

4-2 Basic Design

4-2-1 Basic Design Principles

The following design principles were derived from the consideration of the objectives of this project and the result of the basic design survey.

- ① In consideration of the natural conditions in the City of Shah Alam, which is in the rainy, hot, and humid tropical zone, the design has taken into account factors such as cross ventilation, sunshine, rain, etc.
- ② In order to minimize cost in maintenance and operation and to facilitate easy handling, the basic system will follow the local construction methods and utilize local building materials to facilitate cross ventilation and natural lighting.
- ③ The site planning will provide sufficient space for expansion in order to accommodate future development and change of CIAST. The facility is to be flexible.
- ④ The total planning is to be easy to understand because the CIAST has many diversified users and offers various functions.
- ⑤ The division of work and phases of construction are to be planned for smooth operation.
- ⑥ The project will be harmonized with the surrounding environment and the Malaysian way of life, giving consideration to future planning.

4-2-2 Facility Planning

(1) Site Planning

① Site planning

The site planning such as clearing of jungles, uprooting, and filling of about 8 ft. is to be completed by the end of 1982 by PKNS. The land handed over by PKNS will be flat land, therefore the site drainage has to be well considered. The exterior works of final grading, filling, and leveling such as, the slopes from the finished grade to the ground floor level, are to be coordinated with the

building work schedule. Earth from excavation may be used for land fill in the final grading.

② Block planning

The site is bounded by a railway on the north, a main road on the west, and by residential areas on the east and south sides. In order to harmonize the facility with the future plan of the surrounding areas, the practical training area was to be located in the northwest, housing in the east, and the dining hall, offices, and classrooms in the south of the site. The various functions were connected to each other by a covered walk, wrapping around a courtyard making a chain of spaces.

The various functions, being the workshops, class rooms, offices, student housing, and the dining hall, were connected to each other by a covered walk that wraps around a courtyard. Each functional zone, being the training zone, residential zone, and academic and communal zone, are clearly identified but closely communicated at the same time.

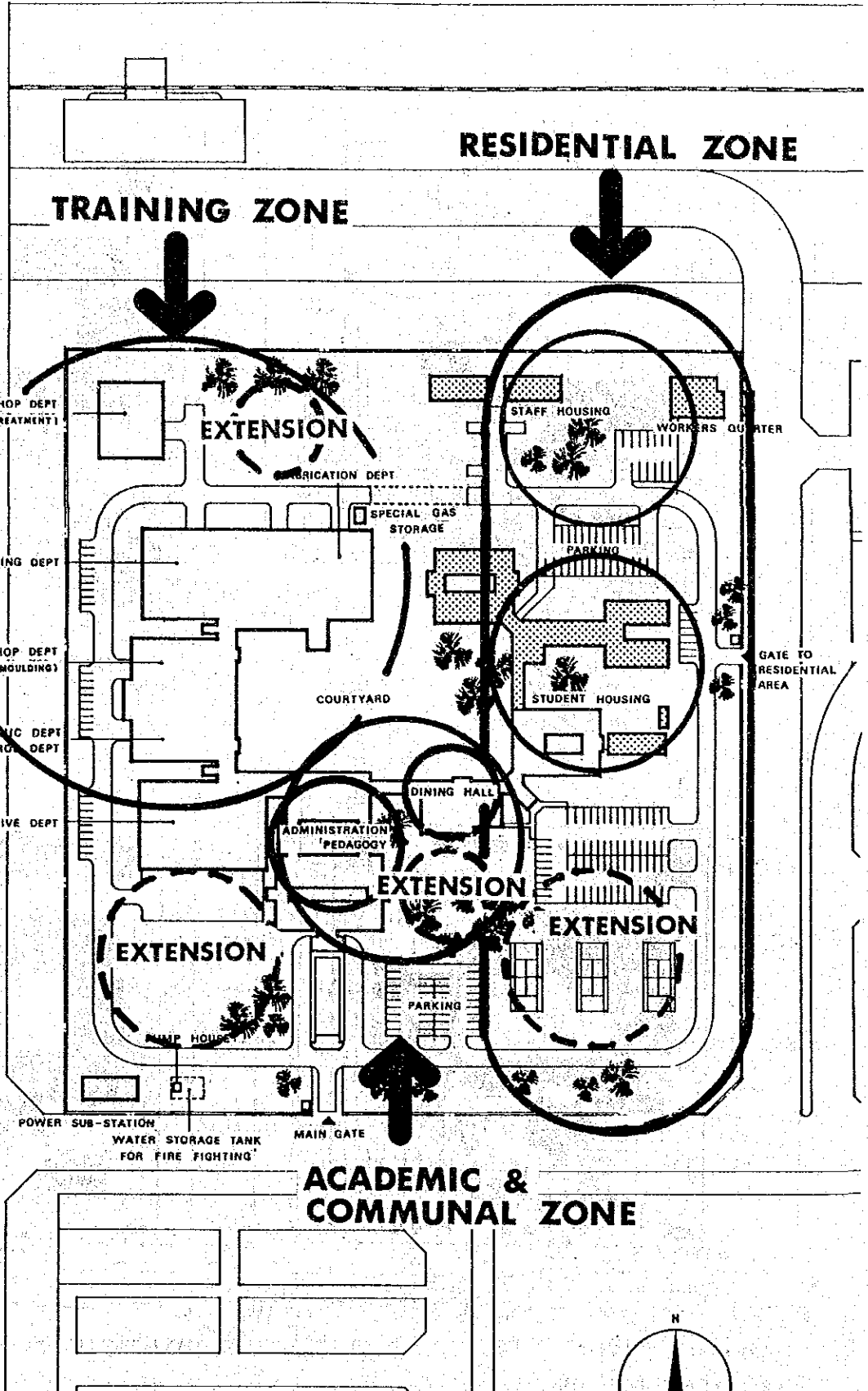
This layout provides a clear planning, which was intended to show the mutual relationship between each block at a glance.

Service road is being provided on the perimeter of the site, and pedestrian circulation and vehicular circulation are clearly separated.

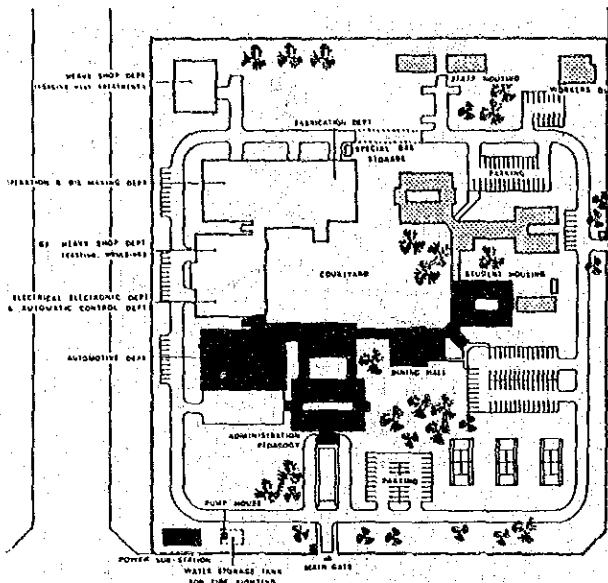
The orientation of each block is to be north to south, that is, taking its longitudinal axis in the east-west direction in order to avoid strong sun shine on the east and west sides.

Since the forging and heat treatment workshop produces heat and noises, it was located in the northwest corner. In order to protect privacy of residents, the staff housing and workers quarter were located in the north-east corner. Furthermore, the dining hall was placed between the main building and parking area facing the courtyard, since

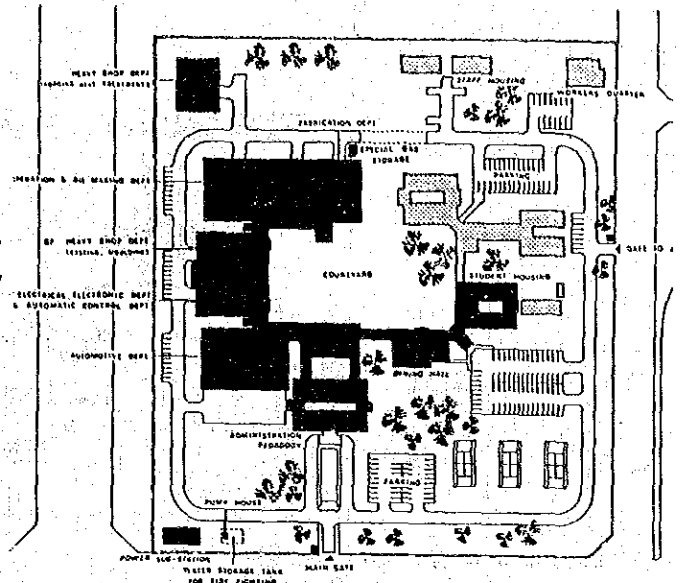
ZONING



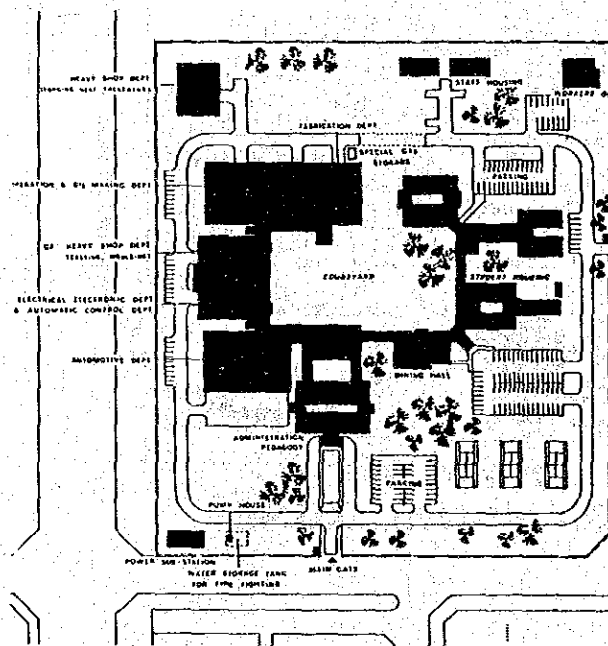
EXTENTION PLANNING



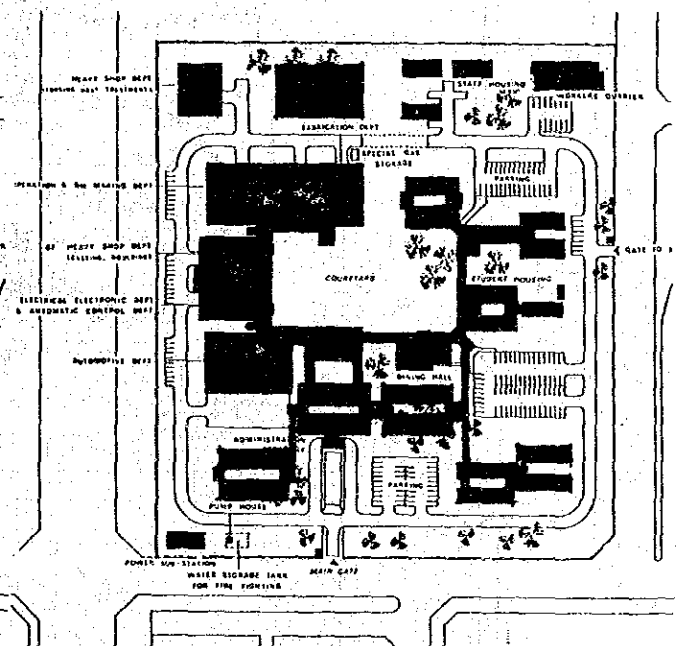
FIRST PHASE



FIRST+SECOND PHASE



JAPANESE PORTION
+MALAYSIAN PORTION



MAXIMUM FUTURE EXTENTION PLAN

it will be used as an assembly hall, the sub-station was located in the south-west corner which is the nearest position to the power mains.

The main gate was provided on the south access road which has direct access from the main road. In response to the directions given from the municipality of Shah Alam, the main gate is more than 250 ft. away from the intersection on the south-west corner of the site. The residential zone can be approached through another gate on the east side road.

The automobile is anticipated to be the main mode of transportation; therefore, a sufficient number of parking spaces were provided.

Since scrap will be discarded from the workshops, a scrapyard is to be provided.

(2) Architectural Planning

In order to secure space for extension, the layout was designed compactly; the main building and student housing were planned to be four-story buildings and the electrical and electronic department and the instrument and automatic control department were placed on the first floor above the heavyshop department. Basically, a single-loaded corridor was adopted to provide cross ventilation. To avoid the strong sun shine, the floor plan has its longitudinal axis in the east-west direction. The characteristics of the floor plan of each building are as follows;

① The main building (the administrative and classroom block) Offices and special classrooms were provided on the ground and first floor, and the library, conference rooms, classrooms, instructor's rooms on the second and third floor.

② Workshop

The testing center having a pivotal function of testing products or materials was placed in between the workshop area and the main building. Three workshop buildings were

connected by the covered walk, which provides sunshade and smooth pedestrian traffic on rainy days. On the first floor those were connected with a visitor's passage and gallery.

The floor area of each workshop was set a little larger than the current requirement to accommodate future increase of students. The work space is a long span structure and is column free. Thus, it allows flexible layout of machinery to cope with future change.

Machine operation and die making, press work, metal fabrication, and welding, are closely inter-related in terms of their work substance; therefore, they were placed in the same building and planned to be dividable as required.

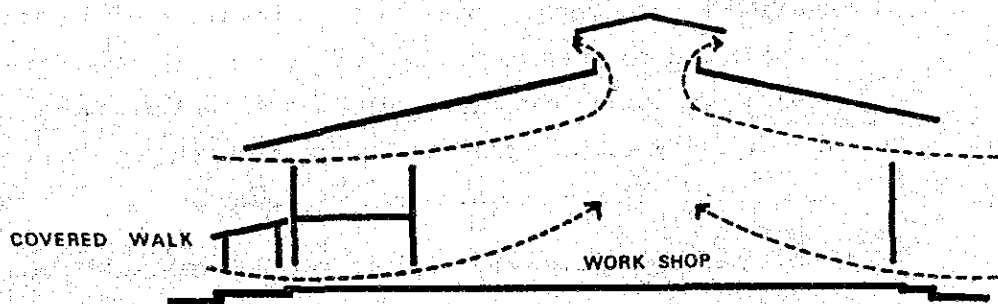
③ Dining hall

The dining hall was designed to be a one-room space, allowing it to be used as an assembly hall.

④ Student housing

Each room is to house two people. Showers and water closets are centralized on each floor. A common laundry room is provided.

(3) Sectional Planning



As shown in the figure on the above, the jack roof can allow the hot air to flow out from the top, and a ceiling height (about seven meters) can minimize the increase of the room temperature in the work area. It also provides natural light in the slightly dark central portion of the long spanned space.

Since the entire facility is designed compactly with large scale buildings, the courtyard may seem smaller than it

actually is and one may feel overwhelmed within it; therefore, a covered walk was provided in front of the buildings around the courtyard, making the section of the building like a set-back style in order to reduce the scale of the buildings. The set-back style also allows the courtyard to have an extending feeling.

The ground floor level will be 60 cm higher than the finished grade in order to keep the ground floor from flooding during the heavy rain.

(4) Required Floor Area

Based on the basic design, the required floor area for each block is roughly calculated as follows;

		(Unit: m ²)
Administration Pedagogy		2,277
Test & inspection room and AV room		545
Workshop	Automobile	
	Air, Electron, Instrumentation, Rubber, Plastic, Molding, Lost-wax, Central tool storage	2,852
	Machine operation & die making	2,813
	Forging and heat treatment	545
Dining hall		576
Student housing		1,485
Covered walk and other facilities		1,153
Power sub-station		126
Total		13,915 m ²

(5) Building Materials and Construction Method

When selecting materials and construction method, the natural conditions in Shah Alam has to be well considered. The local construction method and materials always available shall be used as much as possible. This is vital

when considering future repair, alterations, or expansion. Based on the points above, the selection will be made with a general consideration of function, appearance, and maintenance.

Since the reinforced concrete structure is the most popular method in Malaysia, structural materials such as, cement, aggregates, forms, and steel bars, are available. Brickwork is commonly used as infill wall.

Most structural steels come from abroad; however, for example, steel framed factories buildings are quite popular. There is no problem in availability. Therefore the main structure shall be reinforced concrete and steel structure shall be used in long spanned spaces.

The exterior finish for walls shall be paint finish on lime or cement mortar. Since the base of the building tends to be moisturized or soiled, adequate protection shall be provided in those areas.

For interior finishes, attention shall be paid to the easy maintenance for the rough usage and the climate of Malaysia.

① Earth work

The rainy season may cause a problem during the earth work phase of construction, but there is no problem in using heavy machines. The situation is considered to be the same as that of Japan.

② Foundation work

The soil conditions in Kuala Lumpur and Shah Alam are not favorable. Spread foundation is only possible for very small or deeply excavated buildings. In general, wood piles, precast concrete piles, cast-in-place concrete piles, structural steel piles, and so on are used. Especially wood piles or precast concrete piles are popular in low-rise buildings due to the cost and construction method.

③ Concrete work

There are several cement manufacturers in Malaysia. As for aggregates, crushed granite for coarse aggregates and mining sand for fine aggregate are abundantly available.

Ready-mixed concrete is available; however, batch mixers on site are generally used by the contractors, due to limitations in amount and in transportation time.

The standard design strength of concrete varies from 180 to 300 kg/cm². The slump is comparatively small and between 8 to 12 cm. Carts, hoppers, and concrete lifts are used for casting concrete. Concrete pumps are not used, but vibrators are used. Construction joints are located under beams.

④ Reinforcement work

Reinforcing bar is produced locally. There are also many imported ones from Japan, and they are abundantly available. The strength and diameter are basically following JIS (Japan Industrial Standard) and the majority is the deformed bar. Almost all fabrication is done on site, and splicing is a lapped one instead of pressure welding.

⑤ Form work

Plywood panel and wood are abundant and similar to those in Japan.

⑥ Structural steel work

There is no domestic structural steel except for a certain type of angles and flat bars. However, the imported ones are abundant in the market. There is no problem in availability. In general, most buildings are not steel structure except factories. There is a little concern for welded structure.

Comparison between the Local Materials and
Construction Method, and Proposed Ones

	Item	Common Local Materials and Method	Proposed Materials and Method	Reasons for Adoption
Exteriors	Exterior Walls	Cement Mortar on Brickwork and Paint Finish	Cement Mortar on Brickwork and Paint Finish	Low-cost and easy for maintenance. The foot of the building to be protected from moisture.
	Roof	Asbestos Slate Boards Roof Tiles Colored Galvanized Iron Sheets	Colored Galvanized Iron Sheets	Light weight material to be required for the long span. Colored galvanized iron sheets have advantage of being durable against mold and weathering. Insulation shall be used to avoid unfavorable room conditions caused by heat radiation.
Interiors	Floor	Terrazzo Tiles Mosaic Tiles Cement Mortar Trowel Finish	Terrazzo Tiles Cement Mortar Trowel Finish	It has superior durability and is easy to clean.
	Walls	Cement Mortar on Brickwork and Plaster Paint Finish	Cement Mortar on Brickwork and Plaster Paint Finish	It is a conventional method which has less problems.
	Ceiling	Direct Ceiling or Suspended Ceiling with Acoustic Tile Paint Finish	Direct Ceiling or Suspended Ceiling with Acoustic Tile Paint Finish	Rooms without duct works shall be a direct ceiling.
Structure Framework	Piles	Timber Piles and Precast Concrete Piles Cast-in-Site Concrete Piles and H Shaped Structural Steel Piles	Timber Piles and Precast Concrete Piles	It is conventional and shall be determined by the size of building, cost, and construction.
	Skelton	Reinforced Concrete Structure	Reinforced Concrete Structure	It is conventional construction method.
	Floor	Reinforced Concrete Structure	Reinforced Concrete Structure	It is conventional construction method.
	Walls	Brickwork and Reinforced Concrete Structure	Brickwork and Reinforced Concrete Structure (around the service core and load bearing walls)	It is conventional construction method.
	Roof Structure	Reinforced Concrete Structure Timber Roof Structure Steel Framework	Steel Framework for Long Span, partially Timber Roof Structure and Reinforced Concrete Flat Roof	Long span requires steel roof structure, otherwise local popular construction method to be employed.

(6) Structural Planning

The structural design of this project will conform the Uniform Building By-Laws and British Standards (B.S.).

As for the horizontal force, it is not necessary to calculate seismic force because there is almost no earthquake in Malaysia, however, wind load must be calculated.

Dead load and imposed load shall follow the Uniform Building By-Laws; however special portions shall in workshops, where equipments are to be placed shall be calculated separately. In order to construct within a reasonable cost, available materials and a popular construction method in Malaysia shall be adopted.

① Structural system

Reinforced concrete structure is the most popular construction method in Malaysia. Materials are abundantly available and the construction cost is reasonable; therefore, main framework shall be a reinforced concrete rigid frame.

② Roof

Sloped roof over large spaces such as workshops shall be iron sheet roofing on a structural steel frame. Wooden trusses may be used for minor sloped roofs. Flat roofs shall be used partially and be reinforced concrete structure finished with covering concrete on asphalt waterproofing membrane.

③ Floor

Floor above grade shall be reinforced concrete structure. The ground floor slab shall be placed on the filling of about two and a half meter. There is a possibility of uneven setting of the soil. Therefore, the main portion shall be reinforced concrete slab. In addition, heavy equipment, vibrating equipment, and special equipment shall have an independent machine foundation.

④ Exterior and interior walls

Load bearing walls and walls around the staircase shall be reinforced concrete structure. Typical exterior and interior walls shall be half, single or one and a half skin brickwork, or wooden structure.

(7) Services Planning

① Airconditioning and ventilation services

The basic policy is to utilize natural ventilation in architectural planning, thus discouraging the use of mechanical cooling and ventilation. If mechanical devices are used due to the function of the building, it should be partially operatable to minimize operating costs.

① a Airconditioning service

The air-conditioning system will be all air-cooling types for easy operation instead of chilled water system which requires water quality control. Separate packaged type air-conditioners and small window type air conditioners will be equipped according to the size of the cooling area and its purpose.

① b Ventilation service

The painting workshop, welding workshop, and similar facilities, where dust, heat, and odor are produced in a concentrated manner, will be equipped with mechanical ventilation.

② Utility services

Planning is based on local construction methods and by local standards. Japanese standards may partially be included for improving durability.

In this project there is little time from completion of filling to building construction; therefore, flexible pipes shall be effectively placed because possible partial sinking.

① Water supply service

Water will be supplied from the proposed city water main under the access road on the south of the site. Drinkable water will be supplied to the required points by direct pressurizing. Water for domestic uses other than drinking will be contained temporarily in the elevated water tanks on the roof of the main building and student housing, and supplied to the required points by gravitation.

② Sewage and drainage service

Sewage will be directly discharged to the proposed public sewer under the access road on the south of the site. Site drainage will be discharged through the open channel to the street gutter in the surrounding roads.

Waste water from the painting booth and similar facilities containing more than an allowable limit of hazardous materials will be equipped with cleaners.

③ Hot water service

Gas water heaters burning LPG will be provided in the kitchen. Hot water for hot water supply rooms and other required points will be provided independently by electrical hot water units.

④ Gas service

LPG tanks required for the kitchen will be placed outside. Special gases in tanks for welding and similar activities will be provided to the required department.

⑤ Electrical services

The electrical service system will be designed complying with the regulations and standards of Malaysia. It shall also be easy to control and maintain. Furthermore, the system will have as much flexibility as possible to cope with changes of training equipment and their locations by revision of the curriculum.

① Electrical power supply system

Transformers will be centralized at the sub-station and from there low voltage power supply will be delivered to each facility.

② Lighting and power outlets

Lighting shall be provided mainly by fluorescent lights. Lighting for high ceiling and exterior spaces will be provided by mercury-vapor lamps. Location of lighting fixture and grouping of switches will be an effective system for saving energy. Power outlets will be provided for general purposes and light powered training equipment.

③ Exterior lighting

Exterior lighting will be provided for outdoor passage ways for security purposes.

④ Telephone service

A private automatic branch exchange will be provided in the main building. Telephone set will be equipped at each required location.

⑤ Public address system

Public address systems will be provided for paging use. A microphone and amplifier will be provided in the main building.

⑥ Master TV antenna

A master TV antenna will be placed on the roof of the main building. TV set antenna outlets will be provided as required.

⑦ Fire alarm and extinguishing system

The system for fire extinguishing, fire alarm, and exit lights will be provided as necessary according to the

direction of the local fire station, regulations, and standards.

4-2-3 Training Equipment Planning

The basic aim for the selection of the training equipment is to prepare necessary equipment enough to facilitate all the training courses appreciating the request of the Malaysian Authorities concerned.

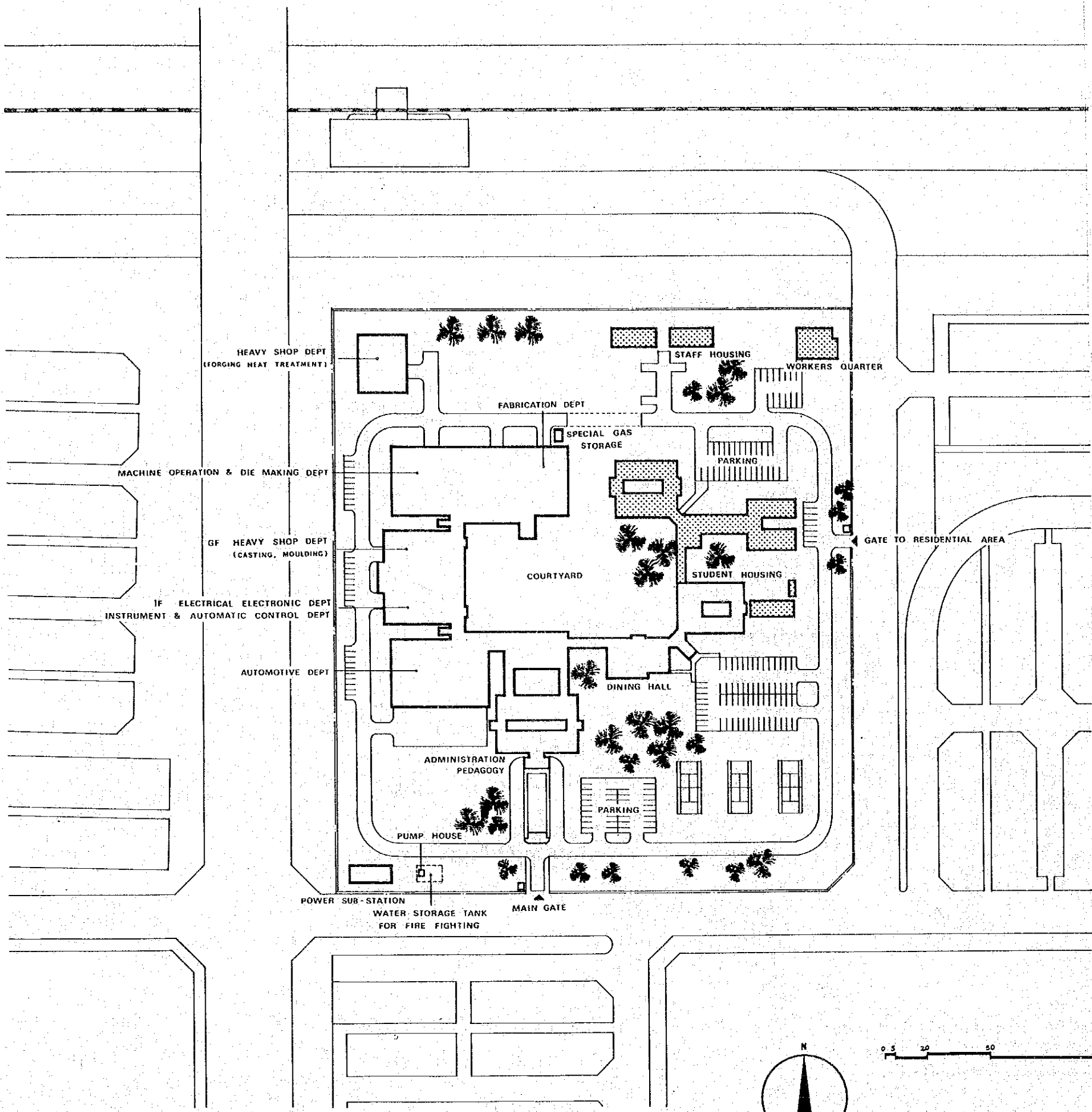
At the same time, since this is "the Advanced Skill Training Centre", the advanced type equipment should be prepared to certain degree.

Through the series of survey, it is clear that the major problems in Malaysian industry are insufficient productivity and quality control, and from this point of view, it seems to be necessary to introduce the Japanese new technology of conservation and rationalization.

However, it will cause a great confusion to introduce these new technology immediately, so, it would be more practical and effective to teach these technology along the process of reviewing the basic skill and learning advanced skill.

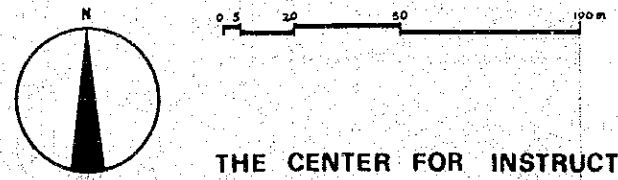
From these reasons, the equipment for basic skill training is also needed.

Based on the above-mentioned factors, we want to design this Center as the central facility for the manpower development along the long range view of Malaysian National Plan and facilitate the mutual training of the trainees from other ASEAN countries.

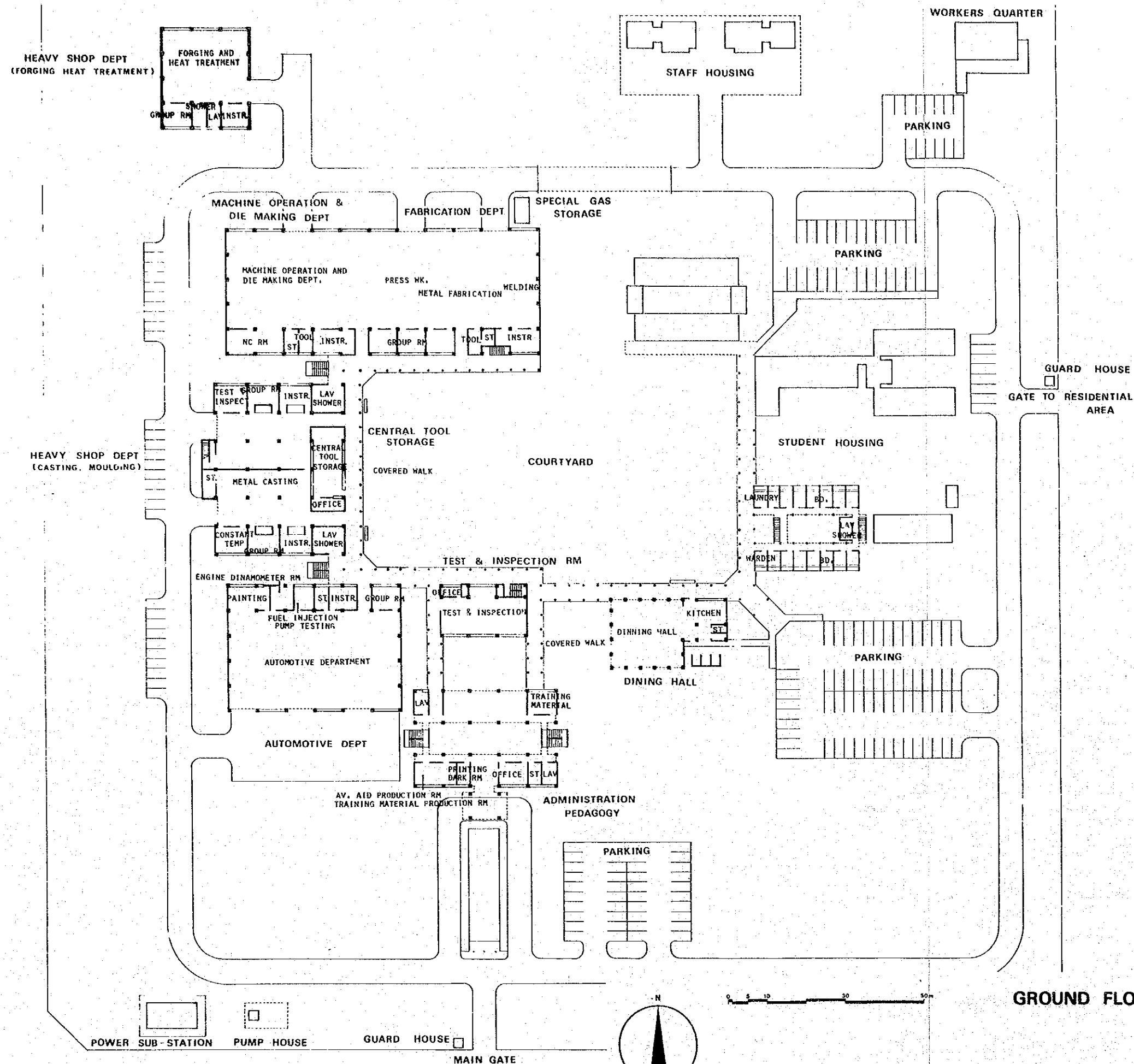


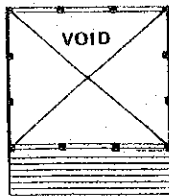
JAPANESE PORTION
 MALAYSIAN PORTION

SITE PLAN

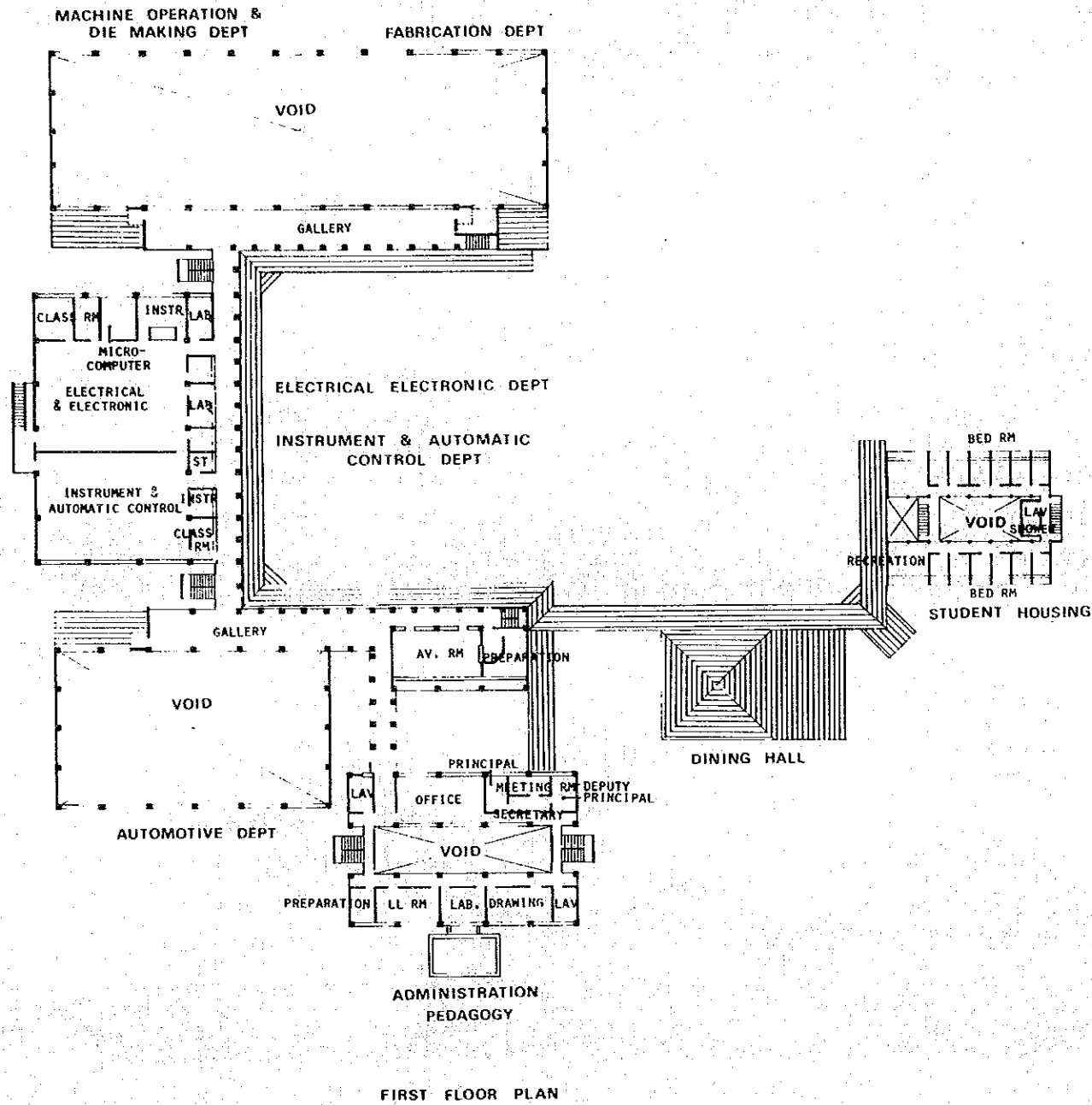
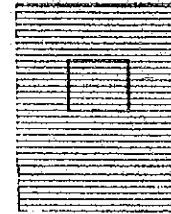


THE CENTER FOR INSTRUCTOR & ADVANCED SKILL TRAINING

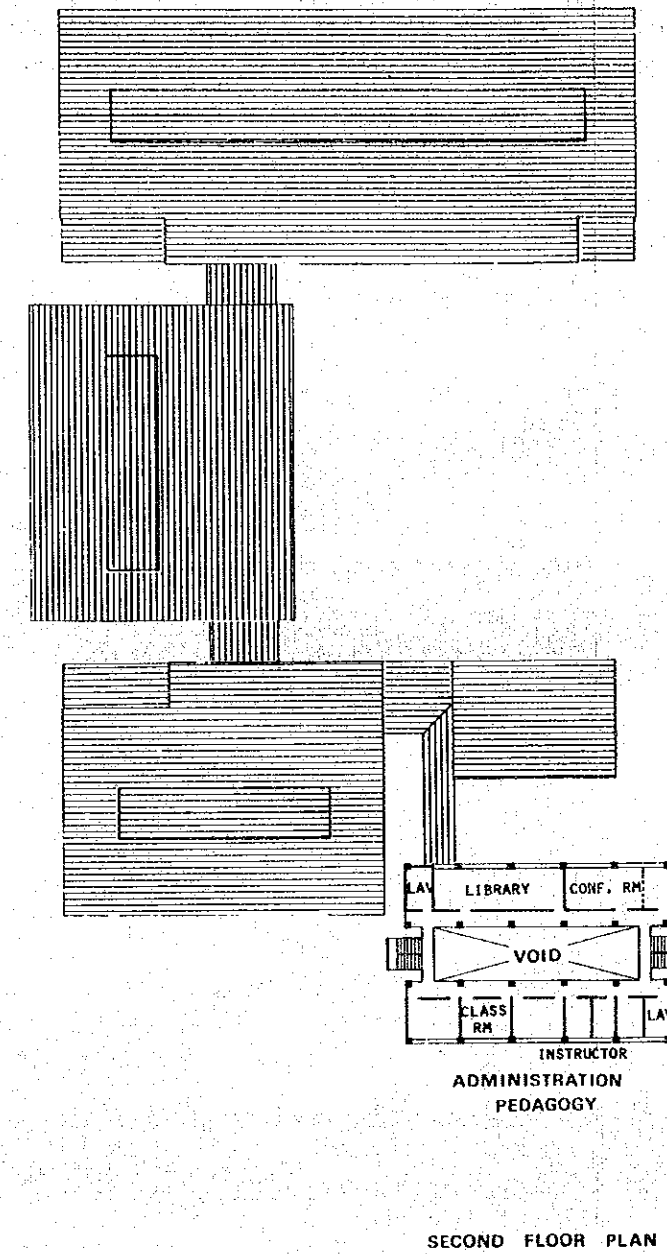




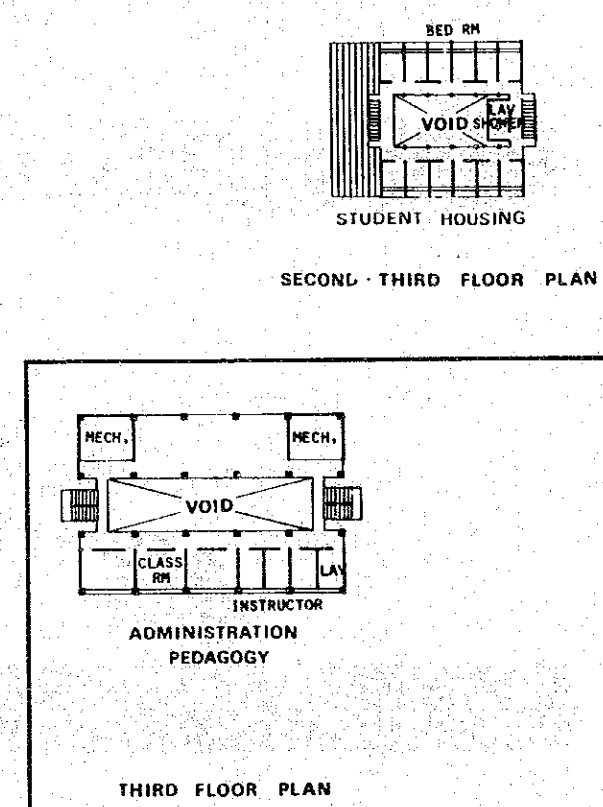
HEAVY SHOP DEPT
(FORGING HEAT TREATMENT)



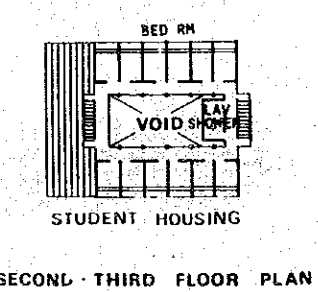
FIRST FLOOR PLAN



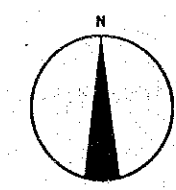
SECOND FLOOR PLAN



THIRD FLOOR PLAN

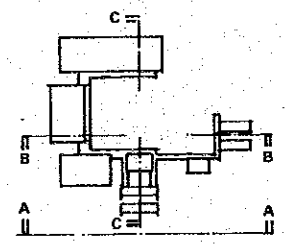
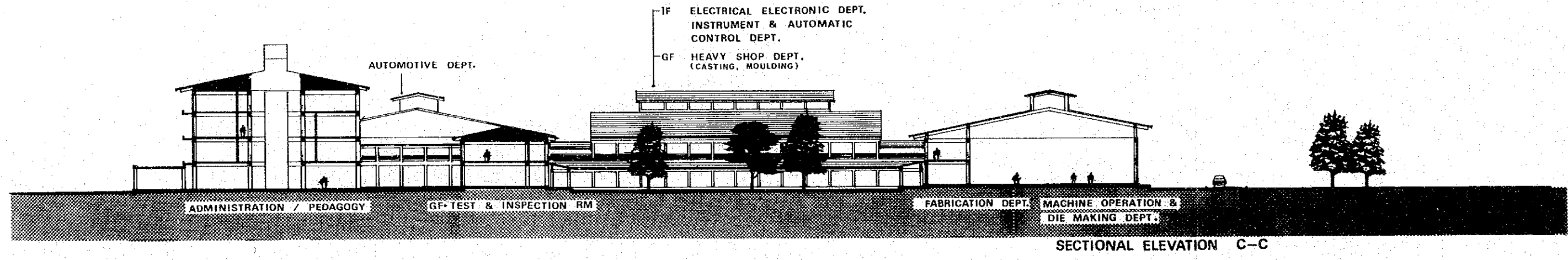
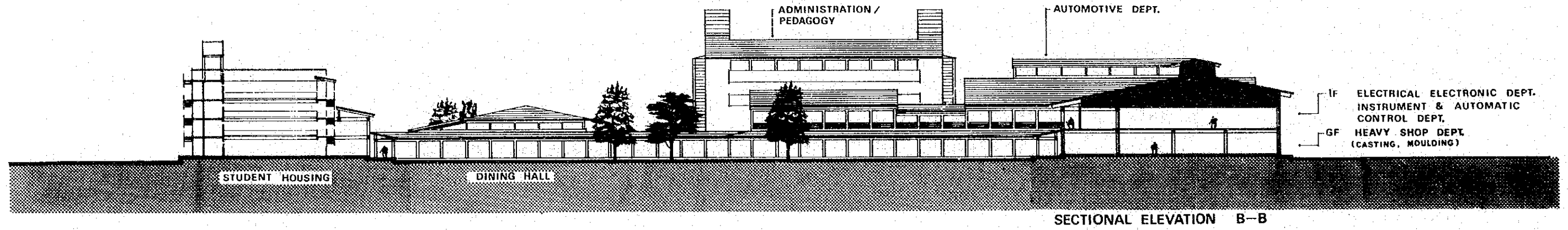
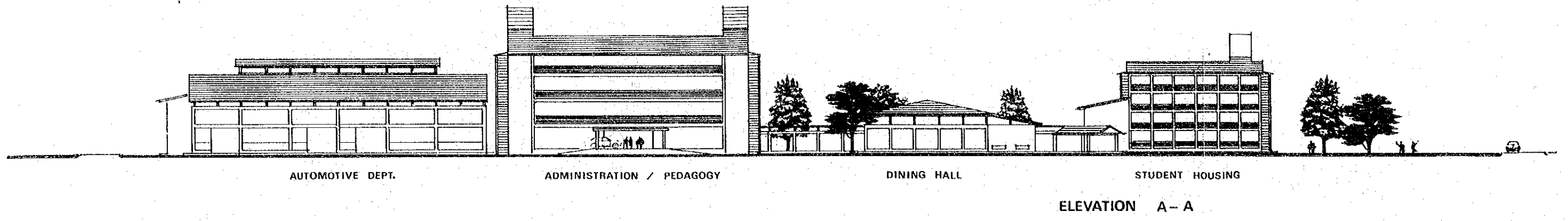


STUDENT HOUSING
SECOND-THIRD FLOOR PLAN



FIRST-SECOND FLOOR PLAN

THE CENTER FOR INSTRUCTOR & ADVANCED SKILL TRAINING



SECTION - ELEVATION

THE CENTER FOR INSTRUCTOR & ADVANCED SKILL TRAINING

Equipment List

① Pedagogy training and supervisory skill training dept.

1. Overhead Projector
2. Slide Projector
3. 16 m/m Projector
4. 8 m/m Camera
5. 8 m/m Projector
6. 35 m/m Camera
7. Copy Stand
8. Close-up Equipment
9. Enlarger
10. Video Tape Recorder
11. Color Video Camera
12. Monitor Television
13. Video controller system
14. Lighting Kit
15. Video projection system
16. Radio cassette recorder
17. Small offset press
18. Electrotpe process
19. Sorter
20. Bookbinder
21. Electronic Copying Machine
22. Electric Typewriter
23. Drafting Machine
24. Tracing Board
25. Equipment for Mirror Drawing Task
26. Equipment for Tracking Task
27. Equipment for Two Hand Coordination Task
28. Video Motion Analyser
29. Transducers Pickups for Motion Analysis
30. Polygraph Systems
31. Equipment for Memory Test and Maze Tracking Test
32. Flicker Tester
33. Eye Mark Recorder
34. Tools to make a model for teaching aids

② Instrumenting and automatic control dept.

1. Thermocouple Training Device
2. Resistance Bulb Training Device
3. Press, Measurement Training Device
4. Pump Press, Control Training Device
5. Level Measurement Training Device
6. Water Flow Training Device
7. Air Flow Training Device
8. 3-Tanks Level Training Device
9. Final Control Elements for Miscellaneous Training Device
10. Orifice Plates
11. Signal Conditioner
12. Strain Gauge
13. Weight Type Press, Gauge
14. Pneumatic Different, Press, Transmitter
15. Pneumatic Indicating Transmitter
16. Pneumatic Indicating Controller
17. Pneumatic Controller
18. Pneumatic Indicating Recorder
19. Pneumatic Recorder
20. Temperature Transmitter
21. Integrator
22. Pneumatic Analog Computer
23. Pneumatic-to-Electronic Converter
24. Pneumatic Indicator
25. Control Station
26. Alarm Set Station
27. Control Relay
28. Pneumatic Buoyancy Transmitter

29. Pneumatic Position Transmitter
30. Seal Valve
31. Pressure Switch
32. Pressure Regulator
33. 3-Valves Manifold
34. Electronic Different, Press, Transmitter
35. Electronic Indic. Transmitter
36. Electronic Pressure Transmitter
37. Electronic Indic. Controller
38. Electronic Programable Indicating Controller
39. Electronic Recorder
40. Manual Station
41. Indicator
42. Electronic Integrator
43. Electronic Converter
44. Electronic Alarm Unit
45. Electronic Programable Computing Unit
46. Electronic Integrator
47. Distributor
48. Power Supply Unit
49. Programmer
50. Programme Setter
51. Annunciator
52. Dead Time Unit
53. Process Simulator
54. Pneumatic Process Simulator
55. Servo Mechanism Training Device
56. Control Valve Training Device
57. Plant Model
58. Hydraulic Control Training Device
59. Packaged Control System
60. Calibration Set
61. Resistor
62. Wheatstone Bridge
63. Insulation Tester
64. Earth Tester
65. AC Universal Bridge
66. Flatbed 2-Pen Recorder

67. X-Y Recorder
68. DC Voltage, Current Standard
69. Digital Manometer
70. Function Generator
71. DC Stabilized Power Source
72. Microprocessor
73. Device for Air Supply

③ Automotive department

1. Fuel injection pump tester
2. Engine analyser
3. Vehicle inspection line facility
 - include following things -
 - 3 - 1 Chassis dynamometer
 - 3 - 2 Brake tester
 - 3 - 3 Head light tester
 - 3 - 4 Side Slip tester
 - 3 - 5 Exhaust emission analyzer
4. Frame straightener
5. Engine dynamometer
6. Conrod Aligner
7. Pinhole honing machine
8. Piston heater
9. Valve seat grinder
10. Valve refacer
11. Hydraulic braking foot press gauge
12. Car washer
13. Parts washer
14. Magnetic flaw detector
15. Armature tester
16. Valve spring tester
17. Nozzle tester
18. Regulator tester
19. Coil condenser tester
20. Dwell tacho tester
21. Battery starter tester
22. Spark plug cleaner tester
23. Air filter tester

24. Timing light
25. Diesel smokemeter
26. Diesel timing tester
27. Diesel tacho meter
28. Engine scope
29. Alotinator scope
30. Distributor tester
31. Wheel alignment Indicator
32. Wheel balancer
33. Road meter
34. Cylinder boring machine
35. Cylinder honing machine
36. Surface grinder
37. Universal test bench
38. Brake drum lathe
39. Brake shoe grinder
40. Air Compressor
41. Battery quick charge
42. Auto lift (2 post type)
43. Lift master (4 post type)
44. Fender tool set
45. Painting booth for automobile
46. Paint color matching system
47. Infra-red ray dryer
48. Air transformer
49. Spray gun

④ Machine operation & diemaking dept.

1. Precision lathe
2. Jig boring machine
3. Upright drilling machine
4. Bench drilling machine
5. Shaping Machine
6. Vertical Shaping machine
7. Universal milling machine
8. Vertical milling machine
9. Profile milling machine
10. NC lathe

11. NC milling machine
12. Engraving machine
13. Electric discharge machine
14. Wire cut electrical discharge machine
15. Power press
16. Vertical band sawing machine
17. Hack sawing machine
18. Universal cylindrical grinding machine
19. Surface grinder
20. Forming surface grinder
21. Profile grinding machine
22. Bench grinder
23. Universal tool & cutting grinder
24. Drilling grinder
25. Cemented carbide grinder
26. Surface measuring instrument
27. Toolmakers microscope
28. Level
29. Roundness tester
30. Hardness tester
31. NC Tape perforator
32. Screen projector
33. Air compressor
34. Drafter & drawing instrument
35. Granite surface plate
36. Block gauge
37. Hobbing machine
38. Centreless glinder

⑤ Heavyshop department

1. Air Hummer
2. Automatic Sawing Machine
3. Duplex Head Grinding Machine
4. Optical Pyrometer
5. Tempering Furnace
6. Dissociate Furnace
7. Metal Cleaning Tank
8. Shot Blast Machine

9. Rochwell Hardness Tester
10. Brinell Hardness Tester
11. Vickers Hardness Tester
12. Upright Drilling Machine
13. High Speed Grindstone Cutting Machine
14. Die Casting Machine
15. Gas Soft Nitriding & Carbrizing Furnace
16. Rubber Molding Test Press Machine
17. Mixing Test Roll Machine (Rubber)
18. Rubber Cutter Press
19. Rubber strength tester
20. Rubber Aging Oven
21. Rubber Abrasion Tester
22. Rubber Hardness Tester
23. Plastic Injection Molding Machine
24. Mold Temperature Regulator
25. Tumble Mixer
26. Drying Equipment (plastic)
27. Hopper Loader (plastic)
28. Coloring Tumbler (plastic)
29. Plastic tensile strength Tester
30. Heat Distortion Tester
31. Color & Color Difference Meter
32. High Frequency Induction Furnace
33. Heavy oil Furnace
34. Pot Type Electric Furnace
35. Sand Binder
36. Sand Mill Machine
37. High Speed Mixer
38. Wax Injection Machine
39. Wax Melting Tank
40. Wax Tempering Tank
41. Hot plate
42. Fluidizer Bed
43. Auto clave for Dewaxing
44. Bake-out Furnace
45. Laddle Furnace
46. Runner Cutting Machine
47. Bader Machine

⑥ Fabrication department

1. TIG Arc Welder
2. MIG Arc Welder
3. CO₂ Arc Welder
4. Arc Air Gouging Welder
5. Engine Driven Welder
6. Plasma Cutting Machine
7. Automatic Gas Cutting Machine
8. Welding Positioner
9. Electrode Dryer
10. Universal Testing Machine
11. Welding Joint Bending Machine
12. Metallurgical Microscope
13. Magnetic Testing Machine
14. Magnetic testing test pieces
15. Ultrasonic Flaw Detector
16. Test pieces (Ultrasonic test)
17. X ray Inspection Apparatus
18. Crank Press (25 ton, 60 ton)
19. Lever Shear
20. Contour Machine
21. Brake Press
22. Shearing Machine (6 mm, 13 mm)
23. Testing Apparatus of Press
24. Upright Drilling Machine
25. Shaping Machine
26. Bending Roll
27. Vibrating Shear
28. Automatic Sawing Machine
29. Pipe Bender
30. Pipe Screw Machine
31. Foot Shear
32. Sharp Cutter Press
33. Universal Deep Drawing Testing Machine
34. Fork lifter
35. Hydraulic Press (50 ton)
36. Shock Tester
37. Submerged Arc Welder

⑦ Electric and electronic department

1. Power Distribution Panel
2. Insulation Testing Equipment
3. Thyristor Control System
4. Triac Control System
5. Testing Transformer
6. Induction Regulator
7. Induction Motor
8. Saturable Reactor
9. Motor Generator
10. Balancing Load, 3 phase
11. Sequence Control Trainer
12. Hydraulic Serro Trainer
13. Air compressor
14. Balance Testing Machine
15. AC Watt Meter
16. AC Current Meter
17. AC Volt Meter
18. DC Volt Meter
19. DC Current Meter
20. Frequency Indicator
21. Three Phase Power-Factor Meter
22. Megger
23. Oscilloscope
24. X-Y. T. Recorder
25. Electric Dinamometer
26. Electronic Load Equipment
27. Theoretical Circuit Training Panel
28. Electronic Circuit Training Panel
29. Semiconductor Training Panel
30. Equipment of Printed Circuit Board
31. Automatic Voltage Regulator
32. D.C Stabilizer
33. Low Frequency Generator
34. Signal Generator
35. Pulse Generator
36. Stereophonic Signal Generator

37. Functional Generator
38. Reflection Sweep Signal Generator
39. Phase Meter
40. Alignment Scope
41. Transmission Characteristic Measuring of Amplifier
42. Variable High-level Filter
43. Transistor Tester
44. Curve Tracer
45. I.C Tester
46. Spectrum Analyzer
47. Frequency Counter
48. Electronic Voltage Meter for AC
49. Distortion Factor Meter
50. SSB Radiotelephone
51. Standard Microphone
52. Field Strength Meter
53. Pattern Generator
54. T.V. Testing Transmitter
55. Micro Computer
56. Shield Rm System

5. Construction Programme

5-1 Responsibilities of Both Governments

5-2 Schedule for Design and Construction

5-3 Construction

5-3-1 Background of Construction Procedure

- (1) Contractors
- (2) Architect and Consultant
- (3) Diagram Showing Relations between Design/
Construction Team
- (4) Procedure for Planning and Building Approval
- (5) Contracting

5-3-2 Construction and Supervision

5-4 Procurement

5-5 Maintenance and Management

5-5-1 Maintenance and Repair of Facilities

5-5-2 Maintenance Staff

5-5-3 Operation Cost

5-5-4 Utilities Cost

- (1) Electricity
- (2) Water
- (3) Gas (LPG)..... gas used for kitchen

