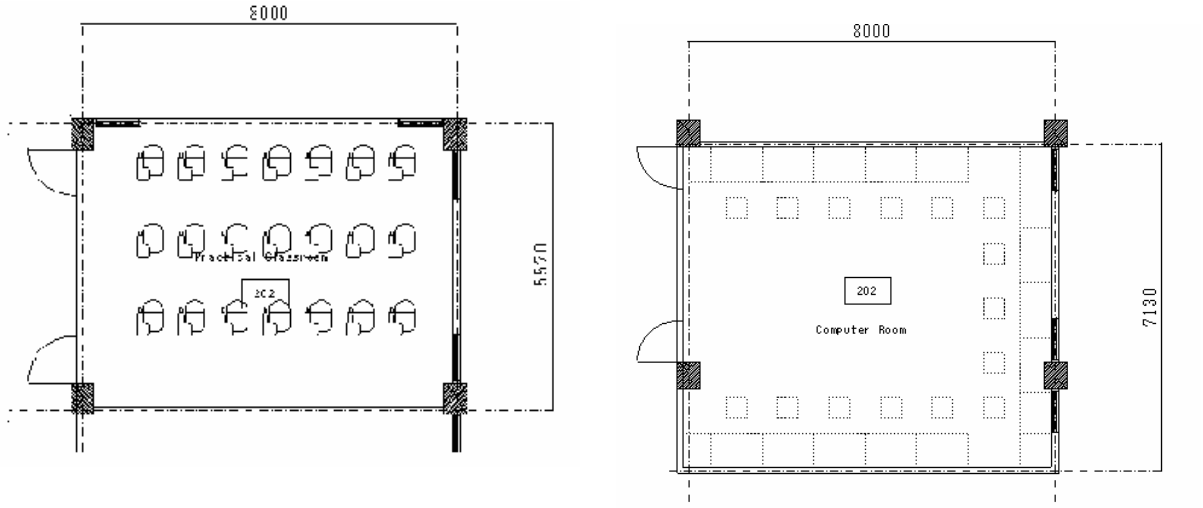
(ii) Computer room

The capacity of the Basic Plastics Technology Course is 30 persons. The participants are divided into two groups: trainees who can simply manage typewriting, and advanced trainees. The former receive the course at the computer room in the existing premises of the PTC, where there are only 15 computers and no room for extra computers. Thus a computer room will be built in the new building. Since there is no criterion for the area setting of this kind of rooms, the new computer room will be designed so that 15 tables for computers will be allocated.

Table 8 Size setting of lecture room and computer room

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Computer room		1	57.31 m^2	1	To install 15 computer tables
Lecture room (for 20 persons)	None	1	42.64 m^2	1	Current room: 2.7 m^2 per person

Figure 5　Floor plans of lecture room and computer room



(iii)　Office

Currently, the PTC is staffed by 20 personnel, who are engaged in their duties either in the first or second floor of the existing building.

Table 9　Size setting of office

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Office	13.50 m^2	1	27.90 m^2	1	Determined in accordance with the above conditions and the floor plan

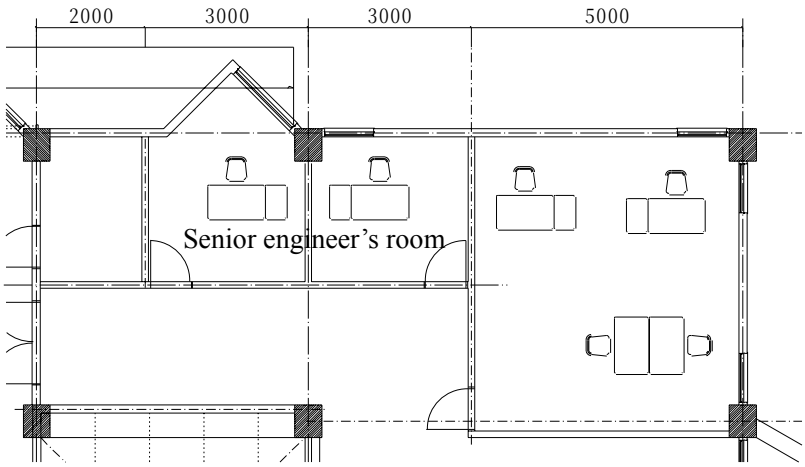
(iv)　Senior engineer's room

Two senior engineers are in charge of guidance and inspection of the production line. Currently, they are obliged to share a room (13.5 m^2) in the existing building. Under this project, they will be provided one room of 8.10 m^2 each with space for closet and furniture.

Table 10 Size setting of senior engineer's room

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Senior engineer's room	13.50 m^2	1	8.30 m^2	1	Determined in accordance with the above conditions and the floor plan

Figure 6　Floor plans of office and senior engineer's room



(v)　Security

There are two security guards who are responsible for control of persons coming in and out of the facility and for the security of the school. They are in service only at daytime. For the floor area of the security room, 7.5 m^2 will be allocated so that a desk, chair, and bookshelves can be installed.

Table 11　Size setting of security room

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Security room	None		7.50 m^2	1	2.5x3.0 m=7.5 m^2

3)　Practical work zone

(i)　Workshop

In the workshop, there are three types of moulding machines in the workshop: the extruder, the injection moulding machine for medium size fitting, and the injection moulding machine for small size fitting. Together with these, a grinding machine for the PVC and training equipment such as a blow moulding machine, a thermoforming machine, and so on will be allocated. The workshop will be spacious enough for trainees to participate in practical training or observe the production processes.

Table 12　Size setting of workshop

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Workshop	480.00 m^2		666.50 m^2	1	45.0x16.0m−b)−c)=666.50 m^2

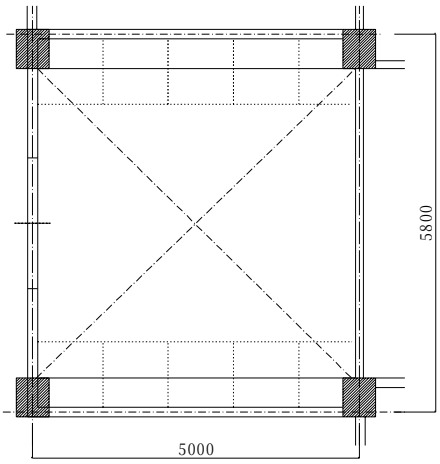
(ii) Mould storage

The mould to be used for the PVC extruder and the injection moulding machine must be stored in the special place in that the volume is quite large and the temperature of the mould becomes high after it is used. The storage has to be rust-free and placed outdoors, adjacent to the workshop. Because each mould weighs 2 t at the maximum, hoists will be attached to the ceiling of the storage and used for keeping mould.

Table 13 Size setting of storage for mould

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Mould storage	None		28.50 m^2	1	2.5x3.0m=28.50 m^2

Figure 7 Floor plan of mould storage



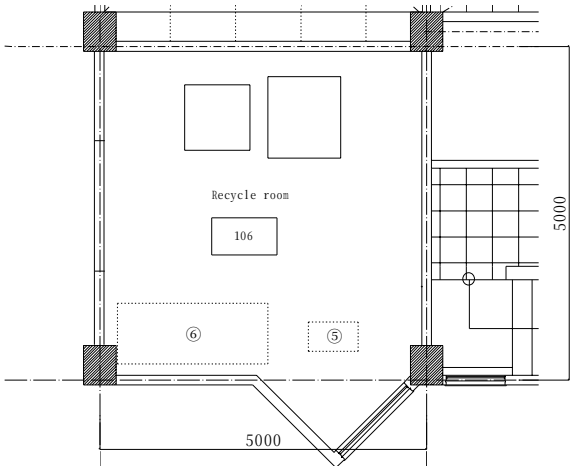
(iii) Recycle room

In Pakistan, the plastics industry has been flourishing in recent years, and the economic trend is expected to continue in future, but on the other hand, the issue of recycling is also expected to be a concern for the country. In line with this, this project will provide a recycle room where defective products and leftover will be grinded in order to be reused as raw materials. This will have an educational effect on trainees who learn the importance of resources. The floor area will be 5.0x5.0=25.00 m^2 where a band saw / a cyclone dust collector will be installed. A ventilator will be also attached for the removal of dusts.

Table 14 Size setting of recycle room

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Recycle room	None		25.00 m^2	1	5.0x5.0m=25.00 m^2

Figure 8　Floor plan of Recycle room



4)　Testing zone

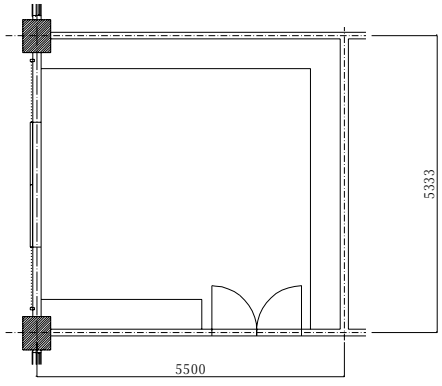
(i)　Material storage

The material storage is for storing materials to be used in the production line. Here, a ventilator will be attached in that dust of raw materials is likely to rise. Also, wood shelves will be installed for arranged storage of materials which are in 25kg bags.

Table 15　Size setting of material storage

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Material storage	None		29.13 m^2	1	5.5x5.3m=29.15 m^2

Figure 9　Floor plan of Material storage



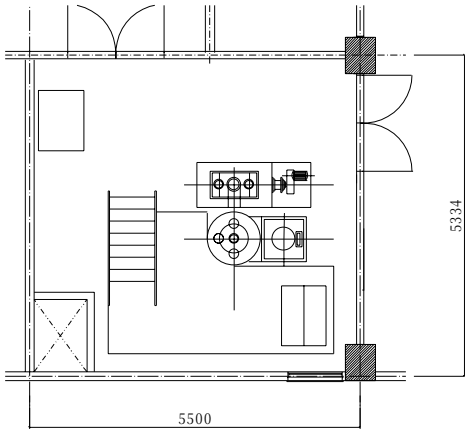
(ii)　Mixing room

The mixing room is designed for putting materials into the mixing machine so that the materials for the production line are blended. The room will be equipped with a heating tank and a cooling tank, and the planned capacity is 200 litters. The size will be large enough to put in the mixing machine and the control panel. A circulation pump will be installed at the bottom floor in order to connect the cooling tank.

Table 16　Size setting of mixing room

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Mixing room	None		29.13 m^2	1	5.5x5.3m=29.15 m^2

Figure 10　Floor plan of Mixing room



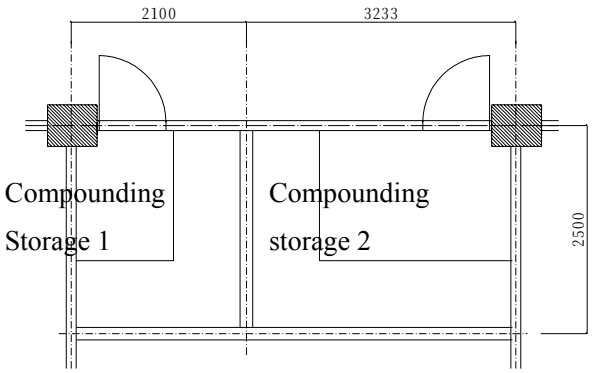
(iii)　Compound storage

This is for temporary storage of blended materials. The compound blended in the training is used immediately with the moulding machine in some cases, but it is also stored to be used later in the other cases. Thus a temporary storage will be required. Each time, 6 – 10 bags (25kg each) are used, so the size of the storage will be large enough to store them. Two doors will be attached so that one each is distinctively used for the injection moulding machine and the extruder.

Table 17　Size setting of compound storage

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Compound storage	None		13.25 m^2	1	2.5x5.3m=13.25 m^2

Figure 11　Floor plan of Compound storage



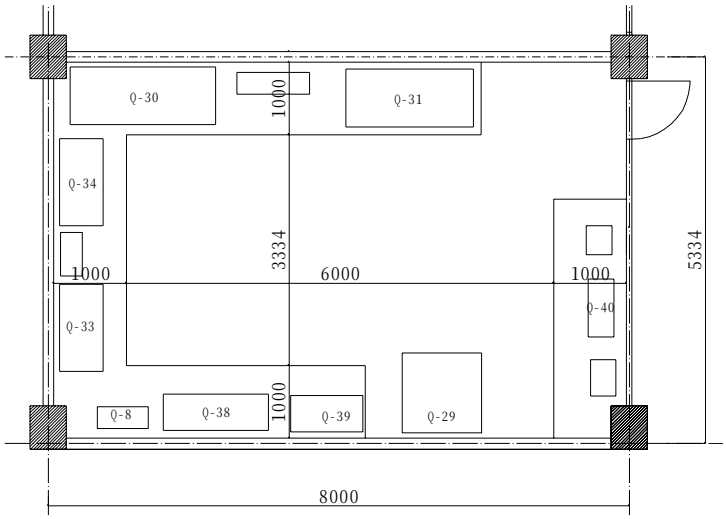
(iv) Testing room 1

This testing room is mainly for property tests of manufactured products and products brought in from a third party. The size of the room will be calculated in accordance with possible test equipment to be installed.

Table 18 Size setting of testing room 1

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Testing room 1	None		42.40 m^2	1	8 .0x5.3m=42.40 m^2

Figure 12 Floor plan of Testing room 1



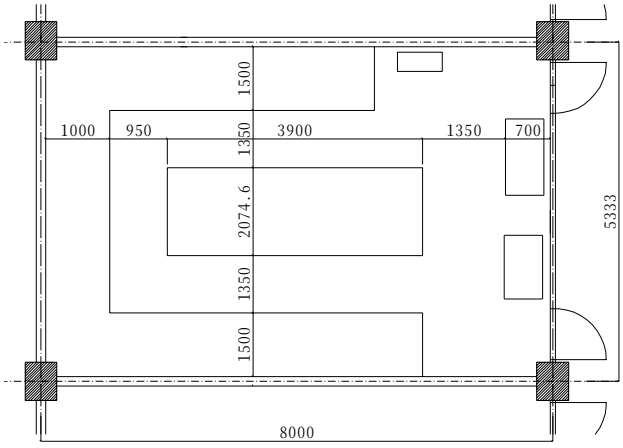
(v) Testing room 2

The purpose of the testing room is for precise measuring. The test has to be conducted under constant temperature and humidity determined by ISO, ASTM, BS, and so on. Hence, double-grazed windows, as well as double doors, will be attached to the room for the appropriate room environment. The size will be determined in accordance with possible equipment to be installed.

Table 19 Size setting of testing room 2

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Testing room 2	None		42.40 m^2	1	8.0x5.3m=42.40 m^2

Figure 13　Floor plan of Testing room 2



(vi)　Testing room 3

Table 20　Size setting of testing room 3

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Testing room 3	None		13.25 m^2	1	2.5x5.3m=13.25 m^2

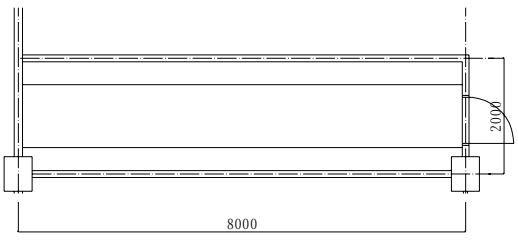
(vii)　Jig storage

This is a storeroom for repair tools and spare parts for equipment to be used in the new PTC building. Storage racks will be attached on the both sides of the room for small tools and spare parts.

Table 21　Size setting of jig storage

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Jig storage	None		16.00 m^2	1	2.0x8.0m=16.00 m^2

Figure 14　Floor plan of Jig storage



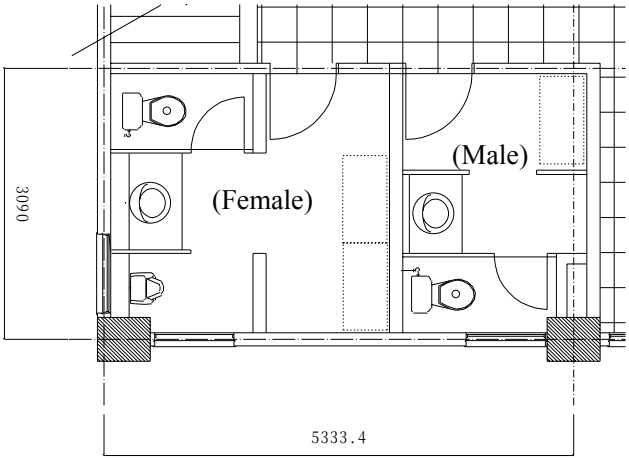
(viii)　Lavatory

Lavatories for men and women will be built in an adjacent to the stairs in the west of the premises. These are for teaching staff members and trainees in the facility. The lavatories consist of one cubicle for toilet bowl and one sink. The front room is designed so that it can be also used for a changing room.

Table 22　Size setting of lavatory (for male and female)

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Lavatory (for men)	None		9.00 m^2	1	5.0x5.0m=25.00 m^2
Lavatory (for women)	None		7.00 m^2	1	5.0x5.0m=25.00 m^2

Figure 15　Floor plan of lavatory



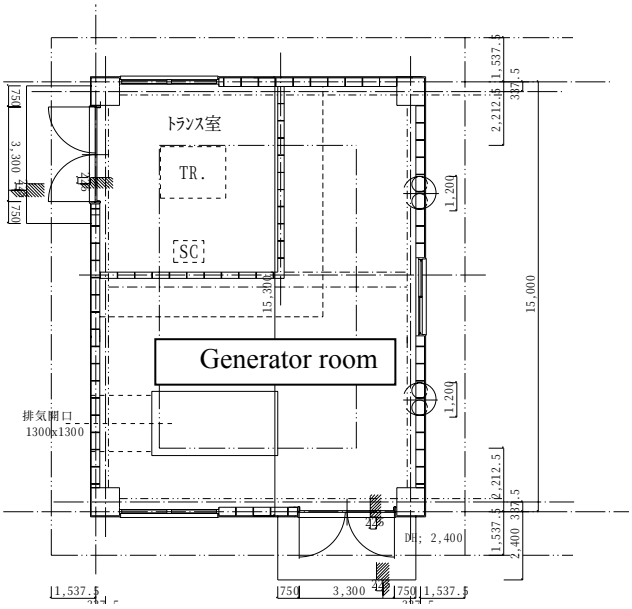
5)　Others

(i)　Generator room

Table 23　Size setting of generator room

Name or facilities	Size of current rooms	Number of current rooms	Planned size	Number of new rooms	Reasons to install new rooms
Generator room	None		100.00 m^2	1	10.0x10.0m=100.00 m^2

Figure 16　Floor plan of Generator room



(3) Table of areas for facilities

As a result of the zoning plan and allocation plans in accordance with the size settings, the dimensions of the rooms are determined as follows.

Table 24 Total areas of the zones

	1st floor area (m^2)	2nd floor area (m^2)	Sub-total (m^2)
Control zone	128.00	128.00	256.00
Practice zone	720.00		720.00
Testing zone	128.00	128.00	256.00
External zone	75.00		75.00
Total	1,051.00	256.00	1,307.00

Table 25 Control zone

Zone	Floor	Name of room	Capacity	Area (m^2)	Number of rooms	Subtotal (m^2)
Control zone	1	Office	4	27.90	1	27.90
	1	Senior engineer room	1	8.30	2	16.30
	1	Security	2	7.50	1	7.50
	1	Electric room		5.60	1	5.60
	2	Computer room	15	57.31	1	57.31
	2	Lecture room	20	42.64	1	42.64

Table 26 Practice zone

Zone	Floor	Name of room	Capacity	Area (m^2)	Number of rooms	Subtotal (m^2)
Practice zone	1	Workshop		666.50	1	666.50
	1	Recycle room		25.00	1	25.00
	1	Mould storage		28.50	1	28.50

Table 27 Testing zone

Zone	Floor	Name of room	Capacity	Area (m^2)	Number of rooms	Subtotal (m^2)
Testing zone	1	Raw material storage		29.33	1	29.33
	1	Mixing room		29.33	1	29.33
	1	Compound storage		13.25	1	13.25
	1	Lavatory (male)		9.00	1	9.00
	1	Lavatory (female)		7.00	1	7.00
	2	Testing room 1		42.40	1	42.40
	2	Testing room 2		42.40	1	42.40
	1	Testing room 3		13.25	1	13.25
	2	Jig storage		16.00	1	16.00

Table 28 External zone

Zone	Floor	Name of room	Capacity	Area (m^2)	Number of rooms	Subtotal (m^2)
	1	Generator room		75.00	1	75.00

(4) Sectional plan

(i) Roof

Materials commonly used in the country will be used for columns, beams, and reinforced concrete for floors, with the waterproof finish of asphalt. For the 16-meter area without pillars in the workshop, pre-stressed concrete will be used for beams and slabs.

(ii) Wall

Walls will be made of cavity concrete blocks which are most commonly used in Pakistan, with mortar finish. Because the wall is 61-meter long, for the purpose of preventing cracks, joints will be used for crack induction.

(iii) 1st floor height

In the light of the natural conditions in Pakistan where dust rises frequently, the first floor height will be set at GL +450, which is the same as the current premises of the PTC.

(iv) Story height

The story height will be 3.8 meters in the total of the heights of ceiling and beams. That is, the height of the ceiling is to be set at 3 meters, the same as that of the existing premises of the PTC and the SFDAC, and the height of beams is to be set at 80 centimetres.

(v) Opening

For windows, aluminium frames which are used for the existing premises and can be assembled at the site will be used. Either openable windows or fixed ones will be used to meet the purpose of individual windows. As an anticrime measure, it will be considered to attach grilles to the windows in the first floor. The exterior surface of the doors will be made of steels, while wood will be used for the interior surface.

(5) Structural plan

The building is two-storied and made of reinforced concrete. The footing is laid down directly because the allowable bearing capacity is 8 t/m^2. However, for the purpose of preventing differential settlement, the bottom of the footing will take a larger area so as to reduce the pressure to the earth. Near to the coast, the water level at the site is somewhat high. The water quality is considered to be salty water. Thus, for the ferroconcrete used below the groundwater level, a certain measure should be taken to avoid corrosion, such as taking a wider margin underneath the concrete or making use of sulfate resistant cement. The workshop requires a room without pillars, so pre-stressed concrete is used for beams. The strength of materials for the structure will follow the Japanese Industrial Standards, $18N/m^2$ for concrete and SD295 for reinforcing steel. The construction regulations in Karachi follows the U.S. code, ACI, UBC, and ASTM, so this project will follow such U.S. codes.

(6) Finishing plan

The rainfall is low throughout a year, so the flat roof will be adopted, with the coating of waterproof asphalt. The exterior walls of the building will be made in a method commonly used in Karachi which is the same as the method

applied for the existing premises: cavity concrete blocks are used for the base with mortar finish. As for flooring of the workshop, mortar is laid down on the concrete base, pressed by metal trowel, and coated with dust-proof paint; terrazzo tiles will be used for the flooring of other rooms. In considering the plan for finishing, the following main points concerning the natural conditions and circumstances affecting the building will be taken into account.

(i) Since the site is relatively close to the coast and is vulnerable to salt injuries, special attention should be paid to the selection of materials used for the finishing of exterior walls.
(ii) Daytime temperature is relatively high throughout a year.
(iii) For easy hygienic management and maintenance, materials which are resistant to stain and easy to clean will be selected.
(iv) Where dust is likely to rise when raw materials are being delivered or grinded, the rooms in question should be well ventilated.
(v) Materials to be selected should be long lasting, break-proof, and solid.

Table 29 Plan for finishing

(i) Roof	In the light of salt injuries, steel and other metal should be avoided as much as possible. Waterproof asphalt will be used for the roof. However, since it is hot in summer, the roof will be supported by expansion joints.
(ii) External wall	Sea wind containing salt is likely to blow in this area. Thus, the external walls will be coated by general mortal, and additionally covered by acrylic emulsion paint.
(iii) Ceiling	Ceiling will not be attached to the workshop area where a machine ventilator is attached so that air supply is sufficiently secured. Perforated plaster board is used for the ceilings of office, the computer room and the testing rooms, with 3 meters in height.
(iv) Internal wall	The internal walls are basically coated by mortar with the paint finish. However, since the hygienic management is required for lavatories, tiles will be used for easy cleaning.
(v) Floor	Two types of flooring are applied in accordance with the places and purposes. The floors of the workshop, mould room, and the band saw room will be concrete bases which are pressed by metal trowel. The flooring of other rooms will be covered by terrazzo tiles.

a) External finishes

Parts	Specifications
	Three-layer waterproof asphalt
External Wall	Cavity concrete blocks = AEP coated by mortar
Window, door frame	Aluminium sash and metal door for the outside; wooden door with steel grilles for the inside
Approach	Interlocking blocks and stone-paved stairs
Scarecement	Interlocking blocks w=1,000

b) Internal finishes

Floor	Room name	Floor	Wall	Ceiling	Note
1st floor	Entrance hall	Mortar underbed with terazzo tile	Mortar underbed with paint finish	Aluminium frame asbestos board	Display stand
	Staircase	-ditto-	-ditto-	Paint	Hand rail: steel wooden
	Office	-ditto-	-ditto-	Aluminium frame asbestos board	Air conditioner
	Senior engineer's room	-ditto-	-ditto-	Paint	
	Mould storage	Mortar underbed with paint floor	-ditto-	-ditto-	Hoist, pallet
	Recycle room	-ditto-	-ditto-	-ditto-	
	Workshop	-ditto-	-ditto-	-ditto-	Ventilator (Large volume)
	Raw materials storage	Mortar underbed with terazzo tile	-ditto-	-ditto-	
	Mixing room	-ditto-	-ditto-	-ditto-	Pump, ventilator
	Compound storage	-ditto-	-ditto-	-ditto-	Shelf, ventilator
	Machine room	-ditto-	-ditto-	-ditto-	Ventilator
	Locker room	Mortar underbed with ceramic tile	Mortar underbed with ceramic tile	-ditto-	Ventilator
	Lavatory（M, F）	-ditto-	-ditto-	-ditto-	Wash basin, toilet pan, ventilator
2nd floor	Lecture room	Mortar underbed with terazzo tile	Mortar underbed with paint wall	Aluminium frame asbestos board	White board, air conditioner
	Computer room	-ditto-	-ditto-	-ditto-	air conditioner
	Testing room 1	-ditto-	-ditto-	-ditto-	Testing desk, ventilator , air conditioner
	Testing room 2	-ditto-	-ditto-	-ditto-	Testing desk, ventilator, Air-conditioner to keep the temperature and humidity constant, Double-grazed windows and double doors
	Jig storage	-ditto-	-ditto-	Paint	Shelf
	Staircase	-ditto-	-ditto-	Paint	Hand rail: wooden 45Φ Support
	Corridor for observation on the 2nd floor	-ditto-	-ditto-	Paint	Hand rail: steel 35Φh=1,100

c) Generator room

Room name	Floor	Wall	Ceiling	Note
Generator room	Mortar underbed with paint floor	Mortar underbed with paint wall	Paint	Ventilator (Large volume)

(7) Equipment Plan

1) Electric equipment system

In principle, the electric equipment system will be simple enough to be maintained without special maintenance procedures. For easy maintenance, standard materials and produces easily available on site will be used as much as possible. The electricity infrastructure is poor in Pakistan, failure of power supply occurs once or twice a week. So a private electric generator is a must, and the existing facilities are equipped with private generators.

(i) Transformer

Electricity comes from aerial cables laid on the road in front of the premises, and the voltage is lowered from 400v to 230v at the transformer station of the electricity company of Karachi, and the electricity is supplied through the low-pressure main switchboard. Incidentally, in cases where the alteration is required to the transformer station, the cost will be borne by the Pakistani side.

(ii) Trunk line

Electricity is supplied through the low-pressure main switchboard within the facilities to individual distribution boards, power boards, and equipment distribution boards. In principle, cables commonly used in the country are made use of for wiring, and are protected by the PVC duct lines.

(iii) Power supply

Electricity is supplied through individual distribution boards to air-conditioners, equipment for practices, and educational equipment. In principle, cables commonly used in the country are made use of for wiring, and are protected by the PVC duct lines.

(iv) Plug sockets

Plug sockets to be used follow the standard type in Pakistan, which have two round pins with a ground, or two round pins without a ground. Electricity is supplied through the general type of plugs to individual rooms, the computer room, the office, the jig storage, and other rooms, and through special plugs to the practice room, the room for grinders, air conditioning equipment, and so on.

(v) Lighting

In the light of the situation in Pakistan and the existing premises, fluorescent light, easy to replace bulbs and maintain, will be mainly used for the new facilities. In the view of possible salt injuries, the attention will be paid in the selection so that products of normal prices will be used for easier replacement in the future. In the light of the code in Pakistan and the current situation in the existing premises, the illumination intensity will be determined in accordance with the following criteria. As for the lighting in the computer room, a care will be taken so as to prevent the reflection of the light on the monitors.

Table 30 Criteria for illumination intensity

Rooms	Intensity
Office, testing rooms, lecture room, etc.	400 lX
Computer room, senior engineer's room, security	250 lX
Practice room, storage for materials, mixing room, and hallway	120 lX
Private electric generator, lavatories, and corridors	70 lX

(vi) Telephone

Utilities such as telephone switches, telephone sets and so on will be supplied by the Pakistani side. This project will provide lead-in lines, internal telephone lines, and outlets alone.

(vii) Generator

Among many pieces of equipment to be provided in this project, three devices generate harmful chlorine gas when the power gets out while they are running. Currently, power failure occurs once or twice a week in Karachi, so it is necessary to provide a private electric generator which will supply electricity to the devices in the events of blackout. The private generator will be installed adjacent to the existing generator of the SFDAC. At the same time, some of the laboratory instruments require safe and constant power supply during experiments, thus the private generator will be designed to supply electricity to these instruments, too.

(viii) Fire alarm system

Fire alarm system will be installed in accordance with Karachi and Pakistani law. The system is consisted of smoke detectors and thermo detectors.

2) Plumbing system

The plumbing system will be simple and effective enough to do basically without complicated handling or maintenance. For the purpose of easy maintenance, materials and products for the system will be standard types and easy to procure in the country.

(i) Water supply system

The water main of the city is laid in the road in front of the PTC premises. Water is supplied through the water meter in front of the road to the water tanks (the capacity of 20t and 28t, respectively) of the PTC and the SFDAC. In summer, however, water supply stops twice or three times per week, so a water tank to be supplied under the project should be large enough to prepare for water stoppage. Water will be supplied to individual outlets through a high tank. The cooling water to be used in the workshop does not contain any harmful substance, and is circulated constantly, so additional water is minimal.

(ii) Sanitary system

For the purpose of easy maintenance, products for the system will be standard types and easy to procure in Pakistan.

(iii) Drainage system

There are two main drainage pipes laid within the site, but neither has terminal processing facility, wastewater discharged to riverbeds. Thus, it will be design to connect a septic tank to the drainage pipes before discharging sewage and wastewater.

(iv) Septic tank

The existing septic tank will be used for this project.

3) Air conditioning and ventilating system

In principle, specific rooms alone will be equipped with air conditioning. The specific rooms will the office, the senior engineer's room, the computer room, the lecture room, and the testing rooms. Since precision instruments vulnerable to dusts will be installed in the testing rooms, the rooms will be also equipped with a humidity regulator. The air conditioning (split-type) will be installed to each room. Apart from this, a water-cooling chiller will be installed at the workshop as a cooling system for the production line.

(i) Air conditioning system

Air conditioning systems will be installed to a minimum number of rooms: the office, the senior engineer's room, the computer room, the lecture room, and the testing rooms 1 and 2. The split-type air conditioners will be used in principle. As for one of the testing rooms where a constant level of temperature and humidity is required, cooling and heating air will be obtained from the chiller.

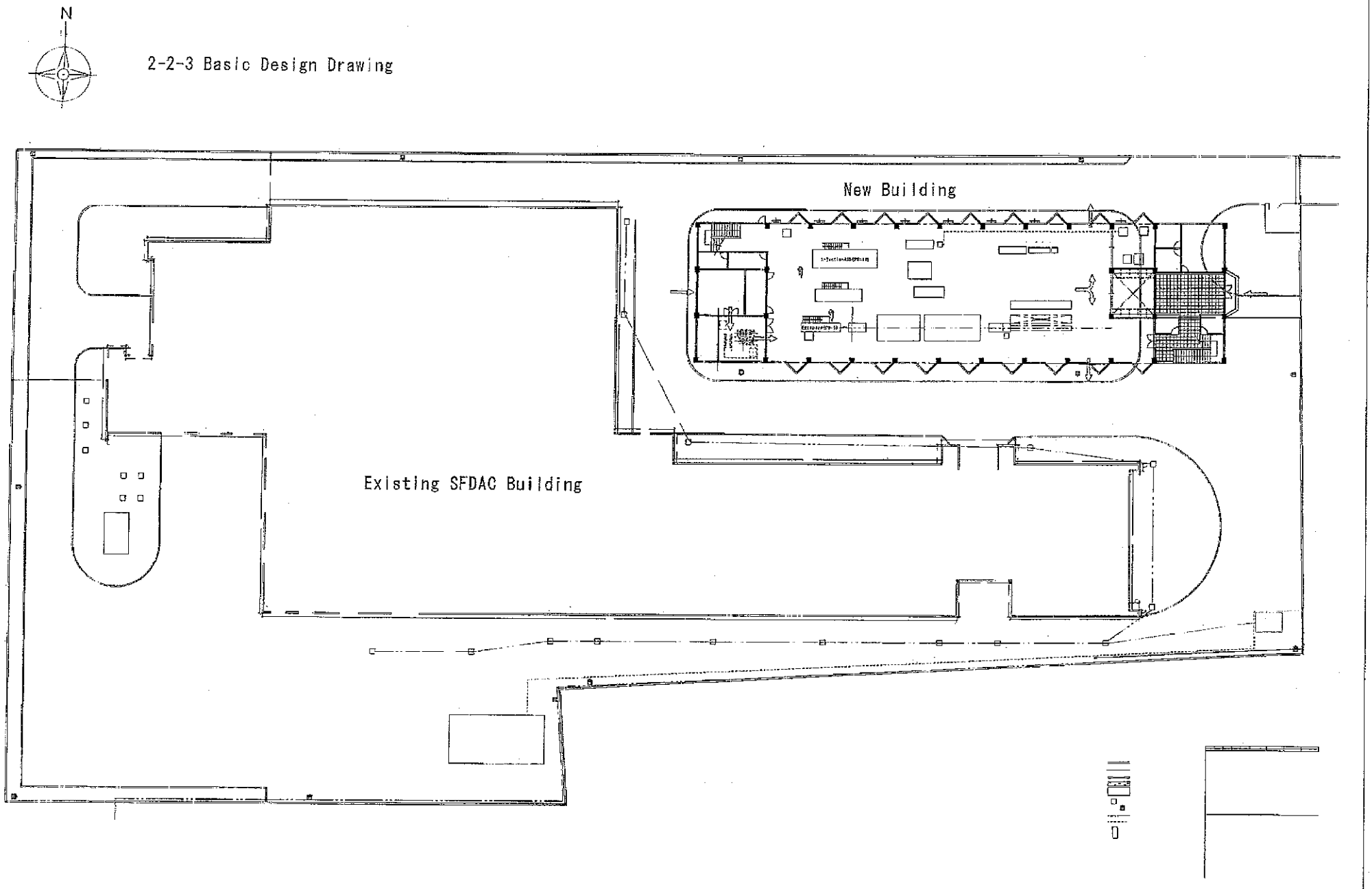
(ii) Ventilation system

Ventilation systems for active ventilation will be installed to the following rooms: the recycle room, the mould storage, the testing rooms, the material storage, the material mixing room, the lavatories, and the testing rooms 1 and 2.

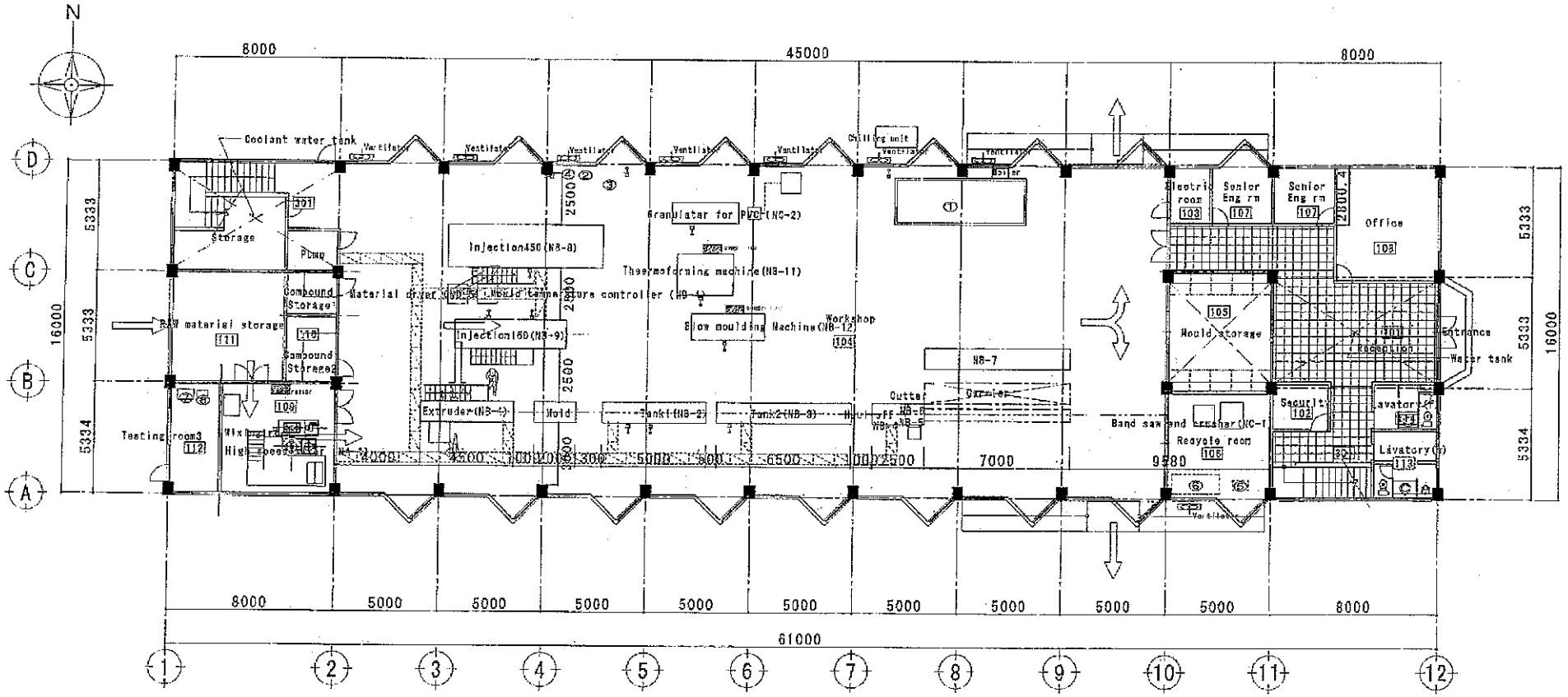
4) Fire-prevention system

For smoother action at an early stage of fire, small extinguishers will be installed to places where necessary.

2-2-3 Basic Design Drawing



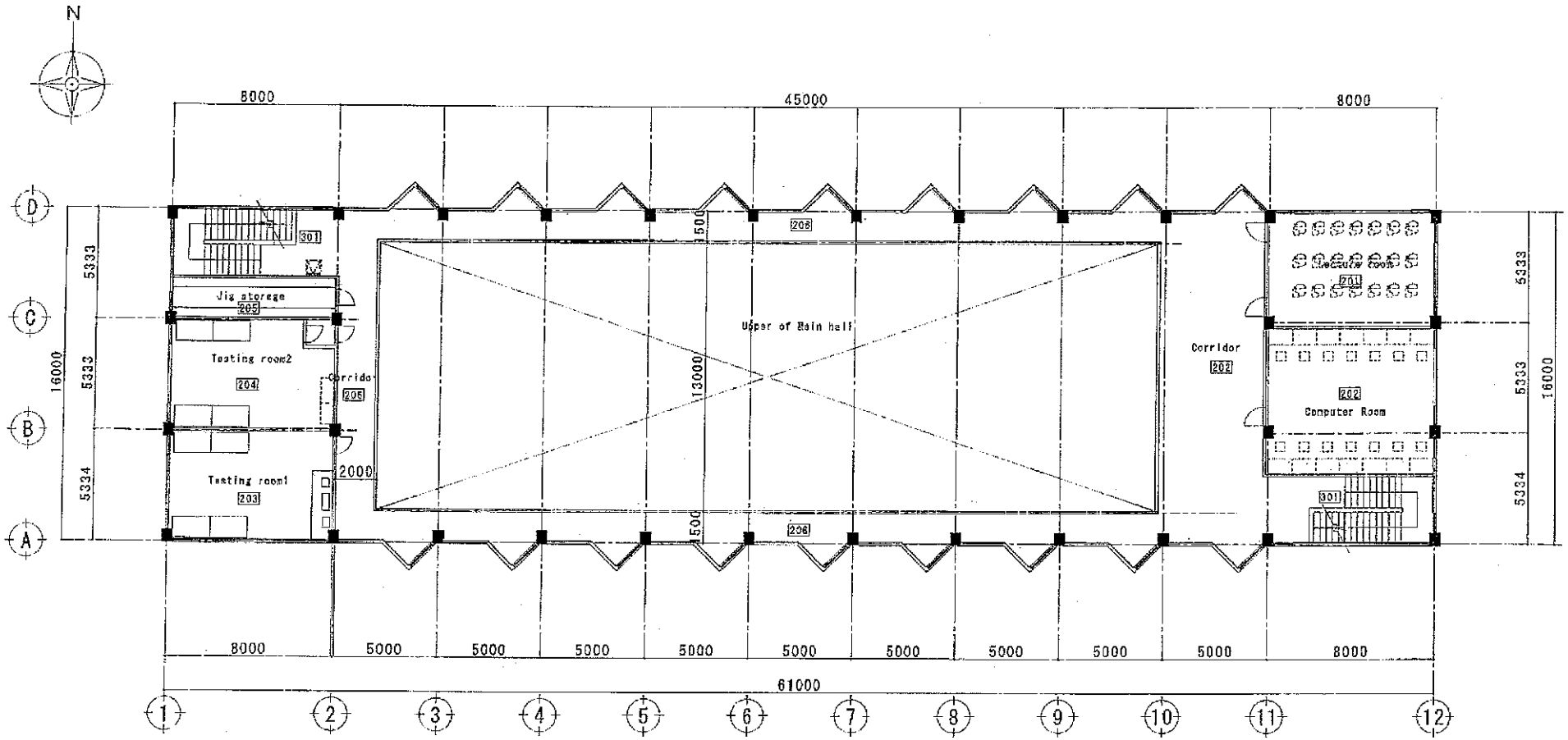
Plastics technology Centre Korangi Karachi In The Republic of Pakistan		DATE 30/03/2001	SCALE 1:100(A-1) 1:200(A-3)	NUMBER OF SHEET 01
Site layout PLAN	DESIGN Kokado			



Ground Floor Plan

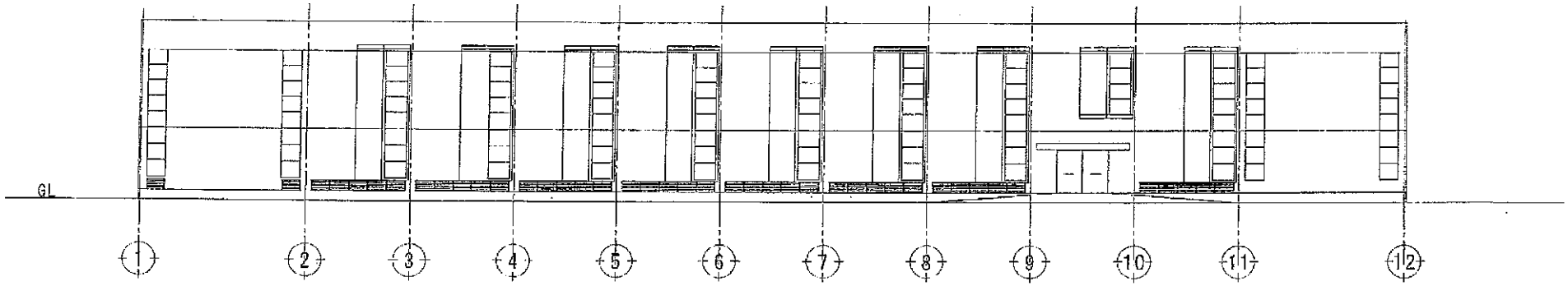
2-47

	Plastics technology Centre Korangi Karachi In The Republic of Pakistan		DATE DECEMBER 2002	SCALE 1:100 (A-1) 1:200 (A-3)	SHEET 03
	Grand Floor PLAN	Kokado			

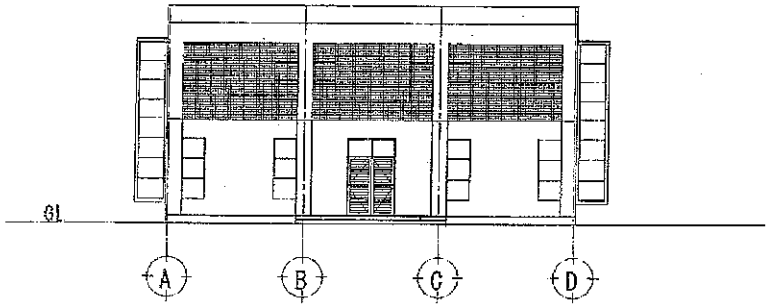


First Floor Plan

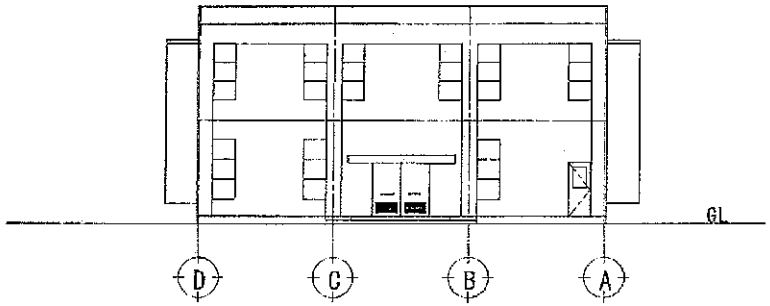
	Plastics technology Centre Korangi Karachi In The Republic of Pakistan First Floor PLAN		SEPTEMBER 2006	1:100 (A-1) 1:200 (A-3)	04



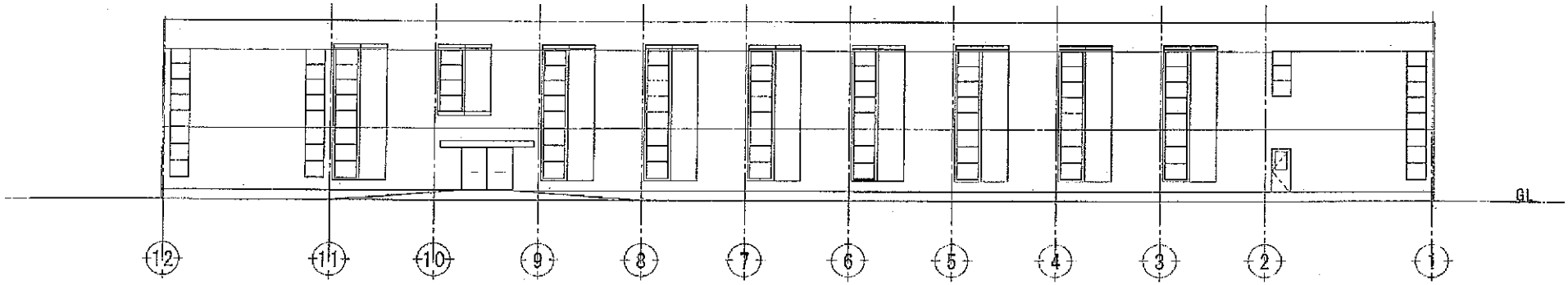
North Elevation



East Elevation



West Elevation



South Elevation

Plastic Emb. Village Center, Korangi Karachi
In The Republic of Pakistan

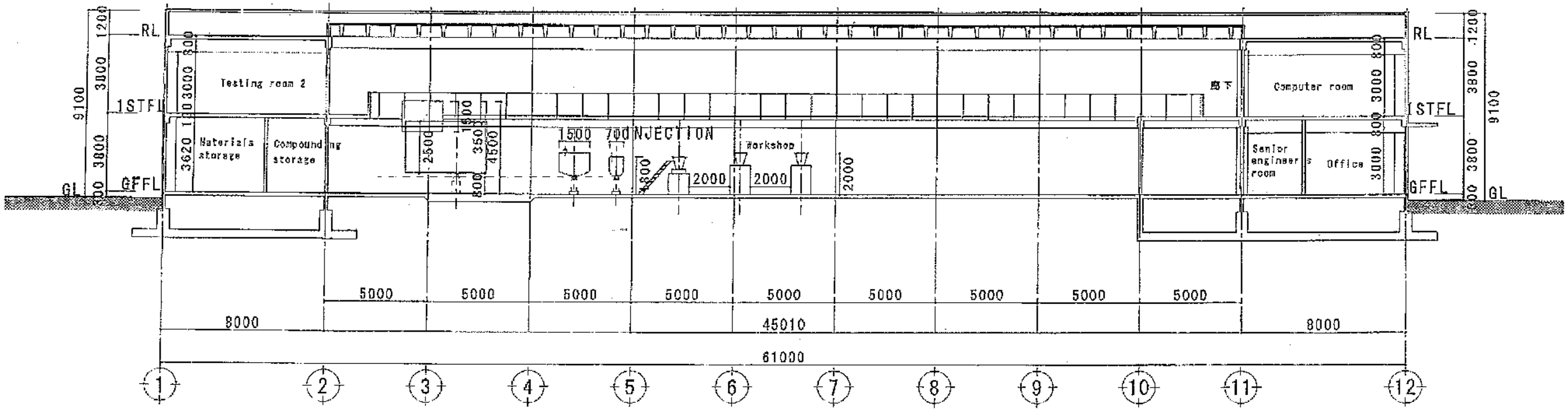
FACADE NORTH EAST, SOUTH, WEST

Kokado

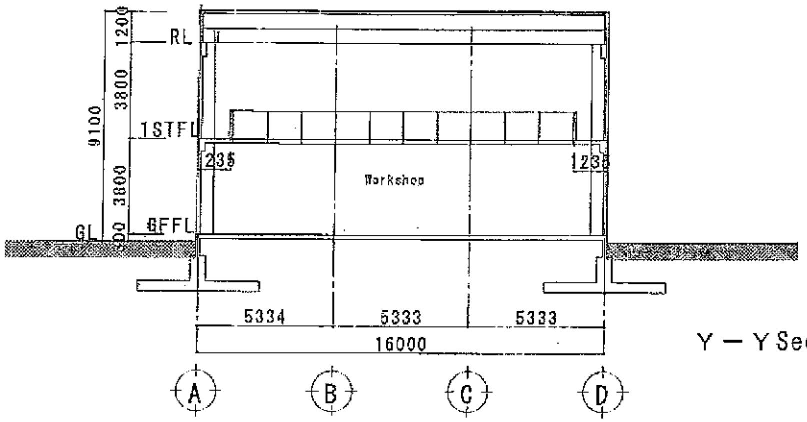
DECEMBER 2009

1:100 (A-1)
1:200 (A-3)

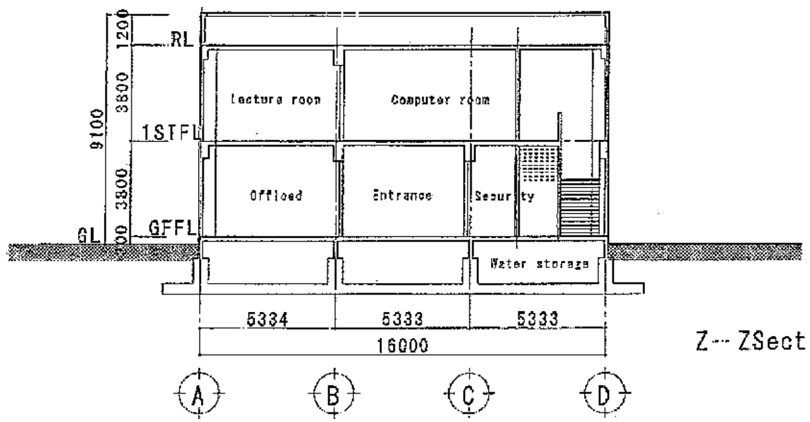
03



X — X Section



Y — Y Section



Z — Z Section

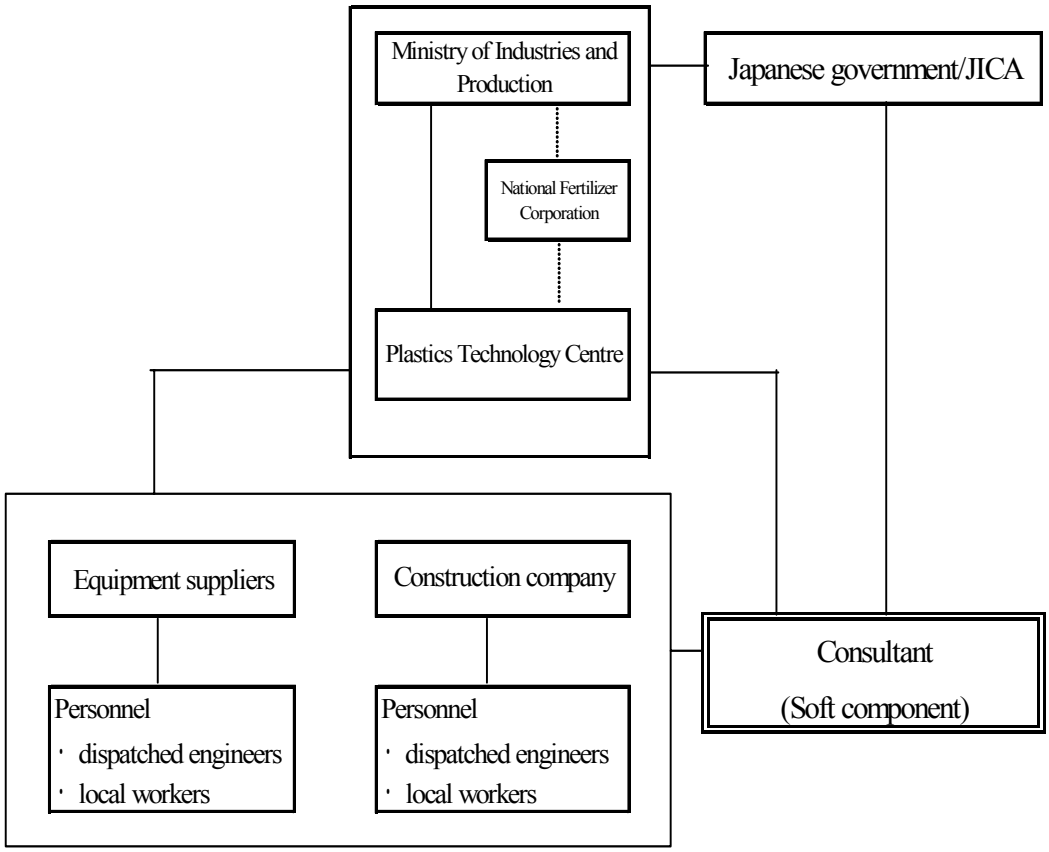
Plastics technology Centre Korangi Karachi In The Republic of Pakistan	DECEMBER 2003	1:100(A-1) 1:200(A-3)	03
SECTION PLAN	Kokado		

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

This project aims at providing equipment and facilities to the PTC in Pakistan through grant aid cooperation of the Japanese government. The executing agency, the Ministry of Industries and Production, will make an agreement with a consultant in Japan, having it engage in tasks concerning designing of the project implementation, writing of tender documents, tender evaluation, construction work of facilities, supervision of installation of equipment, as well as the execution of soft components concerning the supervision of curriculum development and the guidance concerning equipment to be procured. Meanwhile, the Ministry of Industries and Production will make agreements with Japanese construction companies and equipment suppliers, and under the agreements the construction companies will be responsible for the construction of facilities and building equipment, whereas the equipment suppliers will be responsible for the supply of equipment, installation, and technical advice concerning operation and maintenance of the equipment.

Figure 18 Implementation Organization



As for the construction of the facilities and the installation of equipment, local workers will be made use of under the supervision of Japanese engineers. Upon the construction of buildings within Karachi, application documents for confirmation have to be submitted to the construction department of the municipal government. Only

consultants registered at the Technology Association of Pakistan are eligible for the submission of the application, and the application for examination concerning the technological aspect of the project is required to be submitted under the name of a local construction office or consultant, and the Japanese firms involved. A technological document to be formed for the examination for the construction needs to be detailed working drawings, rather than a technological document for usual projects of grant aid cooperation, or the application for confirmation required in Japan. Upon consideration of such various issues regarding the application for the authorization, a large number of documents required for the application, and the limited time schedule for construction, a local architectural office will be made use of effectively. In particular, prior to the designing of the project execution, it is necessary to have discussion with the construction department of the Karachi municipal government. At the same time, Karachi city has is own regulations concerning city and building plans, which, together with the Pakistani construction codes, have to be complied with. On the other hand, for better use of local construction companies, the participation of local skilled workers and supervisors will be essential in that they have experiences in groundwork and works related to electricity, water supply and drainage facilities in the Korangi area.

2-2-4-2 Implementation Conditions

(1) Since the vast majority of people in Pakistan are Muslim, drinking and eating are restricted in the daytime during Ramadan. Thus, the construction schedule has to be drawn up in the light of the possible drop in the efficiency, in particular, for outdoor construction work. In 2004, the Ramadan commences in mid-October.

(2) Even during the construction of new buildings, the existing premises are being used. Thus safety of teaching staff, trainees, and students must be secured. It is expected that construction vehicles and vehicles of persons who uses the facilities move in and out, so that traffic safety must be ensured and it will be necessary to take safety measures when carrying in and out materials and equipment.

(3) An application for confirmation is required from a local architectural design office in order to construct facilities of the PTC. At the same time, in order to supervise local construction companies, it is required to have a local architectural design office and a consultant, who are familiar with technical drawings and construction methods in the country, participate in the project. In this project, a Japanese design office will make use of a local architectural design office.

(4) All cargos and technologies (with an exception of some items which are considered to be irrelevant to the development of weapons of mass destruction) are in principle subject to restrictions on export to Pakistan under the Catch All Control of the Japanese government. Restrictions on export do not necessarily mean the impossibility to export, but certain procedures may be required. Moreover, export of computer-related equipment (hardware and software) to Pakistan requires the permission of the U.S. government. Thus, as a condition of the tender, it will be stated that equipment suppliers are required to conduct such procedures, as well as the procedure to obtain permissions from the Japanese government.

2-2-4-3 Scope of Works

Japan	Pakistan
1. Construction work Building framework and finishing 2. Work related to electrical facilities Transmission and transformer, trunk lines, power equipment, plug outlets, lighting, telephone cables, and private power generators 3. Work related to water supply and drainage system Water supply from the public facilities, plumbing fittings, water distribution, and septic tank 4. Work related to air conditioning and ventilation Air conditioners and ventilators 5. Work related to disaster prevention facilities 6. Training aids Mixer for raw materials, plastics moulding lines, production line for recycling materials, testing equipment, training aids, and maintenance equipment 7. Soft Component	1. Securing land necessary for construction 2. Removal and repair of the existing walls 3. Exterior work 4. Extension of transmission and transformer (if necessary) 5. Cost for retraction of infrastructures 6. Appliances and furniture such as desks and chairs 7. Procedures related to the application for confirmation, customs clearance, and tax exemption 8. Cost for things which are not covered by the project but are necessary 9. Cost for operation and maintenance

2-2-4-4 Consultant Supervision

(1) Basic policy

Complying with the guidelines of the grant aid cooperation of the Japanese government and the consultant agreement, and in the light of the primary purpose of the basic design, the consultant will carried out the project without delay until the completion of its assignment by means of formulating a project team which can cover the designing, supervision of construction work and procurement of equipment, and soft component. The tender for building and equipment will be conducted among Japanese firms.

(2) Scope of services

The scope of services is as follows.

1) After the conclusion of an agreement concerning the design with the Pakistani government, the consultant will conduct surveys and discussion about the execution of the design with the relevant bodies in Pakistan. The basic design plan of the facilities, accounting statements, specifications of work will be drawn in Japan, and then the approval will be obtained from the client, the Ministry of Industries and Production of Pakistan.

2) The consultant and the local architectural design office will submit the application for construction permission under the joint signature to the responsible department of the Karachi municipal government, and gain the permission after the examination. The local architectural design office will be responsible for the detailed design. The consultant will visit Pakistan at regular intervals, and supervise the process of the designing through mutual consultation with the local design office.

3) When completed, the tender documents will be approved by the client, the Ministry of Industries and Production of Pakistan. Then, after the procedure for the execution of the plan, its approval, the examination for qualification to participate in the tender, the tender, and the evaluation, a construction company will be determined.

4) After the conclusion of agreement on construction work between the Pakistani government and the contracted companies, the consultant will conduct the checking on the working drawings submitted by the construction company, the supervision of manufacture of components, the inspection of quality of products and materials, and the inspection of shipments.

5) Where the structure of the project execution and the supervision is concerned, an office will be set up within Karachi for the supervision where a certain number of management staff from the construction company and one person from the consultant will be dispatched from Japan and stationed.

6) The consultant will hold monthly and weekly regular meetings so as to monitor the process of work schedule, and supervise the local construction companies.

7) In relation to the management of the local construction work, in order to deal with confirmations and inspections to be carried out during the construction work of the building (ground testing; inspections for bar arrangement, framework, placement of concrete; checking on the strength of concrete, and so on), local experienced local building engineers, if necessary, will be hired at the supervision office or on site.

8) The consultant will make effective use of local building engineers, supervise the local construction work, confirm the items in the list to supervise, and report and discuss its duties at regular meetings.

9) The consultant will issue certifications and other formal documents when required.

10) The consultant will dispatch personnel for the purpose of guidance concerning curriculum development and equipment, and engage in duties related to the soft component.

11) The consultant will be in charge of necessary duties, including the contact and report to the Ministry of Industries and Production, the Embassy of Japan in Pakistan, and the JICA Pakistan Office, and so on.

(3) Project team members and responsibilities

(i) Project manager

- Comprehensive management of the overall duties of consultant
- Agreements and discussions with relevant bodies in Pakistan
- Discussions and confirmation of detailed specifications of equipment
- Drawing of the tender documents and witnessing the tender
- Inspection of delivered equipment and witnessing the delivery

(ii) Facility manager

- Comprehensive management of duties related to designing (plans concerning architecture, structure, electricity, hygiene, air conditioning)
- Designing the overall plan for facilities and drawing of the tender documents
- Discussion and examination of equipment to be procured, and direction about examined matters to the structure, electrical, and plumbing engineers
- Cooperation on the application for confirmation, and discussion with local consultants
- Witnessing the tender
- Witnessing inspections of buildings at the time of commencement of work, during the work, and at the time of completion

(iii) Architect

- Comprehensive management of duties concerning designing
- Reconfirmation of conditions and criteria related to designing
- Drawing of the tender documents (technical and design plan documents) and witnessing the tender
- Drawing of the design plan documents required for the application for construction of buildings, and the provision of technical information
- Examination and approval of the construction plan
- Inspection of buildings at the time of commencement of work, during the work, and at the time of completion

(vi) Structure engineer

- Drawing of the tender documents (technical and design plan documents) and witnessing the tender
- Drawing of the design plan documents required for the application for construction of buildings, and the provision of technical information
- Examination and approval of the construction plan
- Inspection of construction work during the work (concerning basis and bar arrangement at each storey)

(v) Electrical engineer

- Drawing of the tender documents (technical and design plan documents) and witnessing the tender
- Drawing of the design plan documents required for the application for construction of buildings, and the provision of technical information
- Examination and approval of the construction plan
- Supervision of the construction work during the work and confirmation of installation of each equipment at the time of completion of work

(vi) Air conditioning, ventilation and plumbing engineer

- Drawing of the tender documents (technical documents and drawings) and witnessing the tender
- Drawing of designing documents required for the application for construction of the building, and the provision of technical information
- Examination and approval of the construction plan and equipment
- Supervision of the construction work during the process of the work, and confirmation of the installation of equipment at the time of completion of the work

(vii) Quantity surveyor

- Proposal of procurement place and method of building materials
- Cost estimation and proposal of cost reduction

(viii) Supervisor of construction work

- Negotiation directly with the Pakistani government
- Examination of matters to discussed with local consultants
- Examination and approval of the construction plan
- Confirmation of the quantities of materials and equipment for the construction work, and checking on the degree of their strength
- Guidance and supervision of the quality of construction work
- Confirmation of the progress of the construction work

(ix) Equipment planner 1

- Discussion and confirmation of detailed specifications of the plastics moulding machines and related equipment
- Drawing of the tender documents (technical and design plan documents) and witnessing the tender
- Approval of equipment, witnessing the factory inspections, pre-shipment inspection, and supervision of the installation
- Inspection of delivered equipment and witnessing the delivery

(x) Equipment planner 2

- Discussion and confirmation of detailed specifications of the plastics moulding machines and peripheral equipment
- Drawing of the tender documents (technical and design plan documents) and witnessing the tender
- Approval of equipment, witnessing the factory inspections, pre-shipment inspection, inspection of transportation, and supervision of the installation
- Inspection of delivered equipment and witnessing the delivery

(xi) Personnel responsible for soft component (guidance for the curriculum development)

- Provision of guidance concerning survey methods of market needs
- Provision of guidance concerning methods to design education and training courses which reflect the market needs
- Provision of guidance concerning methods to form curriculum
- Provision of guidance concerning design of teaching materials

(xii) Personnel responsible for soft component (guidance related to equipment)

- Operation of the PVC pipe manufacturing lines and management methods for maintenance
- Provision of methods for quality control

2-2-4-5 Procurement Plan

[Building]

Most of the basic materials for construction are available within Pakistan. However, due to the increasing demand for construction in the country and the boom in construction in Afghanistan, there is a concern that building costs are likely to increase substantially. Thus, the materials will be procured as early as possible once the agreement is made.

(1) Labour

General workers and skilled workers are available without difficulty in Pakistan. However, the absolute number of the latter is limited. Under this project, in order to ensure the accuracy of construction and high quality, efforts will be made to secure skilled workers so that an appropriate labour division can be established.

(2) Raw materials

1) Construction materials

Most of the materials for construction are produced in Pakistan, and are easily available. However, aluminium sash, paint, etc. which are forecasted low quality and lack of stock. Therefore, they are acceptable imported from ASEAN countries also.

2) Electric facilities and air conditioning

Both domestic and import products are available. However, considering quality of products and delivery date, the products imported from ASEAN are acceptable.

3) Construction machines

Medium-sized construction companies own heavy machines to some extent, and rented machines are also available. Hence, almost all kinds of construction machines can be procured.

The major plan for the procurement of materials and equipment is defined as follows:

Table 31 List of construction materials and equipment to be procured

Name of materials/equipment	Country	Note
Cement, Reinforcing bar	Pakistan	Domestic products are available
Aluminium sash	Pakistan / ASEAN	Materials for frames are import
Concrete block	Pakistan	Domestic products are available
Asphalt sheet membrane waterproofing	Pakistan / ASEAN	Import and domestic products are available
Paint	Pakistan / ASEAN	Import and domestic products are available
Wooden doors	Pakistan	Domestic products are available
Building hardware	Pakistan / ASEAN	Import products are available
Air conditioning appliances	Pakistan / ASEAN	Import and domestic products are available
Electric equipment	Pakistan / ASEAN	Import and domestic products are available

[Equipment]

A majority of equipment to be procured in this project are not manufactured in Pakistan, and only limited kinds of products are manufactured such as hand tools, furniture, and general electric appliances. However, in the light of the functions, quality, durability, and safety of such available products, nothing apart from furniture will be unsuitable for the education and training. On the other hand, equipment actually used by Pakistani companies is mainly made in Japan, Europe, Taiwan, or China. At the same time, support services are well established for Japanese products, so equipment to be procured under this project will be selected among Japanese products. Equipment for testing and education will be selected among Japanese products, but when the number of manufacturers is limited, the products of OECD members will be subject to the selection for the purpose of an increase in competition. Meanwhile, as for equipment which is manufactured by Japanese companies or OECD members but outside Japan, so long as its quality is comparable to that of made-in-Japan products or OECD member products, such equipment may be selected. However, the countries of origins will be restricted. All the equipment delivered from Japan will be subject to the Catch All Control regulation, whereas equipment to be procured from the U.S.A. such as software, computers, and related parts, requires the U.S. verification. It should be noted that it will take two to four months to obtain the U.S. verification.

2-2-4-6 Quality Control Plan

Based on the design plan documents (specifications, drawings, etc), the construction company will submit a construction plan to the consultant before the commencement of the actual work. The plan should include the target values of strength and dimensions, testing and inspection methods, and construction methods. The consultant will check on the submitted design plan documents. In particular, various tests and inspections have to be based on the schedule management plan; and the test methods, the timing, and frequencies are presented in advance, and the criteria for the tests and inspections is provide; and good quality has to be ensured. On the other hand, the consultant will organize and clarify the criterion measures concerning quality control (i.e., materials, strength of the design, structure, shape, and dimensions); investigate the nature of “methods of various tests and inspections (proposal)” in

the construction plan submitted by the contractors; and draw a quality control plan. The major items to be confirm are as follows:

(1) Materials

(i) names of manufacturers of reinforcing bars and test methods
(ii) names of manufacturers of cement and test methods
(iii) test methods to check proportion of aggregates (sand and aggregates), percentage of moisture content, dimensions and component of aggregates
(iv) Obtaining of warranty letters for other materials, and test methods

(2) Excavation, Filling and Grading Work

(i) slope angles, precision of excavation to designated levels, height for foundation work
(ii) confirmation of filling and grading methods

(3) Reinforced Concrete

(i) test mixing of concrete in accordance with the mixing chart
(ii) target values for the proportion of water and cement, volume of air, density of salt, and slump in the mixing plan
(iii) Confirmation of criterion values for designing
(iv) types of mixers and measuring methods, and a plan for allocation of engineers responsible for the management of concrete manufacturing
(v) test methods for slump, volume of air, and density of salt; the frequencies of tests; and data collection
(vi) curing methods for concrete test pieces
(vii) test for the strength of reinforcing bars

(4) Masonry
(i) target values for precision of evenness and perpendicularity

(5) Plaster Work
(i) target values for precision of evenness and perpendicularity

(6) Waterproofing
(i) leakage test with water

(7) Door & Windows, Ceiling Works

(i) target values for precision of evenness and perpendicularity

Control standards

Because quality control standards are not defined in Pakistan, the standards to be used in the project will follow the standards regulated by the secretariat of the Minister of Construction of Japan or the U.S. standards. They will be based on the construction plan submitted by the construction companies, and required to be approved by the consultant.

2-2-4-7 Implementation Schedule

In the case that this project is carried out under the grant aid cooperation of Japan, the project will be implemented in the following steps:

(1) Detailed design

Based on the survey report on the basic design, detailed specifications of equipment to be procured and construction plans will be determined. Then the tender documents will be drawn and the approval will be asked for from relevant organizations of Pakistan and Japan. This process requires 3.5 months.

(2) Tender procedures

Upon the completion of the drawing of the design to be executed, the announcement will be made in Japan concerning the procurement of equipment, then a tender will be conducted at the presence of the persons concerned. The tenderers whose offers are evaluated as appropriate will win the tender, and make agreements concerning the procurement of equipment with the Pakistani organization. This process requires 2.5 months.

(3) Manufacture, delivery, installation and construction work

After the conclusion of agreements concerning construction work and equipment procurement, the contract companies will commence the construction work or duties related to the procurement upon the verification of the Japanese government. Documents for applying for approval, and documents for manufacturing will be drawn; and the equipment will be manufactured, shipped, and delivered to Pakistan. The companies responsible for the supply of equipment will be in charge of all tasks including inland transportation, up to the completion of test operation.

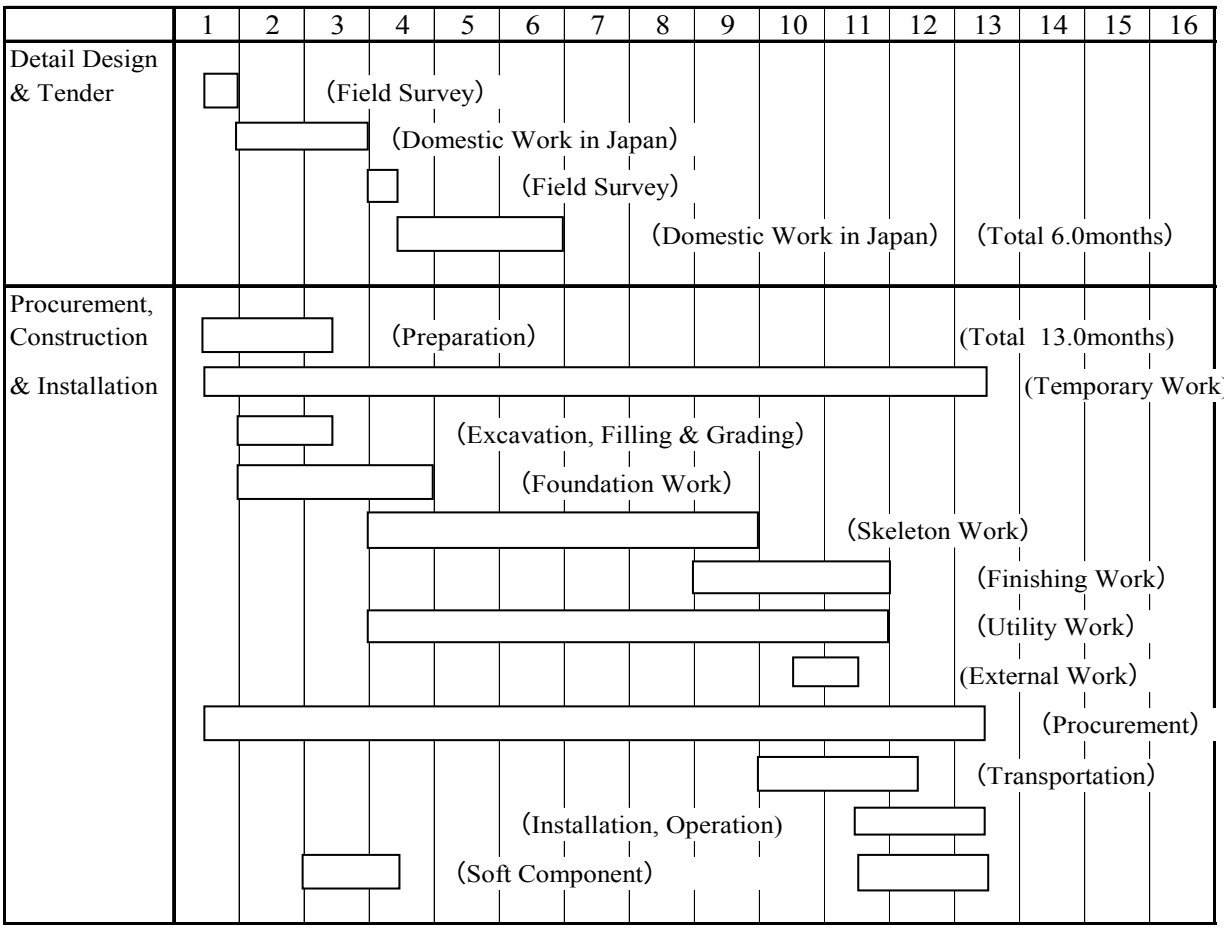
(4) Completion of work

Following the completion of construction of the building and the installation of equipment, trial operation of the equipment will be conducted at the presence of the Ministry of Industries and Production, the PTC, the consultant,

and other related persons. Then after the confirmation that the works satisfy the specifications in the contract documents, the building and the equipment will be handed over to the Pakistani side, and then all the work will be completed. Upon the completion of work, the Pakistani side will issue a certification of the completion of work to the contract companies. If all the work is carried out smoothly, the period starting from the contract agreement and ending at the completion of work is expected to be approximately 13 months. The soft component will be carried out during this period, and it requires a month.

The implementation scheduled described above is shown in Table 32.

Table 32 Implementation Schedule



2-3 Obligation of the Recipient Country

In the case that this project is carried out under the grant aid cooperation of Japan, the Pakistani side will bear the costs for the following items:

(i) Ground making at the project sites, securing stockyard for the construction work, and provision for infrastructures (electricity, and water supply) during the construction work

(ii) Work related to infrastructures within the construction site

(iii) Removal of buildings within the sites (decrepit or hazardous buildings)

(iv) Procedures necessary for tax exemption for import of materials and equipment, permissions, and custom clearance

(v) Arrangements for immigration and residence of Japanese personnel involved in the project

(vi) Procedures necessary for permissions and applications related to the construction work

(vii) Measures for exemption from all taxes and import tax related to materials, equipment and services which the contractors procure in Pakistan for the project

(viii) Surveys on environmental evaluations, if necessary

(ix) Securing of storages for equipment during the construction work (i.e., from the arrival of equipment to the site to the completion of the installation)

(x) Procurement of furniture such as laboratory tables, desks, and chairs

(xi) Inter-bank handling charges for foreign exchange banks authorized by the Japanese government

(xii) Customs charges

(xiii) Costs for all duties which are not included in the project but are necessary

(xiv) Costs to secure personnel necessary to make effective use of the equipment to be procured

2-4 Project Operation Plan

(1) Project operation plan

The teaching staff team responsible for lectures consist of four persons with Master degrees of Science, one person with Master degree of Engineering, four persons with BS degrees of Engineering, and one with a diploma. Many of them were educated in the U.S. or the U.K. Because they have a long experience as teaching staff with an average of 20 years, their theoretical ability is quite excellent. At the same time, teaching staff members in charge of practical work are graduates of industrial high schools or technical schools, different staff members provides training courses for individual moulding machines, and they engage in teaching in good cooperation with lecturers. Their ability in the operation and maintenance of equipment is sufficient in that the machines made in 1965 are still in good conditions, and that other aspects of maintenance are well conducted such as oil filling and the clean workshop. However, due to the facts that the current equipment were already second-hand at the time of the establishment of the centre, and that some of the equipment are currently out of order or fail to demonstrate their full functioning, it is necessary to improve the level of their operation and maintenance ability so as to meet the new equipment to be procured under the project. The improvement will be realized through the C/P training, the soft component, and the extension of the period for operational guidance provided at the time of the installation of equipment.

(2) Cost Estimation for the Project

The total costs of the project when it is carried out under the grant aid cooperation of Japan is estimated approximately 806 million yen. In accordance with the conditions for the estimation provided in 3), the breakdown of the costs borne by the Japanese and the Pakistani sides will be as follows. This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant.

1) Costs borne by the Japanese side

Cost estimation for the project: approximately 804 million yen

Items		Approximate costs (million yen)	
Facilities	Building for practical work	192	694
Equipment		502	
Designing, supervision of construction work, technical guidance, and soft component			110

2) Costs borne by the Pakistani side

The estimated costs to be borne by the Pakistani side will be 1,031,000Rs (1.94 million yen). The breakdown is as follows:

(i)	Costs of temporary fence for store area	137,500Rs
(ii)	Costs of removal for existing fence between PTC and SFDAC	27,000Rs
(iii)	Costs of removal and re-building for security shed	70,000Rs
(iv)	Costs of alteration for electric station	100,000Rs
(v)	Costs of furniture (tables, chairs, whiteboards etc.)	696,500Rs

Apart from the items above, costs for common services (costs of connection and extension of public electric wire, public water supply and sewage) and handling charges are required for the Banking Arrangement (B/A) when the Pakistani government opens an account at a bank in Japan; the issuing of the Authorization to Pay (A/P), and the revision of the A/P.

3) Basis for estimation

(i)	Base period	March 2004
(ii)	Foreign exchange rate	1 US$=108.07Yen 1 Rs=1.88Yen
(iii)	Implementation period	As shown in the implementation schedule
(iv)	Other	The project will be implemented according to the rules and procedures for the grant-in-aid programme of the Japanese government.

(3) Project Operation and Maintenance Cost

The operational and maintenance cost of the equipment to be procured will cover utilities costs (electricity and water supply) due to the increase in the number of equipment; costs of materials (main materials and additives); costs of spare parts; and extra labour costs which will incur due to increases in the number of equipment and training courses. The operation and maintenance cost will be calculated in accordance with the operational plan of the PTC concerning main equipment to be covered by the project.

Outlays

1) Electric Supply

The commercial electrical power will be used. Electrical power generators will be used as well, but since the annual operational hours fluctuate substantially each year and the unit cost for the generators is similar to that for the commercial power, the calculation for the costs will be on the basis of the commercial electrical power. The annual power consumption is estimated at approximately 22,000 kWh in the light of individual consumptions of major equipment to be procured and their operating hours.

Table 33 Power consumption of main equipment

	Power consumption (kW)	Operating hours (hour)	Total (kWh)
1. Mixer	45	15	675
2. Pipe Manufacturing Line	110	70	7,700
3. Injection Moulding Machine (small size fitting)	90	40	3,600
4. Injection Moulding Machine (medium size fitting)	170	40	6,800
5. Thermoforming Machine	40	18	720
6. Blow Moulding Machine	60	18	1,080
7. Recycle material manufacturing line (for PVC)	45	10	450
Total			21,475

Note: The power consumption includes the consumption for the cooling water maker.

2) Water Supply

Water is supplied from the main pipe of the public facilities to the water tank under the ground, before reaching individual outlets. In the project, a water tank will be installed under the ground of the building to be constructed, from which water will be supplied to individual equipment and lavatories. However, most of the water to be used for the equipment is as cooling water, and the coolant system is based on the water circulation, so water will be mainly consumed for the refilling of the coolant system and lavatories. The total amount of consumption is estimated as approximately 30 m^3 per year.

3) Cost for Raw Materials

Resin is not necessarily used as raw materials throughout the operation; a certain amount of time is spent without using raw materials on the explanation of the structure, preparatory operations, heating, and so on. Thus, the actual time when it is in operation using raw materials will be shorter. What is more, because the manufacturing line for recycling materials is installed and thus waste materials and products are reused, the equipment will be able to be operated with a smaller amount of resin. Hence, the estimated total amount of resin will be approximately 1,800 kg per year. At the same time, the production process requires additives, together with resin, but the required amount is a mere 4 % of the amount of the raw materials, so the estimated total amount of additives will be approximately 70 kg.

4) Personnel Cost

In the initial academic year after the implementation of the project, the capacity of the education and training courses will not be increased excessively. And additionally three staff members will be hired to deal with an increase in the number of students and trainees from the following year.

5) Others

For the implementation of this project, other possibly required costs such as office expenses, telecommunications costs, costs of advertisement for the PTC, and costs of market surveys related to the curriculum development, will be incorporated in the budget.

6) Total Cost

Table 34 Total cost

Items	Contents	Annual cost (Rs)
Personnel	Three teaching staff members	375,000
Utilities	Electricity：9Rs/kWh×22,000kWh Water：80Rs/m3×30m^3	200,000
Materials, Consumables	Resin：50Rs/kg×1,800kg Additives：150Rs/kg×70kg	100,000
Spare Parts	Not required in the initial year, but the budget is allocated for reserved fund	13,000
Stationary		10,000
Communication		12,000
Advertisement	Advertisement of the PTC and the market surveys PTC	200,000
	Total cost	910,000

Incomings

1) Basic Plastics Technology Course

The capacity of this course will be set at 30 persons per year on the grounds that the average number of participants in the Basic Plastics Technology Course per year is 31 persons, that the course is given once a year, and that the effects of the promotional activities for the PTC and the market survey will not materialize so immediately.

2) Short Training Course

The capacity of this course will be set at 80 persons per year on the grounds that the average number of participants in the Short Training Course per year is 56 persons, and that the course is available throughout the year.

3) Technical Services

The revenue related to tests and technological assistance will be calculated in accordance with the past performance.

Table 35 Total incomings

	Capacity	Number of courses held per year	Number of participants per year	Tuition fees (Rs)	Annual incomes (Rs)
Basic Training Course					
3 months course	30	1	30	6,000	180,000
Total			30		180,000
Short Training Course	Capacity	Number of courses held per year	Number of participants per year	Tuition fees	Annual incomes
Plastics Materials	10	2	20	2,000	40,000
Extruder	10	1	10	2,000	20,000
Injection Moulding Machine	10	2	20	2,000	40,000
Thermoforming Machine	10	1	10	2,000	20,000
Blow Moulding Machine	10	1	10	2,000	20,000
Testing Equipment	10	1	10	2,000	20,000
Total			80		160,000
Technical Services		Number of courses held per month	Number of courses requested per year	Unit price	Total income
Testing		20	240	1,500	360,000
Technical Service					240,000
Total					600,000
				Total	940,000

In accordance with the above estimation, the revenue and expenditure is well balanced even if the number of equipment increases and the operation and maintenance costs of the PTC expand due to the implementation of the project. Thus, the project is considered to be reasonable.

2-5 Other Relevant Issues

【Soft Component Plan】

(1) Background

PTC has been obliged to provide lecture-based education and training courses alone in that its equipment is decrepit or out of order, and thus fails to demonstrate satisfactory performance. This situation leads to the low evaluation of PTC among private firms. Behind the low evaluation also lies the fact that PTC does not conduct sufficient market surveys and is not capable of developing curriculums matching corporate needs. Without technical capabilities and the equipment for the execution of such curriculums, it would not be able to provide trainees with concrete technological knowledge. As a solution for such circumstances, this project will not only offer required equipment, but also give, through the soft component, guidance in the procedure of setting curriculums from market survey methods to course designing, curriculum development, and so on.

In addition, Pakistan has already taken into account that improvement of the quality of plastics products will eventually lead to import substitution and export promotion, so that quality control is considered essential for industrial products. Although PTC is not a factory, the premise is that the technological level which PTC provides through education and training satisfies quality standards, and teaching staff members and trainees are required not only to be taught and acquire technological skills but also to possess methods and knowledge concerning quality control. That is why the soft component is to include these aspects.

At the same time, a "counterpart training" is scheduled to conduct for smooth technology transfer after the installation of equipment. This gives opportunities for experiencing actual operations of plastic moulding machines and testing machines to be provided, or of equivalent or similar ones at production factories in Japan.

Table 36 Problem analysis of PTC

Current situations	Reasons	
Low evaluation among private companies	Fails to provide education and training matching the needs	
	Reasons	Measures
	(1) Insufficient market surveys (note 1)	Soft component (1)
	(2) Due to (1), appropriate curriculums are not developed on the basis of the results of market surveys (note 2).	
	(3) Also, equipment required for the implementation of curriculum is decrepit or out of order, and does not function satisfactorily (note 3).	Provision of equipment under this project
	(4) Since equipment is in bad shape or out of order, the technological level among teaching staffs to operate such equipment is low (note 4).	Counterpart training
	(5) Under such circumstances, PTC cannot afford to pay attention to quality control (note 5).	Soft component (2)

Notes represent the numbering in the table of evaluations of the current state of the PTC. See Table 37.

As described above, the soft component, the provision of equipment and the counterpart training will make it possible to overcome the weak points recorded in the evaluation items in the table showing the current state of PTC, and thus are expected to substantially improve the opinions and evaluation of the Centre. In the meantime, it is considered that evaluation items which are not subject to the soft component or the counterpart training this time can be handled with self-reliant efforts of the centre itself. But still, it is desirable to monitor the contents of the activities related to such items, and to consider whether or not technical assistance is required.

Table 37 Evaluation table for the current situations of PTC

	Excellent	Good	Fair	Somewhat poor	Poor
1. Ability in management of the Centre		○			
2. Ability in financial management		○			
3. Ability in human resource management		○			
4. Theoretical ability of teaching staffs	○				
5. Ability of teachers in operating equipment				○(note4)	
6. Ability in developing curriculums				○(note2)	
7. Performance level of equipment for practical training					○(note3)
8. Ability in maintenance of equipment		○			
9. Ability to provide technology assistance			○		
10. Ability to control quality				○(note5)	
11. Ability to conduct market surveys				○(note1)	

(2) Contents of the Soft Component Activities

1) Soft component (1): related to market surveys

Soft component (1) will be implemented for the head of PTC and teaching staff members of individual departments for 45 days after the commencement of construction work (guidance), and for 15 days after the commencement of installation of equipment (evaluation of curriculums).

① Get them to understand the roles and importance of market surveys.

② Teach how to grasp corporate needs for technologies.

The document surveys will make use of various statistics and white papers published by relevant ministers, agencies, and international organizations, in gaining a general picture of the plastics industry. In the questionnaire survey, questions will be formulated both at individual and corporate levels, and questionnaire sheets will be distributed to firms and individual people in Karachi city. And in the interview survey, interviews will be arranged with individual and firms who have responded promisingly to the questionnaire survey so as to obtain more detailed information

③ Guidance n developing curriculums based on the nature and aims of the courses

Practice in developing course curriculums in accordance with the above information. The practice method is to have repeated group discussions where required abilities and qualifications are clarified and analyzed so as to set up targets for courses. In addition, annual, term, and weekly timetables will be drawn up. Next, facilities and equipment to be used for the courses are planned, and the curriculums drawn up.

④ Guidance in formulating teaching plans based on the curriculums

The teaching plans are a form on which, with reference to specific credits for education and training, (1) the time allocation, (2) teaching contents, (3) activities of trainees, and (4) facilities and equipment to be used are filled in. And courses will be provided in accordance with these teaching plans.

2) Soft component (2): In relation to quality control

A training course will be conducted for 60 days after the completion of the installation of equipment for the head of PTC, teaching staff members in each subject, and engineers.

① Get them to understand the role and importance of quality control

② Explain the overall picture of quality control methods

The methods include relations diagram, systematic diagram, matrix diagram, arrow diagram, and so on.

③ Practice with concrete examples, and select techniques appropriate to the plastics processing industry in Pakistan

Direct application of methods utilized among large may be a burden on small and medium-sized enterprises in Pakistan and also dampen their enthusiasm, so methods to be used are modified to some extent.

④ Apply the selected methods in actual manufacturing lines