PART II

STUDY OF VARIOUS OF HOUSES

PART II STUDY OF VARIOUS TYPES OF HOUSES

1. SETTING OF PRE-CONDITIONS

1-1 Living Style and Family Image

1-1-1 Family Composition

The number of members per family in DKI Jakarta changed yearly as follows.

1970	5.06
1971	5.22
1972	5.35
1973	5.58
1974	5.34
1975	5.77
1976	5.89
1977	6.05

Source: Census and Statistics Office DKI JAKARTA

The gravitation of population toward Jakarta extremely aggravates the situation of housing in DKI Jakarta and its suburbs. Though it is difficult to obtain specific data, it is said that sharing of one dwelling unit by two households is not rate. In case of Klender housing complex, seven to nine persons really dwell in one dwelling unit on the average, and also in other housing complexes, similar values are surmised to be shown. A real mean number of members per family is tentatively surmised to be 6 to 7, and in most cases, the number contains one servant. Thus the value is greatly different from the theoretical number of 5 members per family adopted for the policy.

When considered 7 to 9 persons per one dwelling unit in house planning, it is better to let the dwellers themselves look for their way of dwelling by arranging flexible partitions within a conceivable realistic floor area (average 36 m^2 or less). Based on this basic conception, here is considered a plan which can meet average six members per family. As an average family, a composition of husband & wife, 3 children and one servant with an allowance is considered.

F + M + C + C + G + S	2 children
$\boxed{F + M + C + C + C + S}$	3 children
F + M + C + C + C + G	
F + M + C + C + C + C	4 children

F: Father M: Mother C: Child

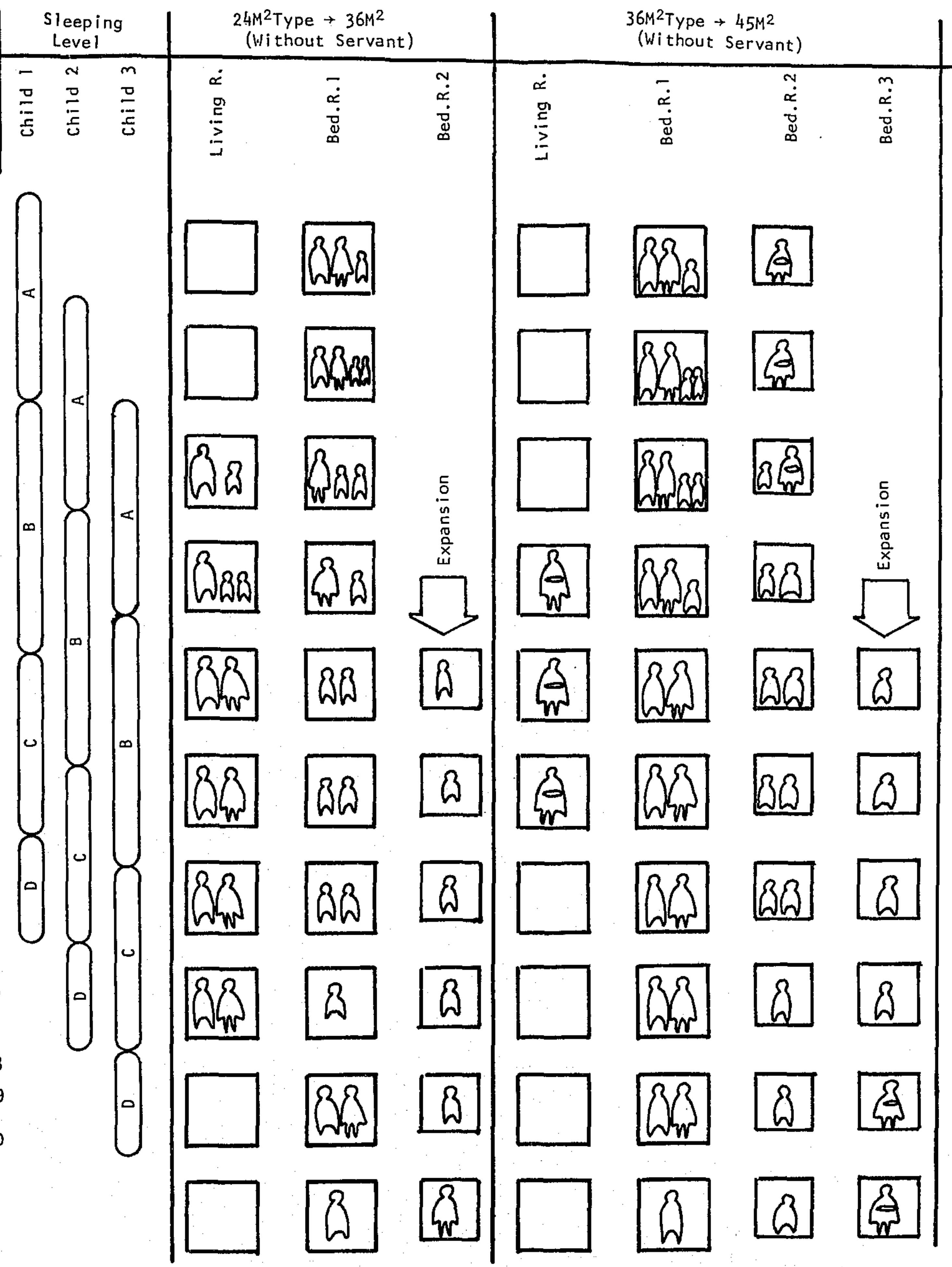
G: Grand Father or Mother S: Servant

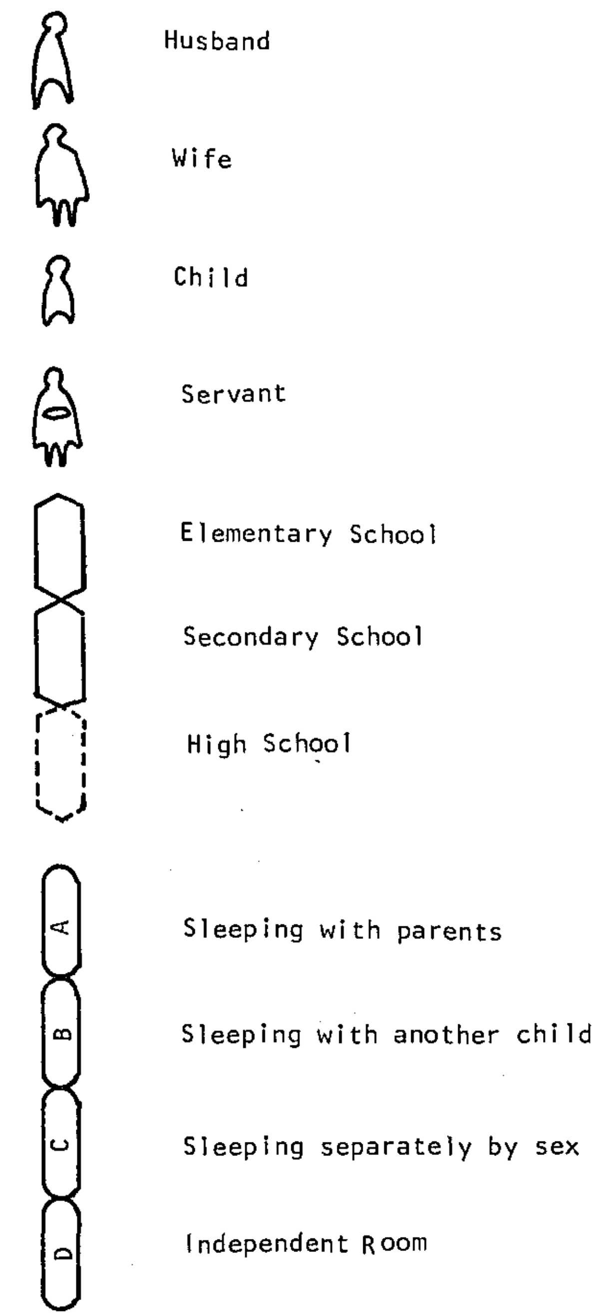
1-1-2 Life Cycle

Based on a general family model, the change patterns of family composition, resulting sleeping levels and house extension systems are analyzed in the graph of the next page. With sleeping levels A, B, C and D set for the child's ages of 0-5, 6-12, 13-17 and 18-20, and a 20-year-old child assumed to be independent and to leave family, the 24 m^2 type house buying class is obliged to use the living room as a space for sleeping for a considerable period of time, and this problem cannot be solved only by expansion of one additional room. On the other hand, the 36 m^2 type house buying class is free from this problem from the beginning, and only when the owner does not extend the house in his age of about 40, the living room must be used as a space for sleeping, though for a considerably short period of time. The average age of the household heads of tenants for Perumnas at the time of entrance is not known. But if a household head of 37 to 38 or higher years old enters, there is not much time before he becomes 45 years old, or when a child begins to be independent, and while the available space cannot meet the need of the family sufficiently, the merit of extension will be limited. Anyway, it should be noted that there is a large difference in the way of dwelling between the initial floor areas of 24 m^2 and 36 m^2. This is especially important for flats which are difficult to be extended, and starting with 45 m^2 is ideal.

Groupe	Hasband	Wife	Child 1	Child 2	Child 3
C_0	24	19			
C_1	25	20	0		
	26	21	1		
	27	22	2		
C_2	28	23	3	0	
	29	24	4	1	
	30	25	5	2	
C_3	31	26	6	3	0
	32	27	7	4	1
	33	28	8	5	2
C_4	34	29	9	6	3
	35	30	10	7	4
	36	31	11	8	5
C_5	37	32	12	9	6
	38	33	13	10	7
	39	34	14	11	8
C_6	40	35	15	12	9
	41	36	16	13	10
	42	37	17	14	11
C_7	43	38	18	15	
	44	39	19	16	13
	45	40	20	17	14
C_8	46	41		18	15
	47	42		19	16
	48	43		20	17
C_9	49	44			18
	50	45			19
	51	46			20
C_{10}	52	47			
	53	48			
	54	49			

Age of Family Member





NOTE : Age of Family Member is average of 32 samples collected by our questionare "RUMAH ANDA", NOV. 1979.

1-1-3 One Day Pattern

Based on questionnairing (For example 3/27 means three answers for the item concerned out of total 27 answers)

a. Cooking method

- o Cooking is made by using kerosene in almost all families (21/27).
- o Spread of LPG is limited (3/27).

b. Sink of kitchen

- o Sink made of concrete/terrazzo (8/27)
- o Sink made of stainless steel (0/27)
- o Other sinks (9/27)
- o Directly to the floor (8/27)
- o Unknown (2/27)

c. Supply of water to kitchen

- o Yes (8/27)
- o No (19/27)

d. Washing of dishes

Kitchen (8/27), Mandi (10/27), Garden (6/27), Terrace (1/27), Kitchen + terrace (1/27), unknown (1/27)

e. Drying of dishes

Kitchen (24/27), Garden (1/27), Terrace (2/27)

f. Cook

Wife (18/31), Servant (9/31), Others (4/31)

g. Sleeping of adults

Bed (27/27), Bamboo Mat (0/27)

h. Double bunk for children

Yes (12/27), No (9/27), Unknown (6/27)

i. Sleeping of servant

Kitchen (3/14), Under stairs (0/14), Own corner (2/14), Independent room (9/14)

j. Sleeping of baby

Wife's bed (10/27), Baby circle (5/27), Hammock (0/27), Unknown (12/27)

k. Nap of baby

Baby circle (7/28), Bed (8/28), Wife's back (1/28), Hammock (0/28), Unknown (12/28)

l. Hours spent for watching television

Less than 1 hour (1/27), 1 to 2 hours (2/27), 2 to 3 hours (4/27), 3 to 4 hours (5/27), 4 to 5 hours (6/27), 5 to 6 hours (1/27), More than 6 hours (1/27), Unknown (7/27)

m. Drying of wasing

When rainy:

Indoor (13/27), Garden (0/27), Terrace (2/27), Under the eaves (11/27), Unknown (1/27)

When fine:

Indoor (0/27), Garden (21/27), Terrace (3/27), Under the eaves (2/27), Unknown (1/27)

n. Washing

Mandi (19/27), Kitchen (0/27), Garden (6/27), Terrace (0/27), Unknown (2/27)

o. Solid waste disposal

At home	Disposal method
Bucket (20/27)	Public garbage depot (6/20)
	Individual garbage depot (2/20)
	Garbage pit (1/20)
	Incineration (1/20)
	Unknown (10/20)
Plastic bag (1/27)	Dumping in river (1/1)
Dust chute (1/27)	Public garbage depot (1/1)
Unknown (5/27)	Garbage pit (1/5)
	Unknown (4/5)

p. Kinds of solid waste

Paper (10/40), Plastics (5/40), Bottles (1/40), Kitchen refuse (24/40)

q. Frequency of dumping solid waste

Twice a day (8/27), Once a day (14/27), Once two days (3/27), Once three days (1/22), Unknown (1/27)

r. Kinds of Mandi

Private use (27/27), Public use (0/27)

s. Times of Mandi

Once a day (1/27), Twice a day (24/27), Three or more times a day (1/27), Unknown (1/27)

t. Mandi using time

Moring		Evening	
~ 5 : 00	(6/27)	~ 15 : 00	(1/27)
~ 5 : 30	(5/27)	~ 16 : 00	(2/27)
~ 6 : 00	(12/27)	~ 17 : 00	(9/27)
~ 6 : 15	(1/27)	~ 17 : 30	(3/27)
~ 6 : 30	(1/27)	~ 17 : 50	(1/27)
~ 7 : 00	(1/27)	~ 18 : 00	(8/27)
~ 7 : 30	(1/27)	~ 19 : 00	(1/27)
		~ 21 : 30	(1/27)
		Unknown	(1/27)

u. Times of going to the toilet per day (faeces)

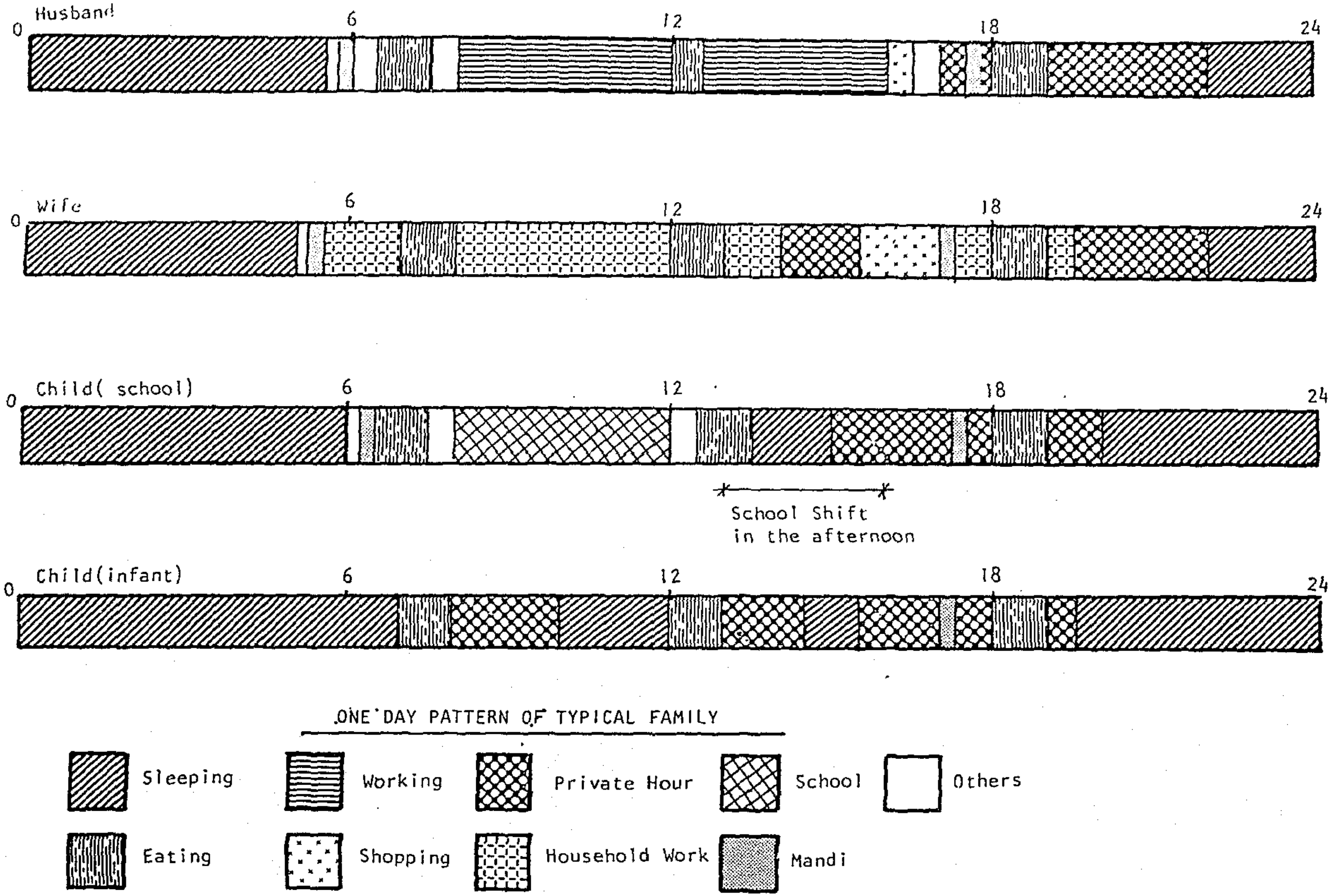
Less than once (1/27), Once (19/27), Twice (5/27), Three times or more (2/27)

v. Time for going to the toilet (faeces)

~ 5 : 00	(4/30)	~ 13 : 00	(1/30)
~ 5 : 30	(3/30)	~ 14 : 00	(1/30)
~ 5 : 45	(1/30)	~ 16 : 00	(1/30)
~ 6 : 00	(12/30)	~ 18 : 00	(2/30)
~ 7 : 00	(4/30)	~ 21 : 00	(1/30)
		Unknown	(2/30)

w. Rest after Mandi

Garden (1/27), Indoor (17/27), Terrace/Balcony (7/27), Unknown (2/27)



ONE DAY PATTERN OF TYPICAL FAMILY

1-1-4 Neighborhood Contacts and Outdoor Living

The following results could be obtained as a result of questionnairing.

- o Contacts with neighbors are generally close, since about half the people deepen relationship by inviting to their home while the other half do not do more than chatting.
- o About a half have a relative or friend staying overnight once or twice a week.
- o About one third hold one to three parties and about one annual event per year.
- o As for circle activities, anyone of a family participates in RT, Rinkgan, sports and religion relating activity at almost same rates.
- o About two thirds go to the mosque once a day.
- o About a half enjoy gardening, but only a few have a flower garden.
- o About one out of several raises birds as pets.
- o About one out of nine raises chicken, but nobody raises goat.

Visiting existing housing complexes, our attention was especially attracted by the dwellers who enjoyed outside living. They extended covered veranda, placing chairs and tables into them, to use the space as a living room during daytime and evening. Also in the housing plan, the provision of space for such extension is absolutely necessary. Housework such as clothes washing and dish washing is often done outdoors.

1-1-5 Other Features of Living

A. Cross ventilation and privacy

- o Cross ventilation is an especially important in the tropics.
- o Questionnairing gives a clear result that cross ventilation has priority to privacy within a dwelling unit.
  In the following alternatives,
  (1) a silent and closed room without cross ventilation.

(2) a noisy and open room with good cross ventilation
26 persons (100%) selected (2).

- In the building plan, the following should be considered (see charts in the following page).
  Door-to-door cross ventilation should be adopted as far as possible.
  The upper parts of partitions and outer walls should have fixed slits.
  Windows can be partly NACO windows.
  The height upto the bottom of beams should be about 2.40 m in case of low-rise house and 2.20 m in flat.
  Eaves of less than 1.2 m wide should be provided, to avoid direct rays of the sun.

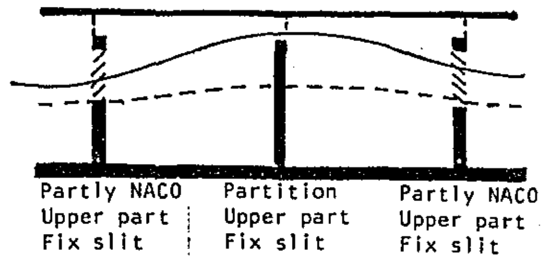
- In site planning, the following should be considered (see charts on the following page).
  Wind direction in Jakarta is NW in the rainy season, and E in the dry season.
  Afternoon sunshine is especially disliked, and should be considered in the planning (especially in the dry season).
  The building axis should be set at N-60-W azimuth.
  In case of flat, the kitchen and the toilet hoply to be arranged on the lee.

- For privacy, the following shojld be considered.
  . Privacy between dwelling units:
  For privacy between dwelling units, the sound insulating level target is 45dB (1000 Hz).
  Flat ..... A dwelling unit partition wall of about 40dB to be planned.
  Low-rise house ..... A dwelling unit partition wall of about 35dB to be planned initially and to be improved in performance by the dweller himself, in case of wooden dwelling unit partition wall.
  A dwelling unit partition wall of about 40dB to be planned in case of masonry dwelling unit wall.

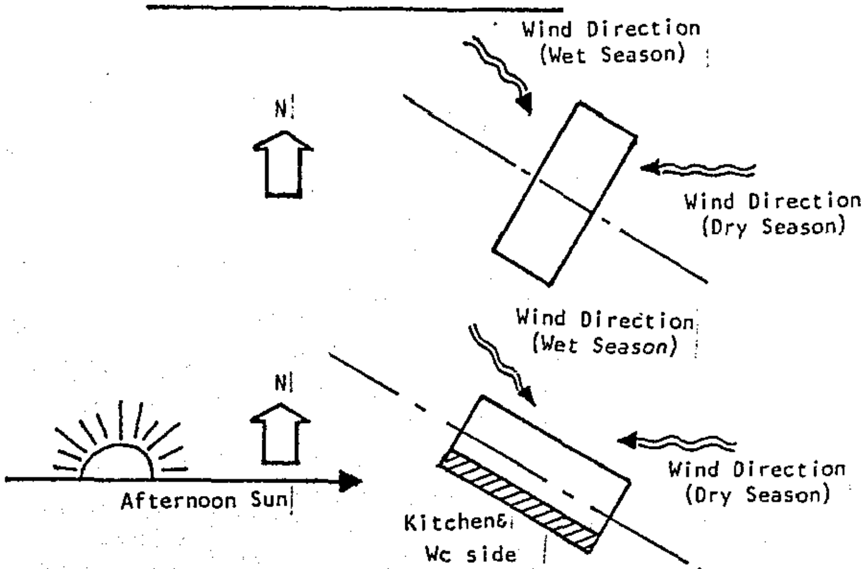
For visual privacy between dwelling units, blind slits and sash bars should be provided at the veranda between adjacent dwelling units.

. Privacy in a dwelling unit:

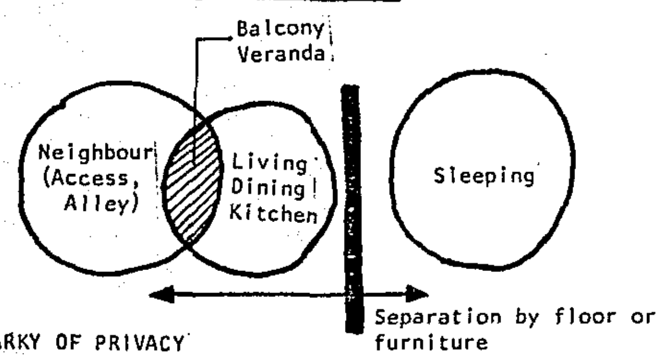
For privacy in a dwelling unit, visual shelter only be considered, for cross ventilation has higher priority. Furniture arrangement to the extent the planning allows also helps for better privacy ..... Especially for the bedroom.



CROSS VENTILATION SYSTEM



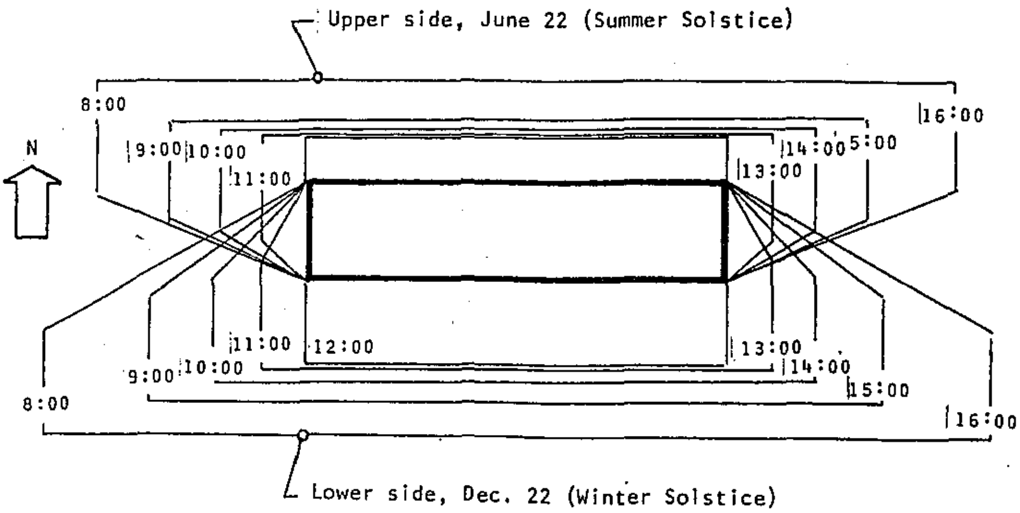
CROSS VENTILATION & BUILDING AXE



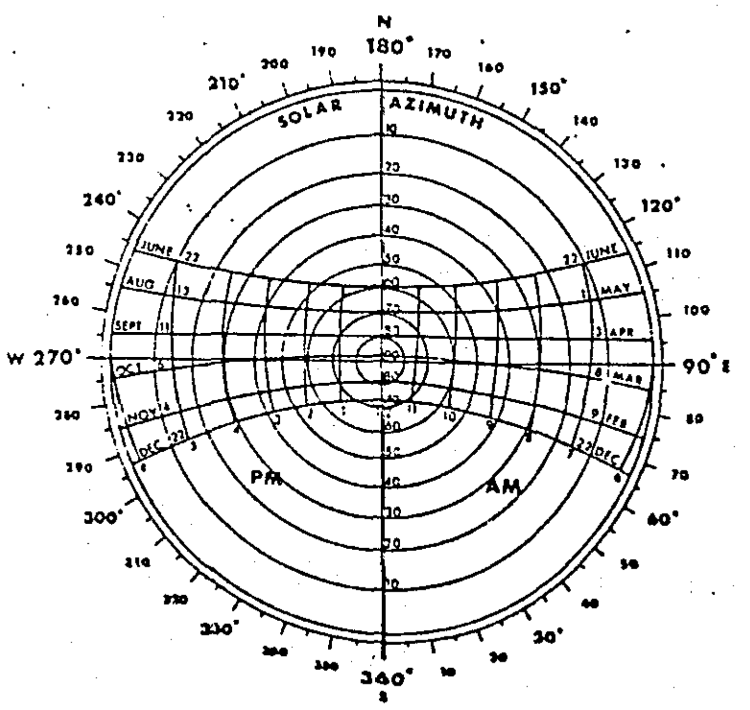
HIERARKY OF PRIVACY

B. Sunshine

- The difference between south and north direction due to sunshine is not considered especially in the tropics.
- To avoid the afternoon sunshine, east-to-west axis is better than south-to-north axis.



Solar Shade Transition of FM-45A Type Walk-up Flat in E-W Axe Position



Latitude 6° South

C. Prevention of crimes

- Results of questionnairing (out of 27 answers):
  Do you go out without locking up your house?
  Yes 2, No 25
  Do you want a key for your own room?
  Yes 18, No 5, Unknown 4

- Though there is high demand for keys, a key will be provided only one of the doors facing the access at the stage of construction.

D. Delivered matters

- Results of questionnairing (out of 27 answers)
  Milk bottle 3
  Newspaper 15
  Magazine 9
  Mailbox prepared or not: Yes ..... 2, No 17

E. Psychological matters

- Preference as to housing type
  Real estate type (21), Flat type (3), Maissonette type (3)

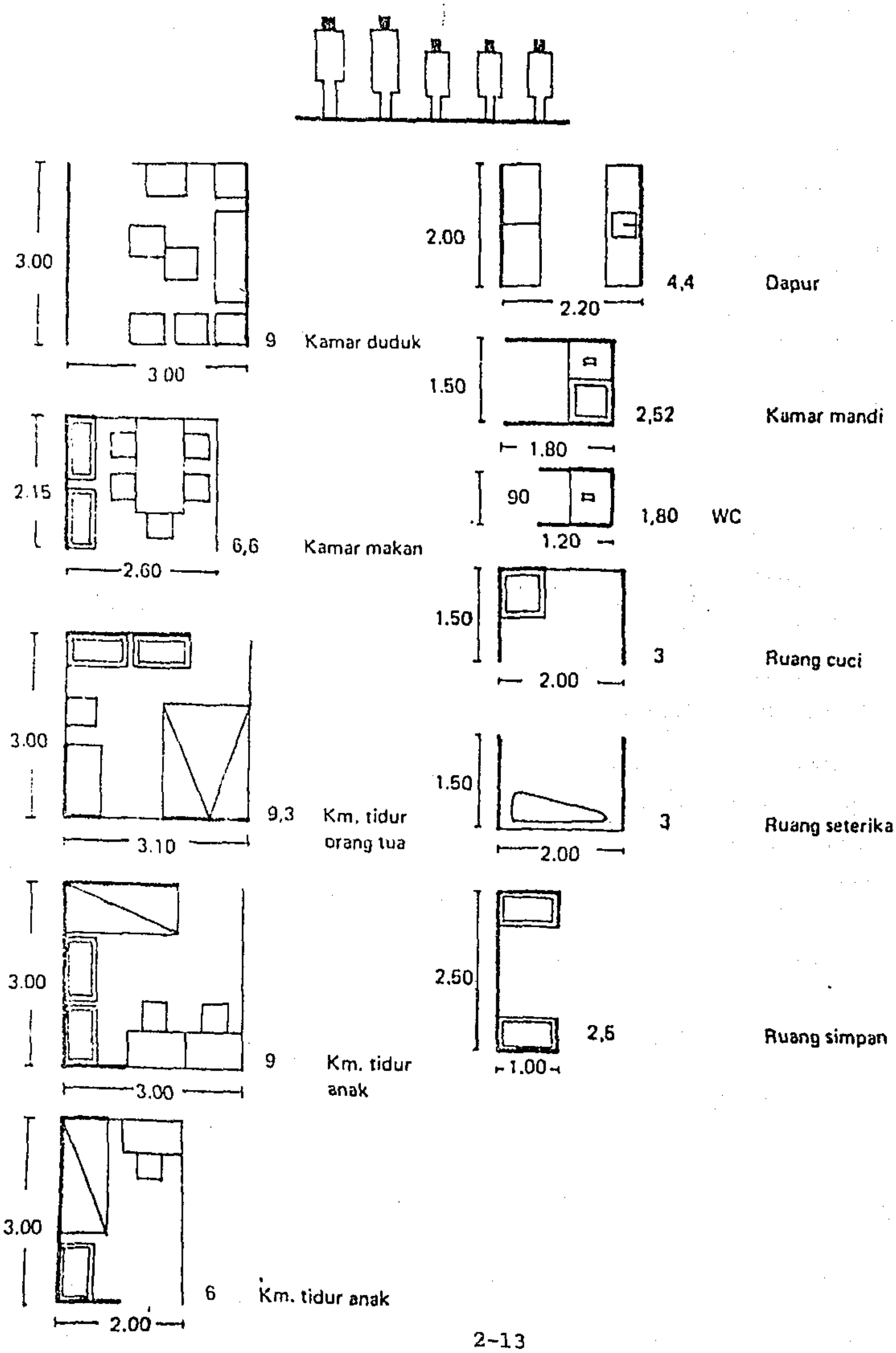
- Preference as to material (wall of room)
  Bamboo (0), Wood (2), Brick (20), Panel (3), Concerete (2)

- Preference as to height
  Upper floors of 10 storied flat (0)
  Lower floors of 4 storied flat (22)
  Unknown (5)

1-2 Space Requirement

1-2-1 Space Requirement for Respective Rooms

Standard of Cipta Karya (for a family with 3 children)



1-2-2 Extension, or Improvement and Do-It-Yourself System

A main principle in the public housing policy of Indonesia is the dwellers' participation system (Do-It-Yourself System) for reduction of initial cost, and S & S (Site & Service) and L C H (Low Cost Housing) respectively offered houses called Rumah Inti (core house) and Rumah Sederhana (single house). These houses have a limited floor area and simple finish, and often do not have housing utilities (especially city water and electricity) either in the initial program.

These houses are extended or improved by dwellers according to their economic and family conditions on the premisis that they will be owners of the houses in fugure, and housing complexes which are bleak at the time of construction change into active spaces with much green and individual design features in a few years. Low-rise houses of 36 m^2 or less are actively extended or improved, and those of 45 m^2 or more are seldom extended, but are actively improved or get a couered veranda. Thus it is surmised to be safe for the time being to consider that a floor area of 45 m^2 + couered veranda is a future target for the average low-cost house buying class of Indonesia.

We would like to adopt the do-it-yourself system to approach this target value of floor area, also in the low rise housing project of this time.

Start from 20 m^2	-	Addition of 2 rooms + Veranda + Sunshade
Start from 24 m^2	-	Addition of 1.5 rooms + Veranda + Sunshade
Start from 36 m^2	-	Addition of 1 room + Veranda + Sunshade
Start from 45 m^2	-	Addition of veranda + Sunshade
Start from 54 m^2	-	Addition of veranda + Sunshade
Start from 70 m^2	-	Addition of veranda + Sunshade

On the other hand, in case of flat, extension is very difficult, and consideration must be made beforehand accordingly. Our proposal is to make at least physical extension possible.

1-2-3 Separation in Sleeping

The sleeping patterns of children involved in their growth are an important problem, and as one target, the following sleeping isolation patterns is set to be satisfied.

Age of Child		Sleeping Pattern
0 - 5	A	Sleeping with parents or at least with mother
6 - 12	B	Sleeping with another child
13 - 17	C	Sleeping separately by sex
17 -	D	Independent room

1-2-4 Separation of Eating and Sleeping Rooms

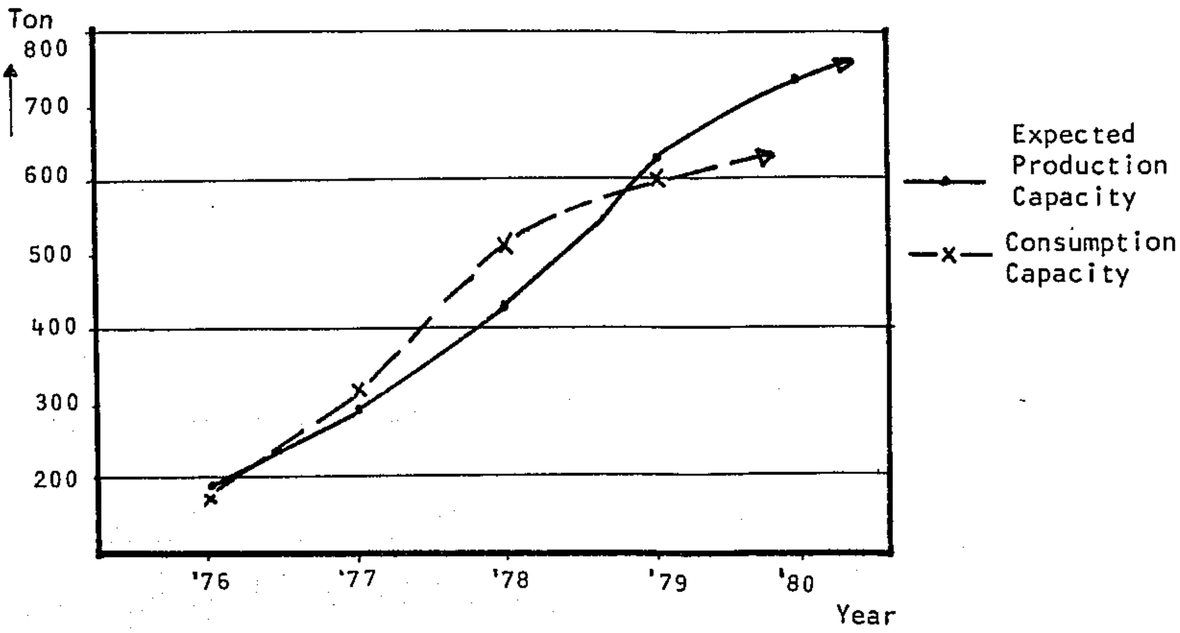
The separation of eating and sleeping room is desired to be satisfied in principle, but cannot be satisfied in houses of 24 m^2 or less and depending on family compositions. It must be realistic to make one large room with DK and L combined, and to use it according to the conditions of each family. When there is a servant, it cannot be avoided to some extent that she may sleep in the kitchen.

1-3 Material and Construction Method

1-3-1 Structural Materials

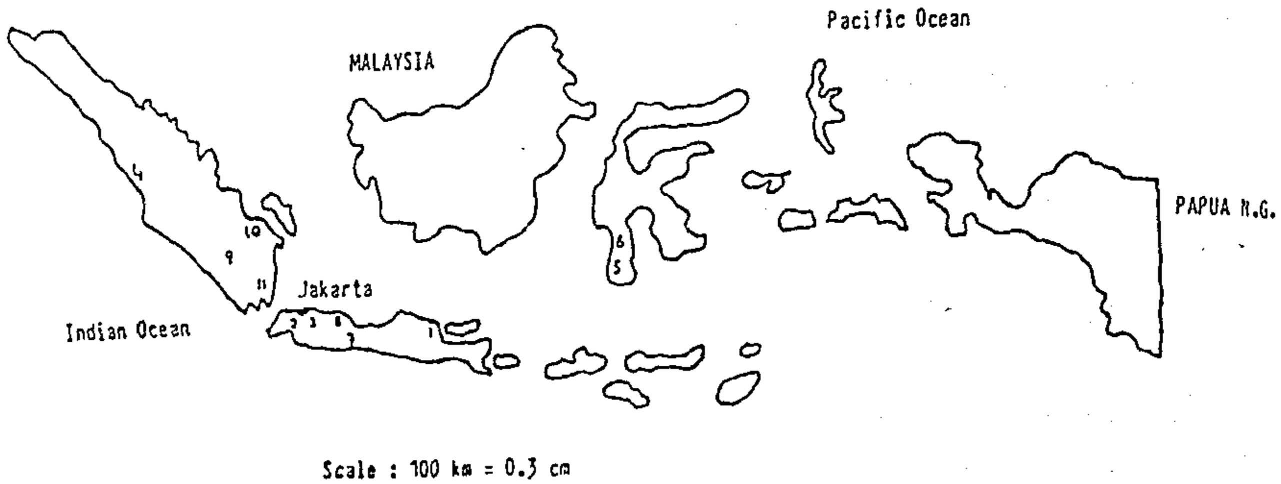
A. Cement

Cement now produced is in conformity with ASTM standards of USA. Most of them are Portland cement, but Portland trass cement also is produced.



o Production amount: The relation between production and consumption amount is shown in Fig. 1, and also at about 1979, production exceeds consumption. Now in Indonesia, kiln factories are planned in the districts shown in Fig. 2, and of them, 6 factories are operating.

1. Gresile, East Java
2. Cibinoug, West Java
3. Cibinorg, West Java
4. Indarung, Padaug, West Sumatra
5. Tonasa, Makasar, Sulawesi
6. Matampa, Sulawesi



TEST RESULTS EXAMPLE (Bandung,3,Jan.1979.
BALAI PENELITIAN BAHAN-BAHAN)

	Cement Test Sample TR-122/ 3.BxD	Species NI-8-1972				
		S 325	S 400	S 475	S 550	SS
1 Raw Test Material						
1-1 Fineness						
Cntent of impurities, ingredient not easily pulverized by hand or stone like ingredient						
1.2^{mm} sieve remnants %	No .	-	-	-	-	-
0.09^{mm} sieve remnants %	0.20	< 20	< 15	< 10	< 7	< 5
Specific surface area	3372	>2000	>2400	>2600	>2800	>3000
1-2 Specific Gravity	3.16					
1-3 Chemical Composition						
Presented by percentage of row test material unsoluble ingredient.	0.20	< 1.5				
SiO_2	20.20					
Fe_2O_3	3.46					
Al_2O_3	6.34					
CaO	64.65					
MgO	1.35	< 5.0				
SO_3	2.28	< 3.0				
K_2O	0.40	< 0.6*)				
Hilang Pijar	1.30	< 4.0				
Free Carbonized Calcium	0.72					
C_3A	10.95					

*) Only in case of the other concrete materials used with this cement is alkaline.

BALAI PENELITIAN BAHAN-BAHAN
Test No. 1 5/78,200 Date 3. Jan. 1979

2. 1.2^{mm} Sieve Remnants.		S 325	S 400	S 475	S 550	SS.
2-1 Weight/Liter						
'Softly packed. Kg	1.135					
Tightly mixed Kg	1.692					
2-2 First Stage Solidificaition (VICAT Machine)						
Mixed Water %	29.0					
Min. First stage solidification	186	>60	>60	>60	>60	>60
2-3 Form Continuance						
Boiling Pat Test	good	Pat shall not be show the above phenomena				
28days Ordinary Water Pat Test	good					
2-4 Strengh-Mixing Ratio Cement 1 + Normal sand 3 (Weight ratio)		Min. Average				
a. average tensile force 1day Kgf/cm	-	-	-	-	-	225
b. average tensile force 1+2days Kgf/cm^2	391	200	250	300	350	425
c. average tensile force 1+6days Kgf/cm^2	479	275	325	375	450	525
d. average tensile force 1+27days Kgf/cm^2	576	325	400	475	550	-

o Problems and future study

The largest problem of cement is that concrete can cause pseudo-cementation immediately after mixing, even if the cement conforms to the standard. Since this is found only when the slump decreases excessively on the way from the mixer to the form, it is usually very hard to be discovered. As the slump is 10 to 15 cm, usually in Indonesia it is still more difficult to find the pseudo-cementation since the raw concrete themselves are already hard. The cause is said to be the dehydration of gypsum. The pseudo-cementation characteristic is a function of time, but since this may disappear and become normal and again occur with the lapse of time, this is liable to occur during storing or transport. The defect occurs, being affected by temperature, humidity and carbonic acid gas in air. In the concrete work, it should be sufficiently confirmed whether there are these factors, with the above causes taken into consideration.

Weathered cement increases in ignition loss, becomes small in specific gravity and slow in cementation, and lowers in generated strength. Ignition loss is generally a yardstick of age of cement, and the percentage is limited in the standard. Furthermore while cement contains small amounts of sodium, potassium, titanium, phosphorus and manganese, it may contain different substances, depending on the components of raw materials and production methods. Especially if 0.6% or more of alkalis such as Na_2O and K_2O are contained, they react chemically with some doubtful silica rock and minerals contained in the aggregate, to cause the sudden expansion and breaking of concrete. This is called alkali aggregate reaction. For this reason, the confirmation of amounts of the above metals seems to be required by all means.

B. Fine aggregate and coarse aggregate

o Fine aggregate

The material used for ready-mixed concrete is surmised to conform to the standard, but more than 80% of concrete is produced still by field mixing. Therefore, it seems that the testing of various matters affecting concrete seriously such as grain size distribution, organic impurities, mud content, specific gravity and coefficient of water absorption is not made sufficiently. In addition to the testing, the way of quality control at the field must be a problem. Especially, organic impurities and mud content determine the properties of concrete, and investigation in future is surmised important.

Fine sand used is mainly river sand, and sea sand is seldom used. With regard to the mud content of fine aggregate, simple volume tests were made using a measuring cylinder.
The results are shown below for reference.

Use	Place of Collection	Date	Mud Content (Volume Percentage)	Note
House	Depok	'80,01.06	16.0%	Finishing
Open Gutter Work	Klender	'80,01.06	15.2%	-do-
High Rise Building(17F)	Jakarta	'80,01.20	9.1%	Mix in situ,structur-al
-do- (25F)	Jakarta	'80,01.20	6.06%	-do- (Water turned to be yellowish after sand is mixed with water)
Market	Cirebon	'80,01.08	7.5%	-do- (-do-)

Note ; Water : Jakarta City Water

o Coarse aggregate

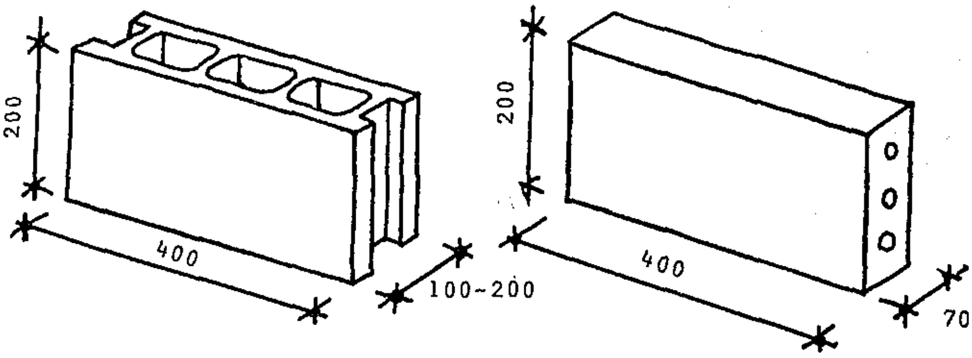
As coarse aggregate, river gravel and crushed stone (for large projects) are used, and the maximum grain sizes are two sizes of 25 mm and 40 mm.

Tests similar to those for fine aggregate must be done by place of origin. Particularly the chemical reaction with alkalis in cement (alkali aggregate reaction) is the largest problem. The chemical stability of aggregate must be confirmed by testing. Known reaction substances are silica minerals, opal, chalcedony, tridymite, cristobalite, zeolite, heulandite, vitric to cryptocrystalline rhyolite, its dacite, tuff, a certain kind of phyllite, etc.

Since abrasion resistance determines the strength of aggregate and the durability and strength of concrete, it must be confirmed by kind of aggregate.

C. Bataco

Blocks generally used in the projects of Perumnas are Bataco blocks.



For Wall HB-100,200 For Fence and Drainage Gutter

For non-structure: Bataco blocks (trass leim blocks) (Lime : pozzolan = 1 : 5, Compressive strength 25 kg/cm^2)
For structure: Bataco cement blocks (Trass cement blocks) (Cement : Pozzolan = 1 : 8, Compressive strength 50 kg/cm^2)

There are two kinds of Bataco blocks as shown above, and the former is more used for one storied houses by Perumnas. Furthermore, they are used without reinforcement, and there are many actually used which are not surmised to give a predetermined strength. Bataco blocks are a traditional building material of Indonesia and have high advantages that the raw materials can be easily obtained, that they can be produced by relatively simple equipment, and so on. But they cannot be used for earthquake-proof walls or in a place of poor ground conditions. They seem to have problems in permeability and shrinkage, too, but we could not obtain data concerning the problems. Data concerning fire-proofing could not be obtained either. However, considering the difficulty in obtaining a large quantity of them in Jakarta and the site condition in Cenkareng, they will be used only for walls of WC/M, etc.

Joint mortar or covering mortar used for Bataco blocks is trass : leim = 5 : 1 or, if water-proofing is required, sand : cement = 2 : 1 or 3 : 1.

The price is about 60 RP/pc in Bandung and 80 RP/pc in Jakarta.

D. Concrete blocks

Concrete blocks are same as Bataco HB-10 both in form and size. The compressive strength depends upon mixing, being 40 to 70 kg/cm^2 with cement : sand = 1 : 8 to 1 : 10 and upto 100 kg/cm^2 with 1 : 5 to 1 : 4. As obvious from the form, vertical reinforcements can be put in but horizontal reinforcements cannot.

The price is about 160 RP/pc.

E. Bricks (Batu Bata or Bata Merah)

Bricks include two major types; for brick exposure wall and for mortar base brick wall. There are various forms. The most used bricks are those for mortar base brick wall with dimensions of about 240 x 120 x 50. The price is about 13 to 18 RP/pc depending on the grades. Irrespective of low-rise or medium-rise building, bricks are highly used for filling between structural members, especially for partial bottom walls, etc, and are covered with mortar on the surface for finishing. In the project of this time, we would like to use this cheap bricks for exposure wall of some partial bottom walls, to obtained colored good outward appearance, though they have a problem in permeability.

Bricks for exposure are generally expensive, and there are various kinds of them. This time they are not considered.

F. River stone (Batu Kali) and coral stone (Batu Koral)

Both are building materials for foundations. The former is general especially with Perumnas housing, and the prices of both are almost same, being about 6200 RP/m^3. Batu Kali includes round ones and crashed ones and is difficult to be collected in the rainy season. Therefore, for a large project, the availability must be considered. Coral stone is limestone obtained in mountains in the suburbs of Bandung, and does not involve the seasonal difficulty in obtaining. As for their strengths, accurate data are not available, and comparison cannot be made. Anyway, much owes to the level of execution of work.

G. Timber

The following timber is often used.

Species	Specific Gravity	Strength	Durability	Price($\times 10^3$ Rp/m^3) -square timber
Jati	0.70	II	I	430
Kamper	-	-	-	115
Borneo	-	-	-	70
Meranti	0.55	II-IV	III-IV	65
Terentang	0.40	III-IV	IV	26

The timber considered this time is Meranti, Borneo and Terentang, and Meranti (merah) is used for walls, floors and also for window and door frames, as a general structural material. Terentang is used for form work.

DURABILITY CLASSIFICATION

Durability Class	I	II	III	IV	V
In continuous contect with moist ground.	8years	5years	3years	very short	very short
Exposed only to weather but kept from getting seaked in water and properly ventilated	20years	15years	10years	several years	very short
Under the roof, not in contact with moist ground and preparly ventilated.	indifinitely long	indifinitely long	very long	several years	short
As above but preparly maintained and regulary painted.	indifinitely long	indifinitely long	indifinitely long	20years	20years
Attack of subterranean termites.	none	rera	rapid	very rapid	very rapid
Attack of powder post beetles.	none	none	almost none	not serious	very rapid

Source : Forest Product Research Institute, Bogor.

STRENGTH CLASSIFICATION

Strength Class	Specific Gravity	Absolute Strength Bending kg/cm²	Absolute Strength Compression kg/cm²
I	Over 0.90	Over 1100	Over 650
II	0.60- 0.90	725 - 1100	425 - 650
III	0.40- 0.60	500 - 725	300 - 425
IV	0.30- 0.40	300 - 500	215 - 300
V	Under- 0.30	Under - 300	Under - 215

Source : Forest Procuct Research Institute, Bogor.

PERCENTAGE MOISTURE CONTENT OF TIMBER FOR USE IN BUILDING CONSTRUCTION

Condition of Room	Utilization of Timber	Average M.C.% after install-ed	Max.M.C.% at time of installation
Non Aircondi-tioned	Framing, joists, bearers, beams, outer walls	15%- 17%	20%
	All roofing timbers	15%- 17%	25%
	All joinery, panelling, trime, etc.	15%- 17%*	18%*
	Strip and parquetry flooring on joints or concrete slabs.	12%- 14%*	15%*
Aircondition	All timber exposed to airconditioning e.g. flooring, doors, frames, and other joinery, furniture.	10%- 12%*	14%

Note : * (1) Installation must be delayed until the building has dried out.
(2) Kiln drying is necessary to attain moisture content below approximately 17%.

For drying timber, air and kiln seasoning with air seasoning and kiln drying combined is executed for the shortening of period and cost reduction, in the effort to attain the moisture contents given in the table of the previous page.

For preservative treatment, the following methods are used to cope with fungi, borers and termites, the damage by which is especially high in Indonesia.

(1) Measures to keep the moisture content of timber 20% or less (moisutre content control)

- o A vapor barrier is put between the footing and the timber contact portion.
- o Cross ventilation is secured.
- o The ends of timber are covered with a paint.

(2) Preservative treatment is applied to timber (wood preservation method)

- o The coating materials used in Indonesia can be classified into the following major three types.

  . Application of creosote:
  Easy to obtain and apply, low price, offensive odor, black surface, painting not allowed.

  . Water-born preservatives - Wolman, Tanalith, Celcure:
  Expensive, free from offensive odor, painting allowed.

  . Oil soluble preservatives:
  Pendrex - Solution of pentachlorophenol and dieldrin
  Solignum - Solution of pentachlorophenol and copper naphtenate
  Expensive, free from offensive odor, painting allowed.

- o In general, chemicals are imported. Therefore, for application, coasts and availability, etc must be studied. Furthermore the vacuum penetration method recently adopted also in Jakarta is worthy of studying. On the other hand, dipping and coating applied hitherto should be studied, and how durable houses should be built in the low swampy of Cengkareng must be considered.

- o Insectisation

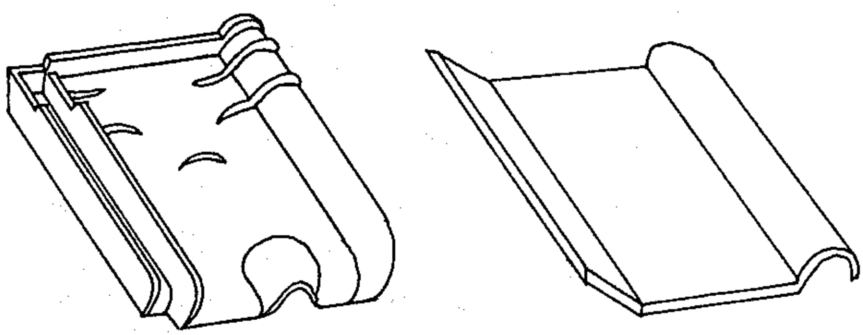
  Of termites in Indonesia, damage caused by a soil termite called sub-terranean termite is large, and insectisation is generally done by soil poisoning around houses. It is adopted also for houses of Perumnas. The price is about 2500 RP/m^2.

In the stage of pre-feasibility study of this time, it is decided to apply insectisation, and to use timber treated by vaccum penetration method only for sills or sill plates and with the wooden portions facing the open air only be coated with creosote.

1-3-2 Non-structural Materials

A. Roof tiles

Red roof tiles are scenery peculiar to Indonesia, and from the roofs of local farmhouses to the roofs of high class houses, there are various levels of red roof tiles. Of unglazed red roof tiles, cheap ones are priced about 30 RP/pc, but they cannot be used for public houses, due to non-standard, irregular forms, low strength to cause breaking when a man is on it, and so on. Among unglaged roof tiles, those called Kodok are priced about 65 to 80 RP/pc, and have sufficient strength, being able to be considered for use.



The slope of the roof should be 35 degrees (10 : 7) with notched and hooked roof tiles only used, or be made gentle to about 30 degrees with means applied to prevent the leaking of rain at the portions of notch and hook. When roof tile is adopted, the attic may be used effectively.

B. Corrugated asbestos sheets

Various products are marketed, and of them, products of particular two makers are good in quality. They are used in almost all the existing houses of Perumnas, and seem to be bought at lower prices than market prices in large quantities. The market prices are about 5,800 RP per 4 mm thick 3 m x 1 m sheet.

C. Particle boards

Perumnas possesses a sole particle board factory of Indonesian, and the products are widely used for outer walls of Perumnas houses. But the particle boards as outer walls have problems in light of weather proofing and water proofing, and actually, with many houses, the outer walls swell at the bottoms, falling to pieces. Also in the project of this time, the use of them for the second floor of wooden houses is considered.

D. Cement fiber boards

At present one company produces cement fiber boards, and the production capacity is about 300 sheets per day, and is said to be raised to about 700 sheets per day in the near future. The boards come in four thicknesses of 1.5 cm, 2.5 cm, 3.5 cm and 5.0 cm, and the approximate prices for dimensions of 1 m x 2 m are:

1.5 cm ..... 1,950 RP/sheet
2.5 cm ..... 2,400 RP/sheet
3.5 cm ..... 3,050 RP/sheet

They are more advantageous than flat asbestos sheets and particle boards in price, but in light of people's preference and fire proofing, it will be better to apply about 10 mm mortar on the surface. For use as a dwelling unit partition wall, a 3.5 cm thick cement fiber board mortared on both sides is to be fitted in a wooden framework.

E. Plywood

Various kinds are produced, and are expensive.

F. Bamboo mats

These are a general material, and have various advantages as a building material. Various patterns can be formed by machine weaving and manual weaving. Though they are not liked by ordinary people, they are planned to be adopted extensively for partition walls in a dwelling unit, considering low price, easy acquisition and that simply movable or renewable.

G. Mortars and plasters

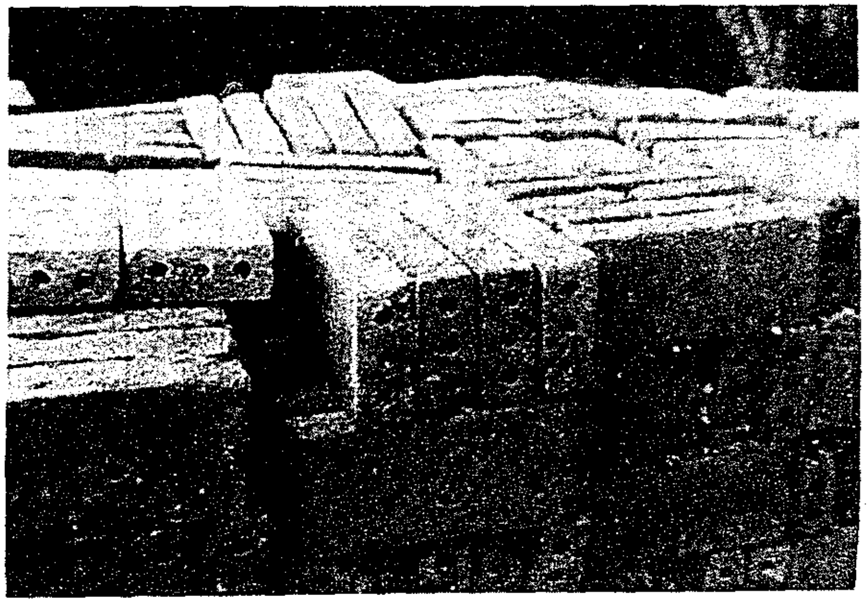
Sand, trass, lime, Portland cement, red brick powder, etc. are mixed variously for various applications.

MORTAR, PLASTERS, CONCRETE PROPORTION BY DRY BULK.

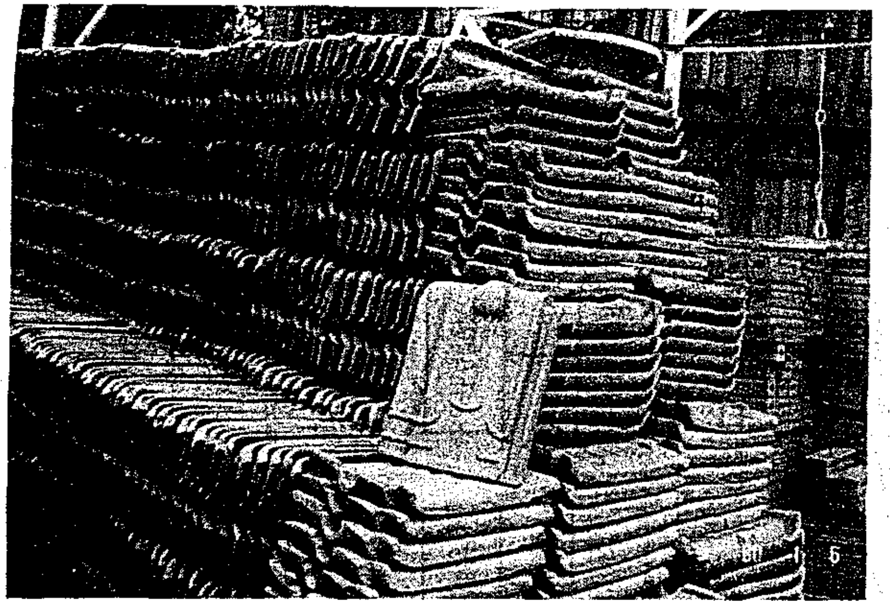
Gravel	Sand	Red Brick powder	Tras	Lime	P.C.	Remarks
			Mortars			
	1	1	-	1	-	Foundations for heavy construction
	2	1	-	1	-)	
	3	-	1	1	-)	House foundations
	5	-	1	$1\frac{1}{2}$	-)	
	4	2	-	3	-)	
	5	-	1	1	-)	House Wall
	5	-	-	$\frac{1}{4}$	1)	
	2	-	-	-	1	Damp-proof courses
	4	-	1	-	1	Foundations near salt water.
			plasters.			
	2	-	-	1	-	Old and new walls
	1	1	-	1	-	New walls
	3	-	-	-	1	Flow rendering
	4	-	1	-	1)	Walls mear sea
	3	-	1	1	-)	
			Concrete			
$3\frac{1}{2} \sim 4$	1	1	-	1	-	Sub floors
$3\frac{1}{2} \sim 4$	1	-	1	1	-	Sub floors
3	2	-	-	-	1	Structural reinforced concrete
4	2	-	-	-	1	Floor tiles and paving slabs
6	3	-	-	-	1	Floors(non structural)
$8\frac{1}{2}$	4	-	1	-	1	Floors(-do-)

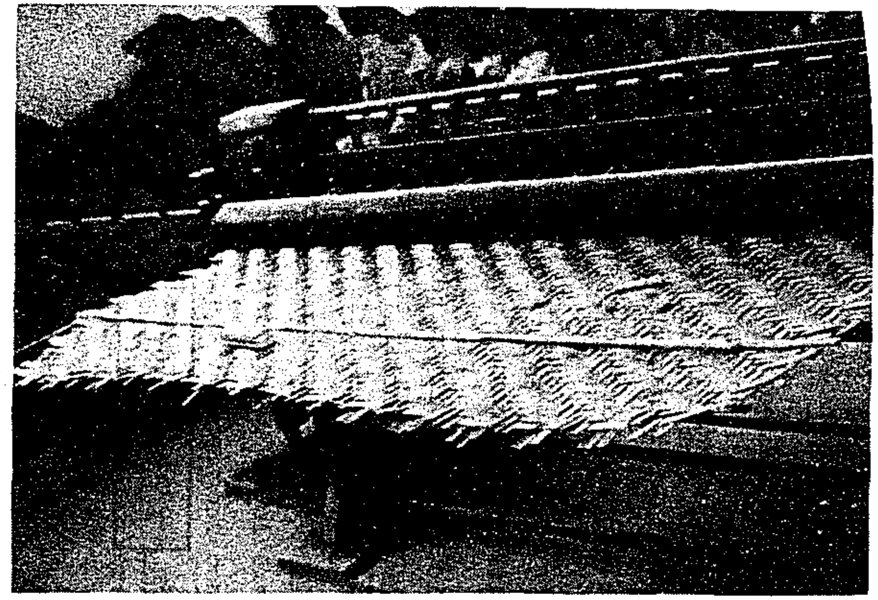
Batu Kali Foundation
(River Stone)

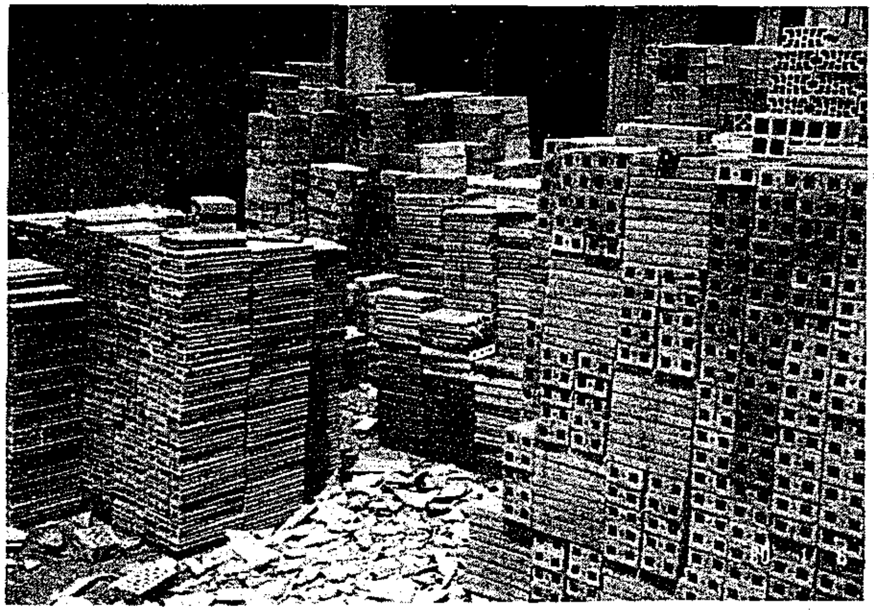
Bataco in Drying Process

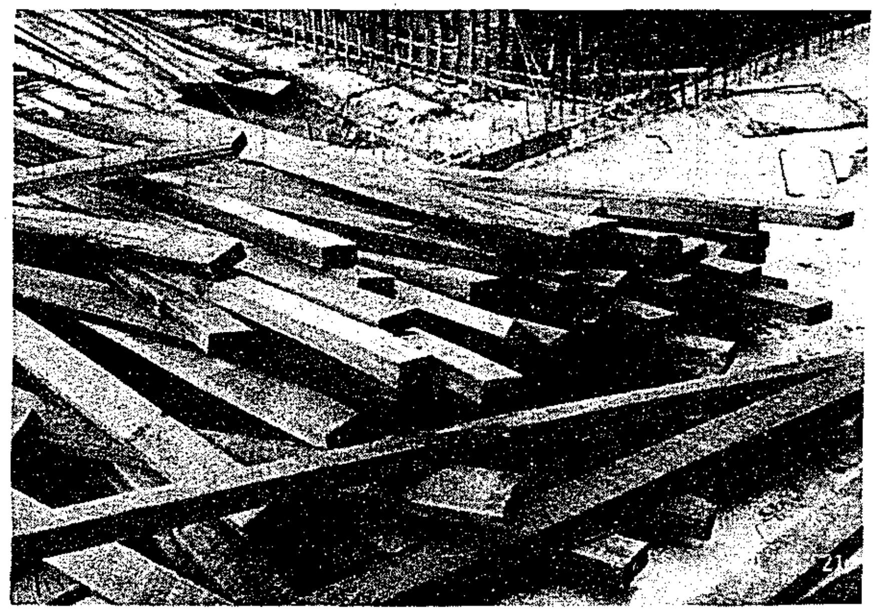


Bataco for Open Gutter and Fence


KODOK Rooftile


Bamboo Mat (Machine Made)


Bricks for Exposure


Borneo Wood

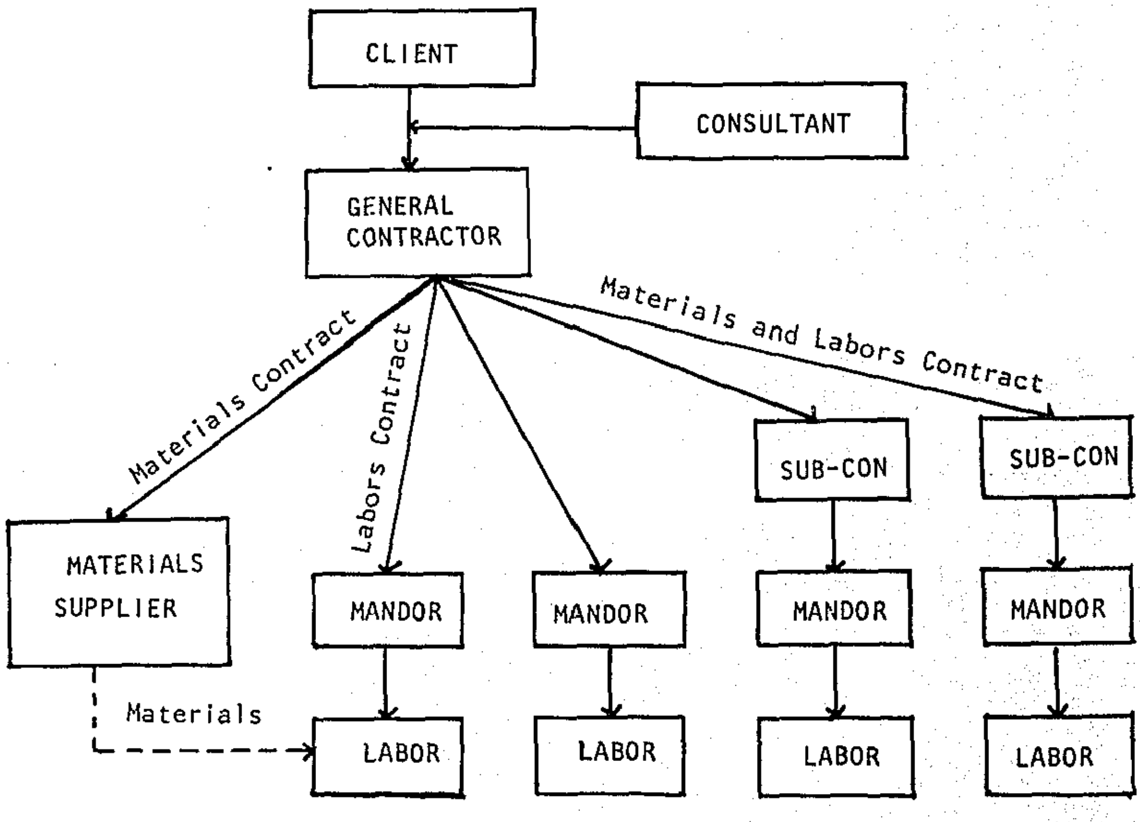
1-3-3 Construction Method

A. Organization of field construction in Indonesia

General organization is as illustrated below. While there is some difference depending on the scale and characteristic of projects, contracts between a general contractor and a sub-contractor can be classified as follows:

i) Separate contracts for materials and labor.

ii) A partial contract and a solid contract for materials and labor in air conditioning and plumming work.



The contract method i) is adopted by most of Indonesian companies. The first reason is that sub-contractors are weak and are mostly not reliable enough to conclude a solid contract for both materials and labor, in light of engineering, scale and funds.

The second reason is that there are few large scale projects in Indonesia, and that in case of medium to small scale projects, the method based on labor sub-contract with materials supplied by the general contractor allows substantial control by the general contractor, though troublesome. Division of a contract reduces the expenses of sub-contracts, providing a merit of profitability. The third reason is that the standards of any advanced country or materials, etc to be applied are determined by the builder and the consultant for each project, since in Indonesia, the scale and standards of construction and materials are not yet systematized or established. For the general contractor, it is advantageous for his control to place materials under his direct control and to meet directly the requirements of standards. These are surmised to be the reasons why most companies rely on the separate contracts for materials and labor, entrusting the labor to Mandors (intermediaries, heads of workers).

Mandors play an important role. For each type of work, a Mandor controls several or hundreds of workers, and about 20 Mandors participate in one porject. The details are as follows.

Species of Work	Note
1. cleaning, carrying of material etc, temporary work,mixing concrete, casting concrete, excavation, bac filling, earth work, road-drainage-, sewerage-, grading-, surrounding work.	Based on the scale of construction sometimes complex mandor-shift is adopted
2. pile work	Machine and execution are unified but material supplied separately
3. form work 4. reinforcement work	Same as 1

(5) Steel, Metal Work (Steel or Metal fabrication)	A	Several shops have 200t/month 500t/month fabricatior Capital 5million Rupia. Australian and Japanese joint company advancing.
6 Masonry Work 7 Plaster Work 8 Terazzo, Stone Work	B	Because of the similarity of works in some case one mandor may conducts these works.
(9) Roof Work (Steel, Al sheet) 10 -do- (Roof tile Asbesto etc.)	C	The variety of water-proofing material is limited. Soul agents accept the execution with full responsibility
(11) Water proofing Work (Sheet Water proofing,Paint water proofing) (12) Door & Window Work (Steel, Al) glass Work	D	Available through soul agent of technically tied-up factory or joint venture factory, but in many cases soul agent sub-contracts including execution.
13 Carpentry, Joinery and Boarding Work (14) Finnishing Work (Carpet, Wall papering, P-tile)	E	Interior design work shops keep worker and contracts also including material+ execution.
(15) Painting Work	F	Japanese major painting factories are advancing. Thoes companies owns painters.
(16) Electric wiring, lighting fixture (17) Plumbing, sanitary fixture (18) Air con.,duct work, installations 19 Miscellaneous Work	G	Generally sub-contractors of electric work are superior to sub-contractors relating to architecture and own workers and contracts also including material+execution.

Without ○ mark means "labor supply only"

As shown above, there are about 18 types of work. This classification is not so different from Japanese classification, but the number of types of work is a littler smaller, since clear specialization does not proceed in some types of work. However, in types (a), (c), (d), etc, workers are unskilled, and contracts for these types have a character of simple provision of labor force. Thus these types are surmised to be almost same as those in Japan in the roles. Furthermore, though labor force is rather excessive in fact in this country, it is an advantage that one Mandor can arrange 110 to 200 workers. Anyway, Mandors do not have sufficient funds, and general contractors pay labor charges to them every other week (the custom in the age of Dutch era remains), and cannot pay every other month or about once a year as in Japan.

The method ii) is used in some cases, and the types of work of circled symbols (◯) in the above table sometimes take this method. However, this occurs only when the conditions of both the general contractor and the sub-contractor coincide. The conditions are:

i) The sub-contractor is a large supplier or manufacturer and has sufficient funds and reliability (b, e, i, l, o, p, q, r, etc in the above table).

ii) The general contractor prefers a contract including both materials and labor, in light of the definite range of responsibility and guarantee (e, i, k and o in the above table).

B. Techniques of various types or work

a. Earthwork (relation to land improvement)

Land improvement are prepared frequently inside and outside Jakarta. Therefore, the machines as shown below are held by lease companies in large quantities. If there is any machine not obtained locally, it can be imported from a foreign country and returned by way of export after the work is completed, without paying the import duty (re-export system). There is no technical problem, and land improvement can be executed considerable amount. Transport can be made sufficiently since there is no limitation in weight, dimensions, or time. However, the security of transport roads is a problem.

Names of machines: Bulldozer, grader, truck, tire loader (for compaction), jumbo, others.

b. Sheeting

As in Japan, sheet piles and H-section steel piles are used, but sheeting is little done for small buildings. For about 2 m under the ground, bamboo piles (50 to 60 mm dia) are driven at 1.0 m pitches, and bamboo sheets are used as lateral sheets, In planning, basement is avoided as far as possible since it is costly due to the technical problem involved in the high ground water level.

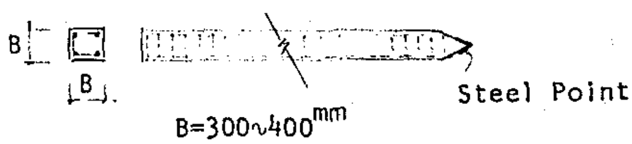
c. Foundation

Since high-rise buildings increase year after year, kinds of piles as shown below are now used.

Kinds: PC piles (there is a PC factory by pretensioning)
RC piles (made by filed form work according to design)
PC piles (made by field form work according to design by posttensioning)
Steel piles (all imported)

Length: Maximum 20 m long piles can be obtained. However, the length is limited by the lifting weight of a driving machine (W max = 7.6 tons/pile).

Section: Square B ≑ 300 ∿ 450 mm



Strength of concrete: Fc ≧ 300 to 350 kg/cm^2
Reinforcing bars: Same as those of the building
Design: Since there is no Indonesian standard, standards of respective countries are applied.
Machines used: Mainly Delmag

Comment:

In some of the past buildings, palm piles are used, to bear considerable weights of buildings. Since there is a large quantity of palm material, its reuse for low-rise houses in had soil condition, etc. may be considered. It seems necessary to investigate lengths and thicknesses used, driving method, yield strength, durability, etc.

On weak ground in swampy land, friction piles, too, can be used, and it is surmised possible that medium-rise houses can be supported sufficiently in ground of about N value 5. This must be examined in future. As an example of minor work, bamboo piles (50 to 60 mm dia and 1.5 to 2.0 m length) were used at 300 mm pitches for road construction (bearing capacity, about 500 kg/pile).

d. Temporary work

Temporary scaffolding

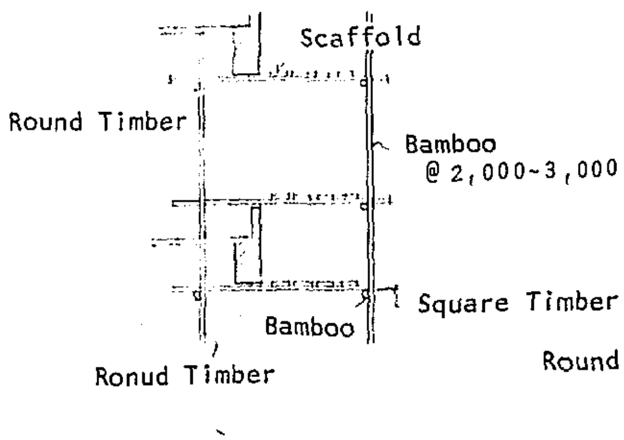
o Bamboo:

Diameter:	50 to 80 mm$^{\phi}$
Length:	about 10 m
Application range:	From low-rise to high-rise (about 25 storied) buildings
Joint:	With slice plate applied, it is made by a special method using rope.
Assembly:	Large braces are set around the outside with single scaffolding, to be resistant against horizontal force. The respective floors are connected, and scaffolding boards are laid, to secure safety.

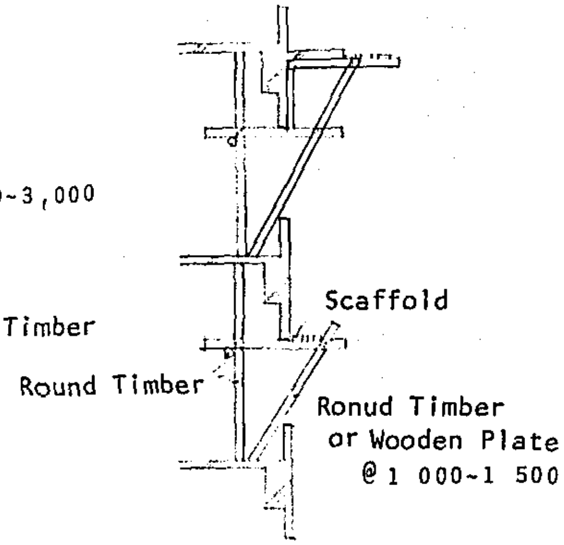
o Log and rectangular timber:

Diameter:	80 to 100 mm$^{\phi}$
Section:	(25 to 30 mm) x (150 to 200 mm)

a. Scaffold -from the ground



b. Scaffold-from the each floor



External temporary stiars, too, are assembled vertically with the above materials.

o Pipe: This is Japanese type, and used partially for high-rise buildings only. The case used is seldom.

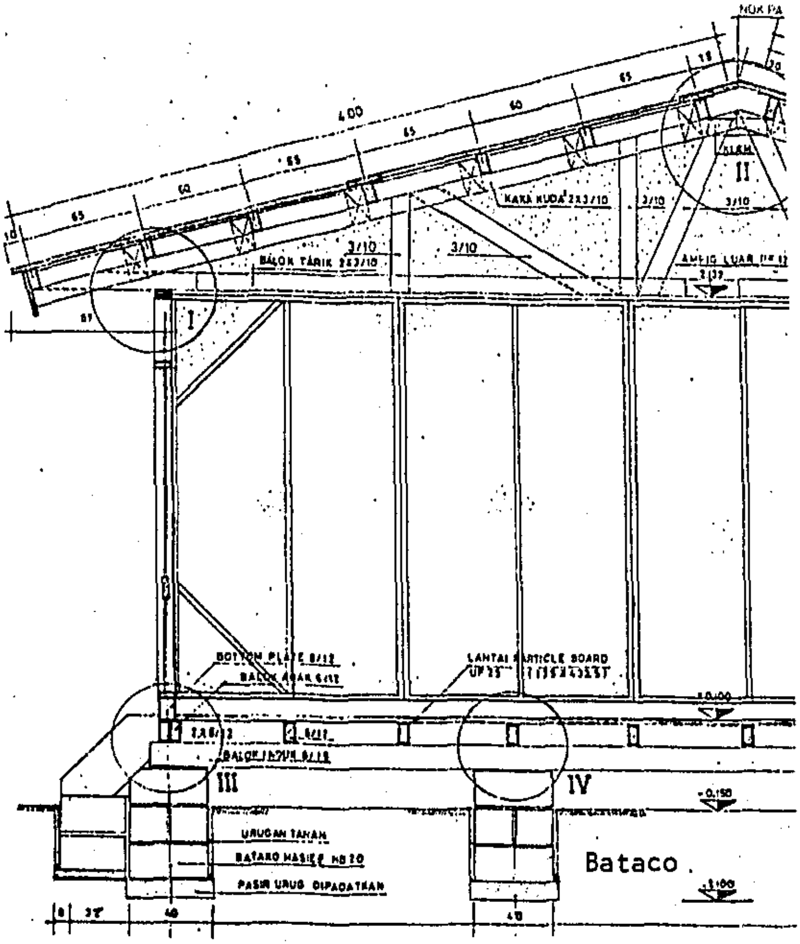
e. Foundation work

For high-rise or heavy buildings, reinforced concrete foundations (independent footing, mat foundation, etc.) are used, as in Japan. For light foundations for low-rise houses, especially for dwelling houses, the following methods are used.

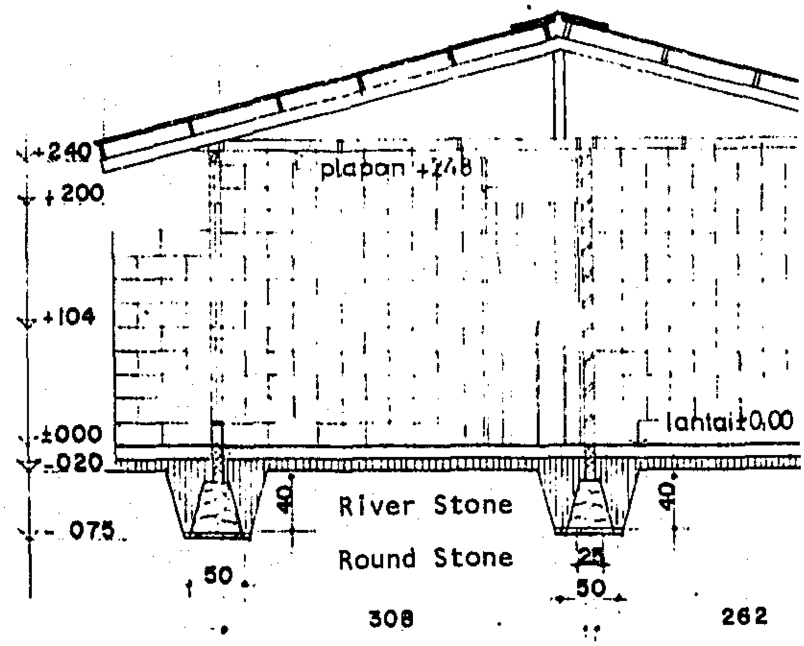
i) On sand compaction, Bataco or brick is laid as continuous footing, to set a sill. (Bataco foundation)

ii) Boulders or crashed stones of about 200 mm are laid, and further boulders or crashed stones are laid on them. They are solidified by mortaring (two kinds of mixing, 1 : 5 and 1 : 3). (Batu Kali foundation)

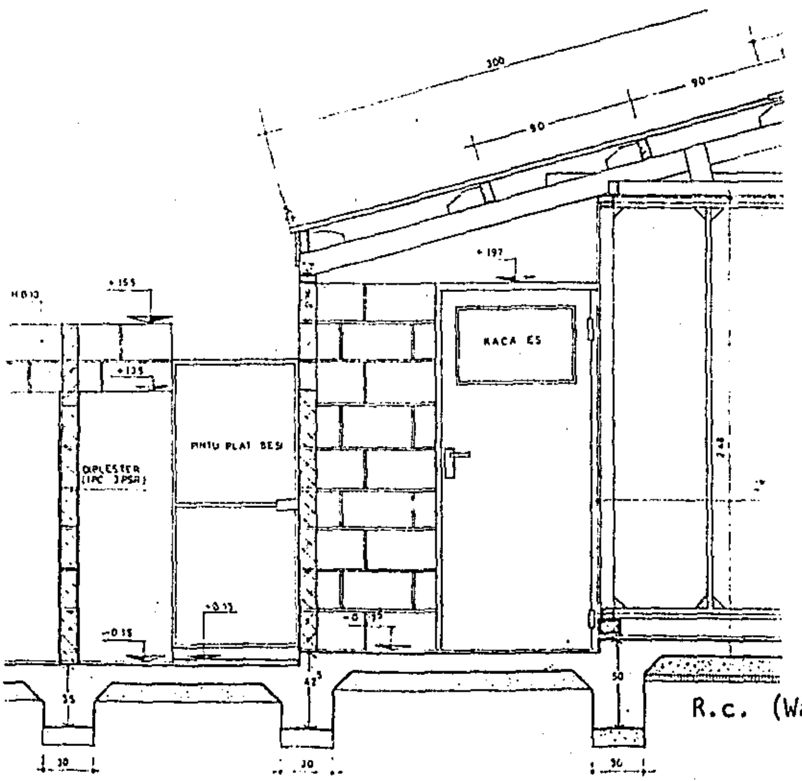
EX.1 Bataco Foundation



Ex.2 River Stone Foundation



Ex.3 R.C. Foundation



R.c. (Wall Footing)

f. Form work

o Materials:

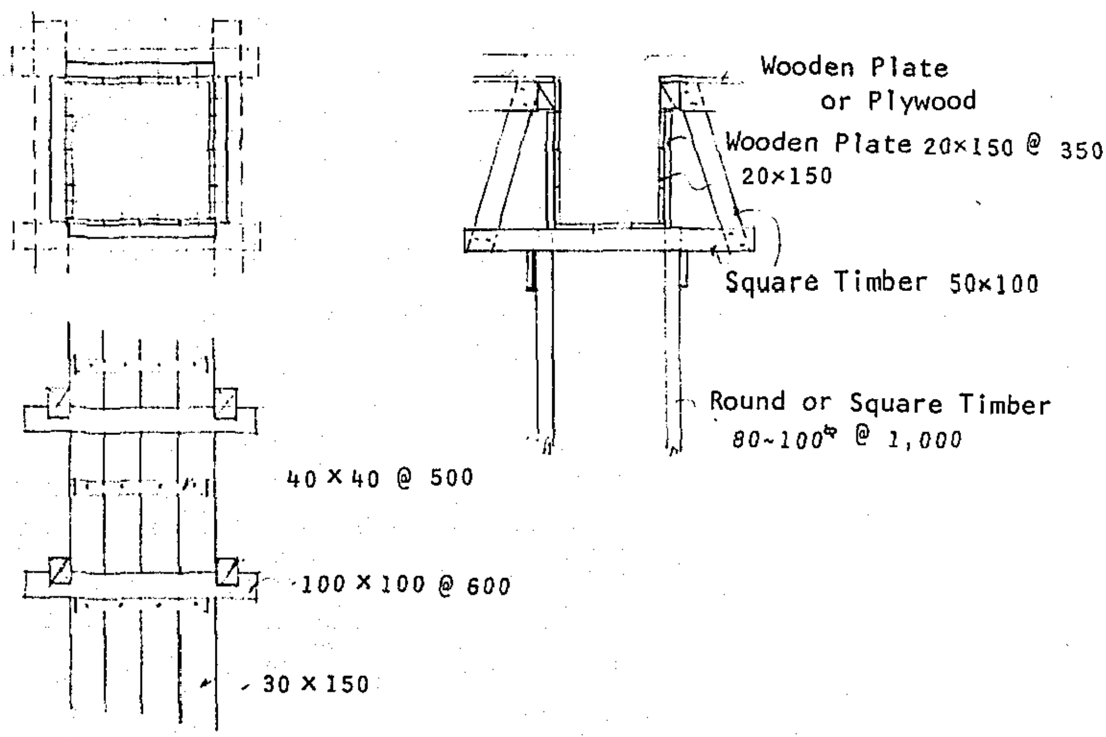
Form: Wooden plate, 15 to 30 mm thick x 150 to 180 mm wide.

Bars: Rectangular timber, 30 mm x 40 mm (beam, column) (Borneo Grade III to IV and Terentang Grade IV) and 20 mm x 150 mm (floor)

Separator: Non.

Support: Log or steel pipe (only partially)

There are only a few forms which are made resistant against seismic force by vertical support only.



As obvious from photos, etc, enormous labor is used for temporary work and form work. Probably because the separator is not used generally, concrete walls are not observed with general buildings (including high-rise buildings), and all the walls are worked after framing with brick or Bataco.

For the shortening of period and also for safety, simplification of form work is desired.

g. Reinforcement work

o Materials:

Round steel:	Diameters applied are 6 to 25 mm. For most reinforcements, round steel is used. Whether it is made by eelctric furnace or blast furnace is unknown. The materials are U-22 and U-24 (mild steel) generally used upto medium-rise buildings, and U-32 (semi-mild steel) and U-39 (hard steel), too, are used for high-rise buildings.
Deformed bar steel:	Used in limited applications (for example, Japanese companies). The material standard is SD30. Imported.
Welded wire netting:	Used in some fields. Imported. 5 ϕ or 6 ϕ x 150 @
Working machine:	Bender (a few jigs for the radius portion of the hook)

o Working:

Reinforcements for columns, beams and slabs are hooked. However, since there are only a few bender jigs as mentioned above, many are inaccurate at the radius portion. All the joints are lap joints. Settlement method, length, etc. are of European or American type, and in most cases, settlement in the joint is made. Slab bending is accurate.

h. Concrete work

In almost all fields, ready mixed concrete is not used, but field-mixed concrete is used. Therefore the control system is the most important. Here is shown an example of survey made on a small-scale reinforced concrete building.

Place:	West of Tembatan
Scale:	Total 1,500 m^2, 3 storied
Application:	Shop and office

i) Places of origins of materials used (for DKI Jakarta)

Sand .... Tangerange   Cement .... Home made

Water ...... City water   Gravel .... Tangerang

ii) Mixing

Cement : Sand : Gravel = 1 (40 kg/bag) : 2 : 3 for 23 liters of water by volume ratio (water : cement : sand : gravel = 230 : 387 : 432 : 649 in terms of weight)

iii) Mixing strength: 175 kg/cm^2

iv) Working method

Mixer (m^3/batch): Yanmar TS50

Mixing sequence and time:

Water ⟶ cement ⟶ sand ⟶ gravel, mixing for 10 minutes

Capacity (m^3/day): 100 cement bags as standard (about 10 m^3)

Placing method: Bucket

v) Workers (skilled and unskilled workers)

Mixer operator: 4 (one for each material)

Transport and supply: 5

Foreman: 1

Placing (striker : 1, recker : 3)

vi) Quality control

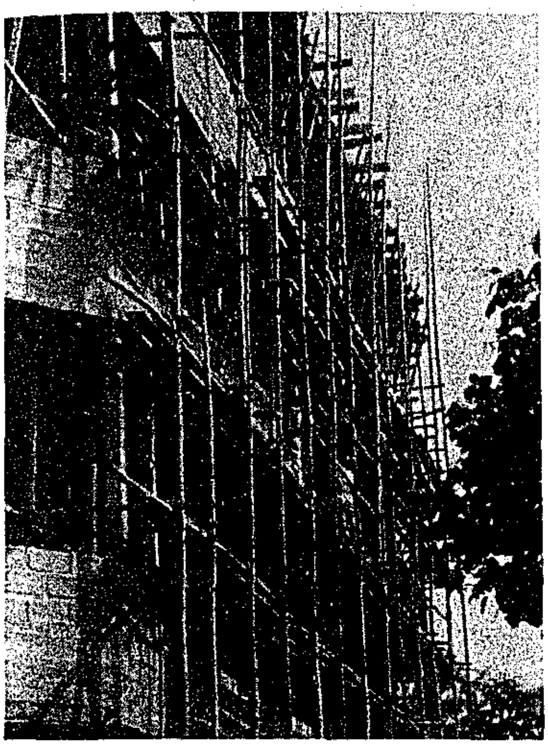
Strength, slump and quantity of air are not especially controlled, and mixing only is controlled.

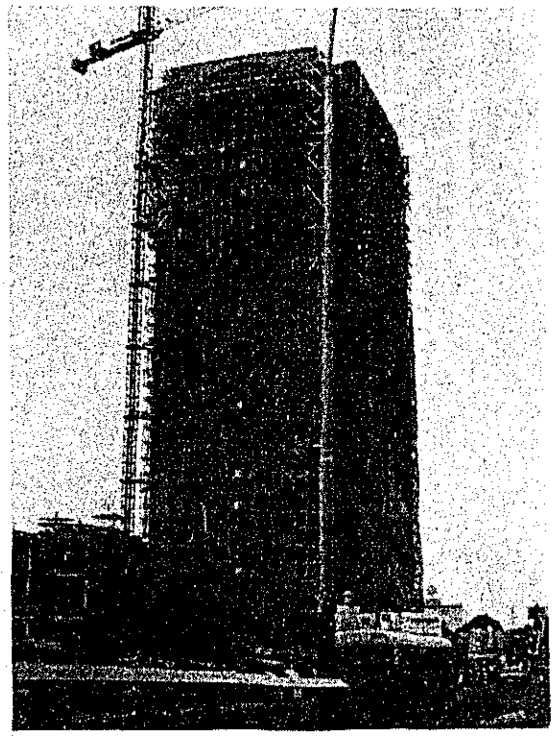
The above is an example for a small-scale building, but may be considered as general practice in DKI Jakarta.
In general, the production capacity of one day is surmised to be about 10 to 50 m^3 (slump is in a range of 10 to 15 cm). For quality control, it is considered that placing with mainly mixing controlled is enough, and test pieces in accordance with NI-2 (Reinforced Concrete Standard) are not obtained. (For high-rise buildings, test piece control is made). For control of materials (cement, sand, gravel, etc.), cement is carried in by a standard quantity of 100 bags, and is stored in a temporary shed on an elevated floor.

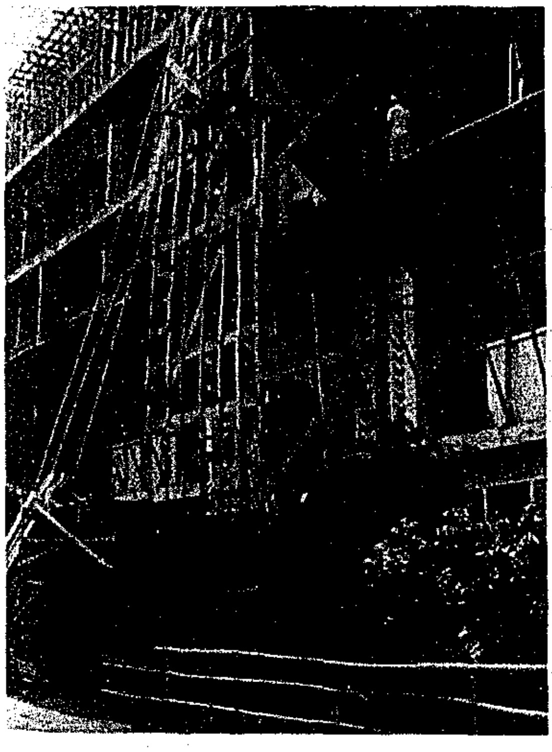
However, sand, gravel, etc. are placed in the field without any protection, and any consideration is not made on the mixing of drainage, mud, etc. As for acceptance inspection, materials are observed with eyes, and no inspection is made at all on grain size distribution, mud content, organic matter, etc.

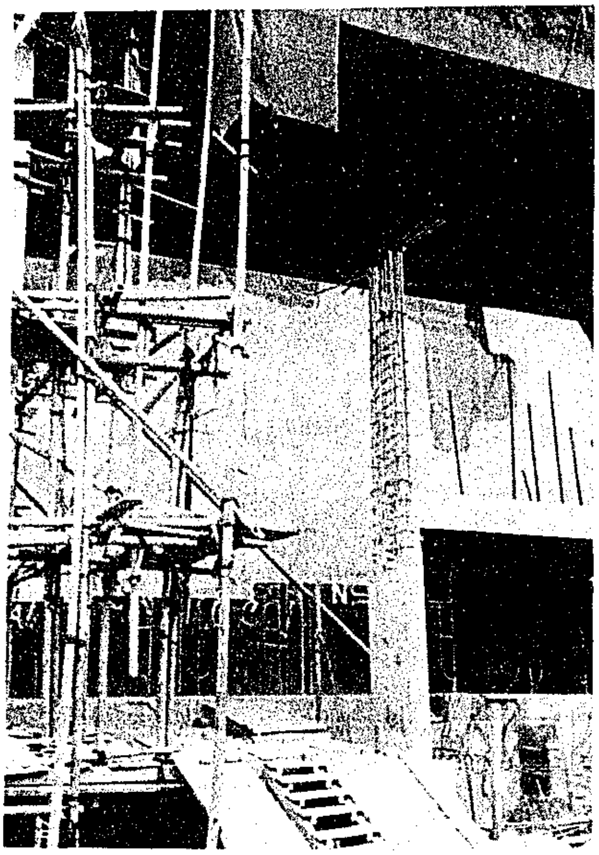
Concrete is mostly placed by the bucket method, since the slump is 10 to 15 cm (standard 12 cm), and partially by crane bucket or by pump piping for horizontal transport.

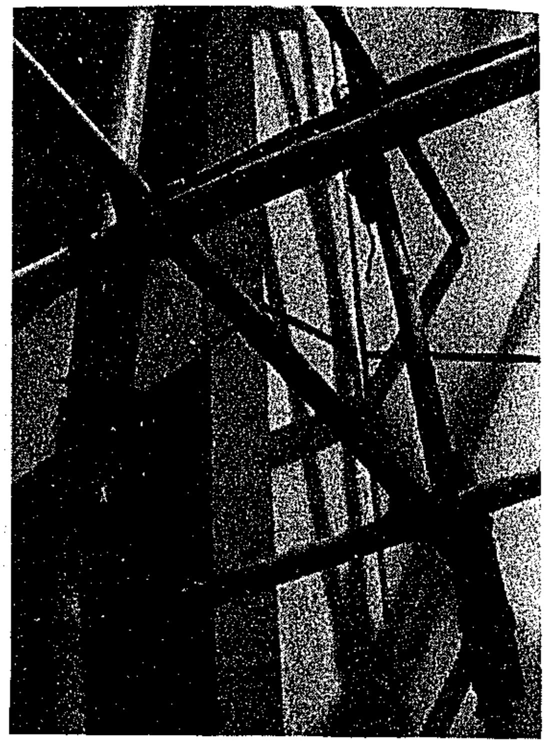
Temporary Work-Bamboo, Timber and Tublar Scaffolds



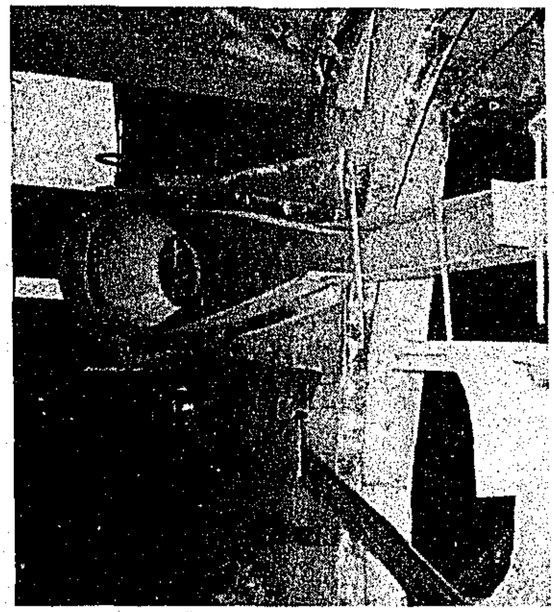


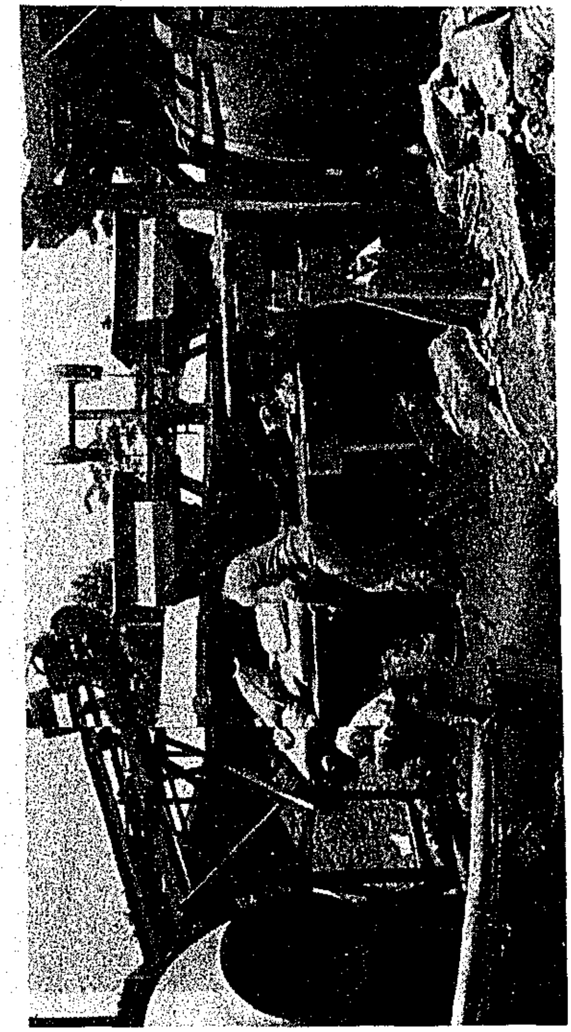




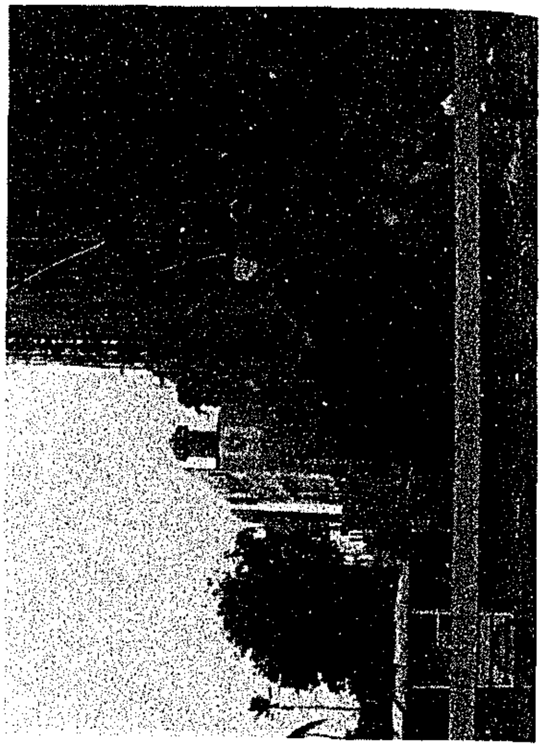


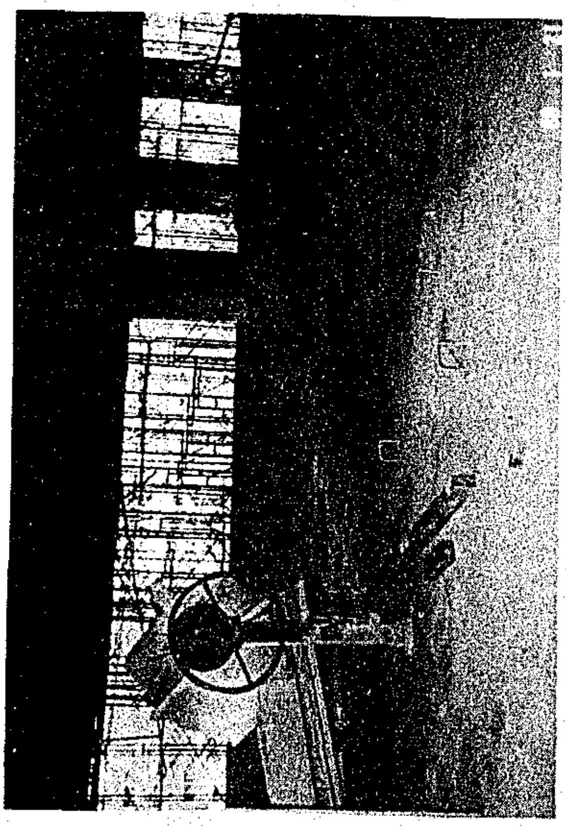
Concrete Work-Several Types of Mixers

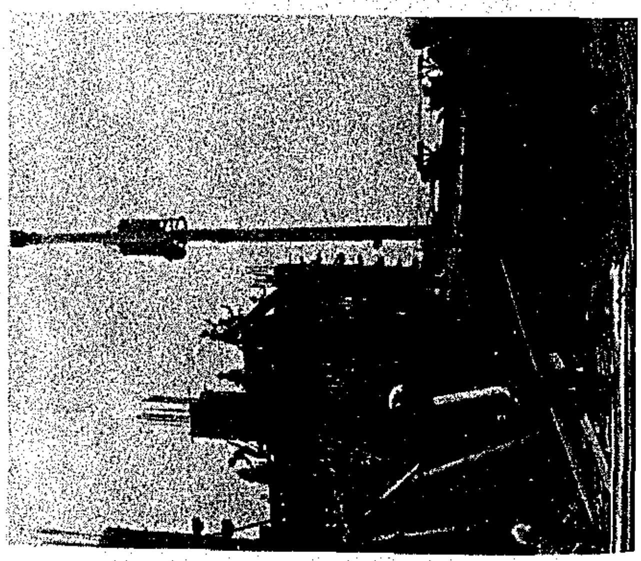




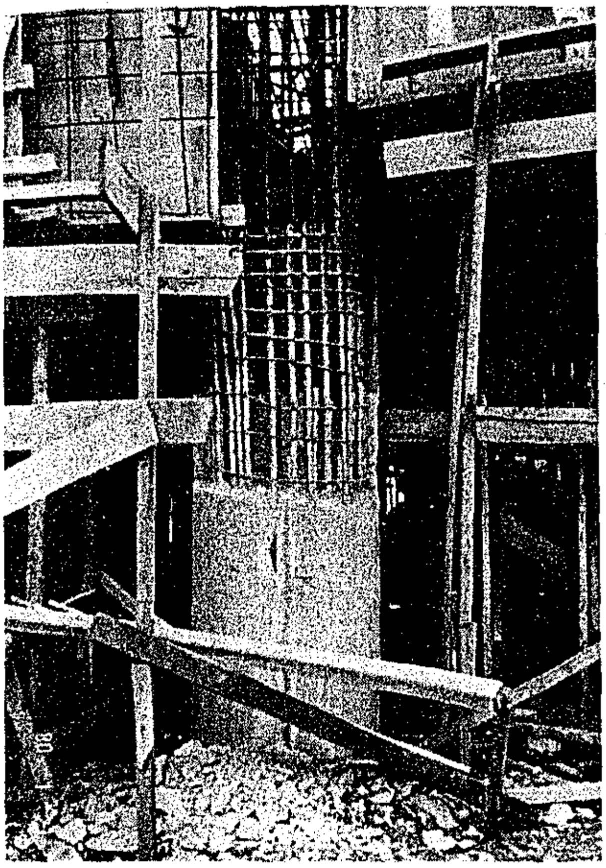
Concrete Work - Sand and Gravel Storage

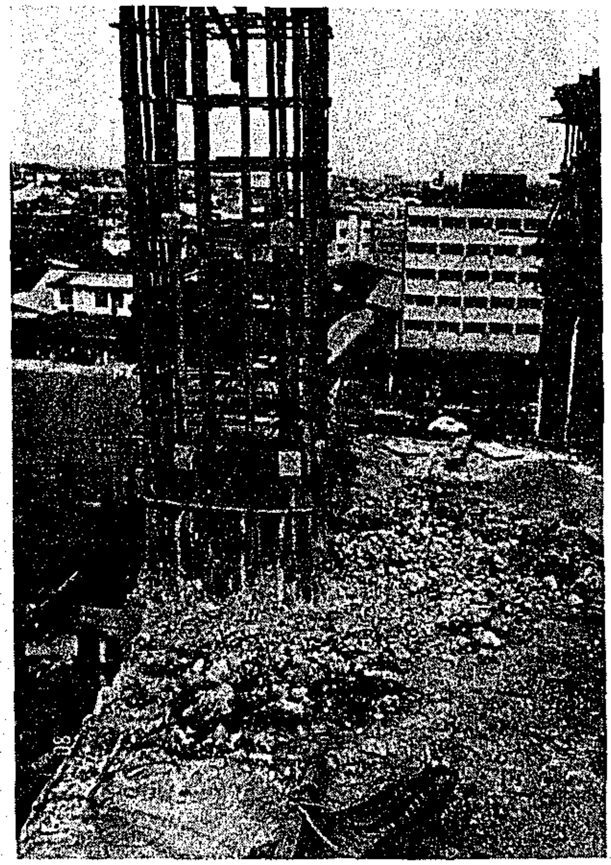


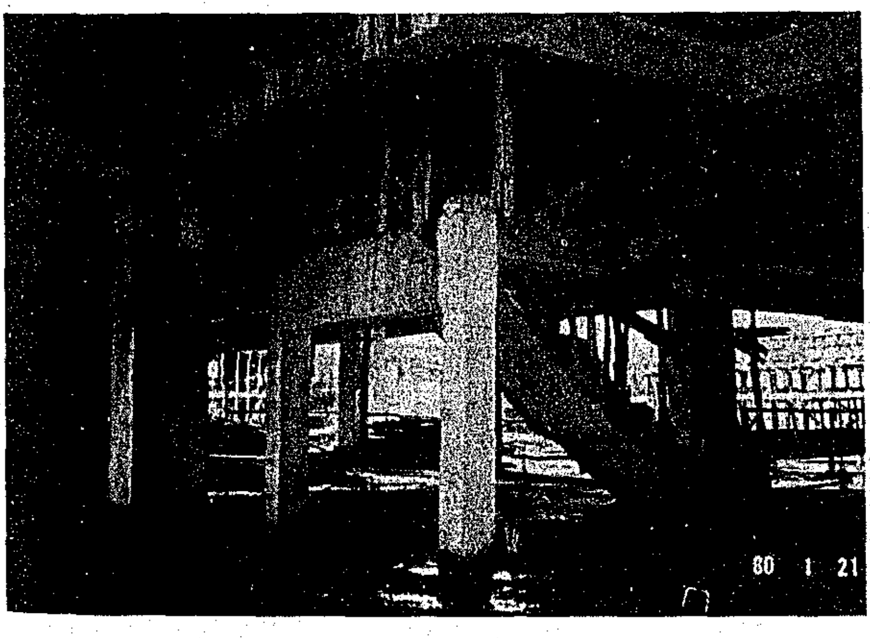




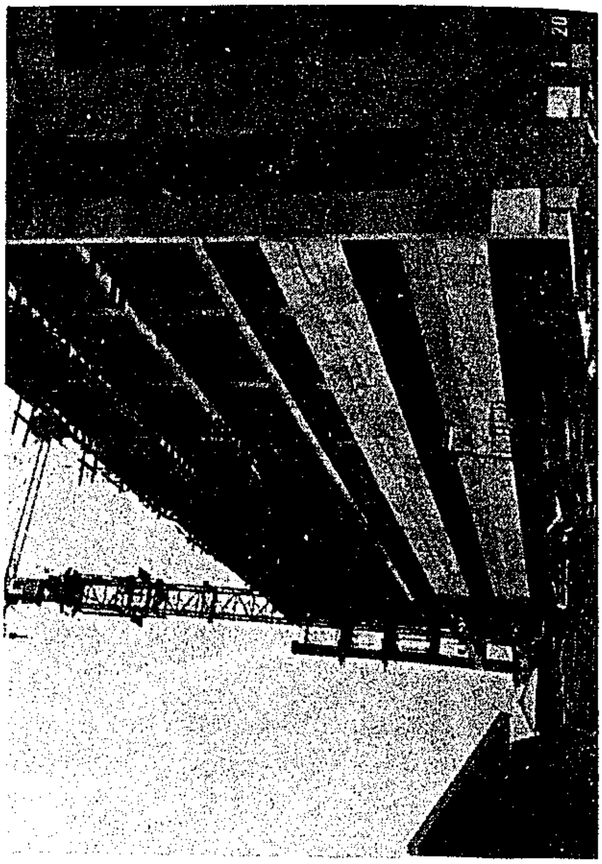
Concrete Work - Construction Joint

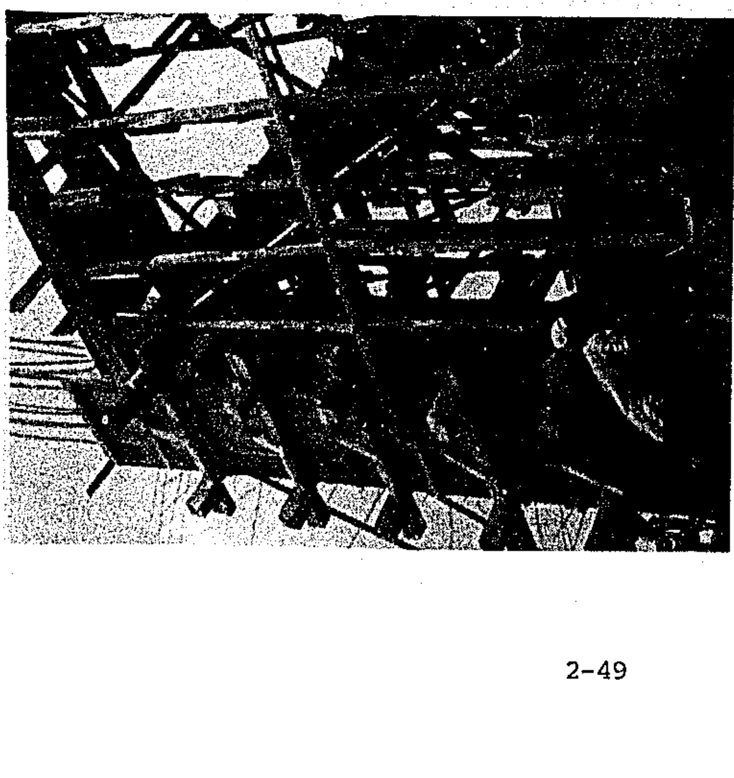




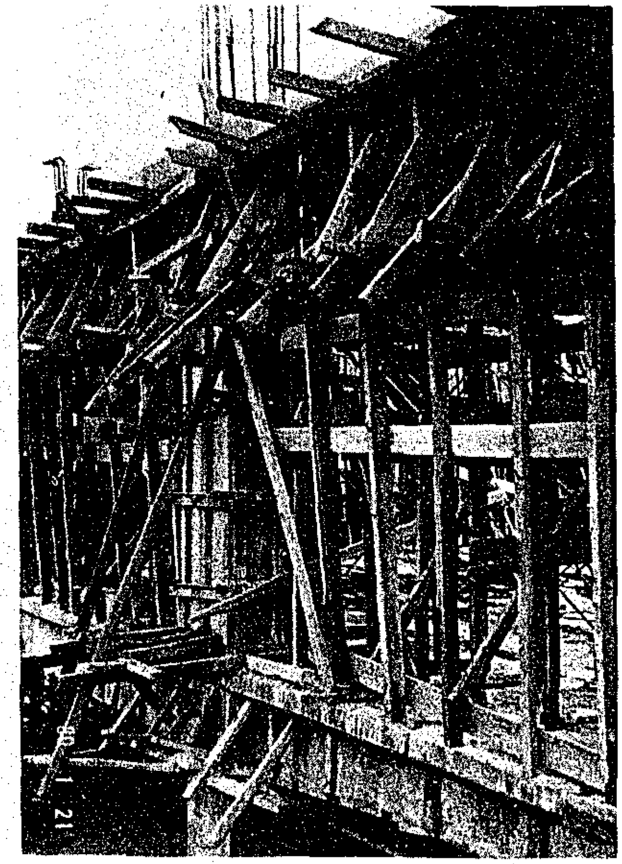


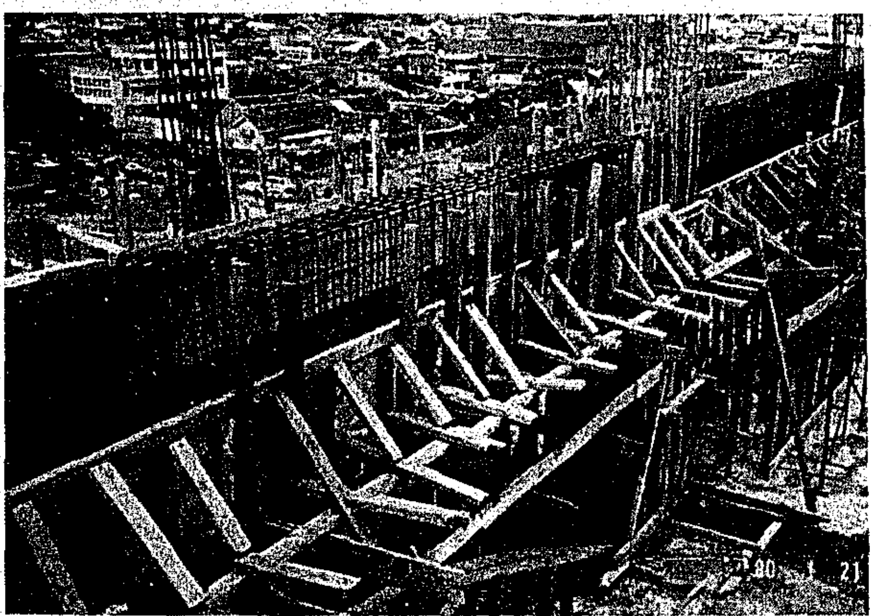
Form Work



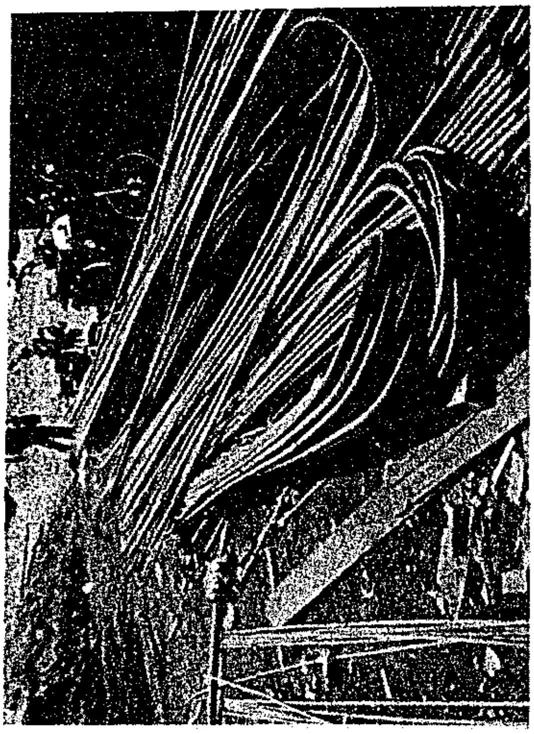


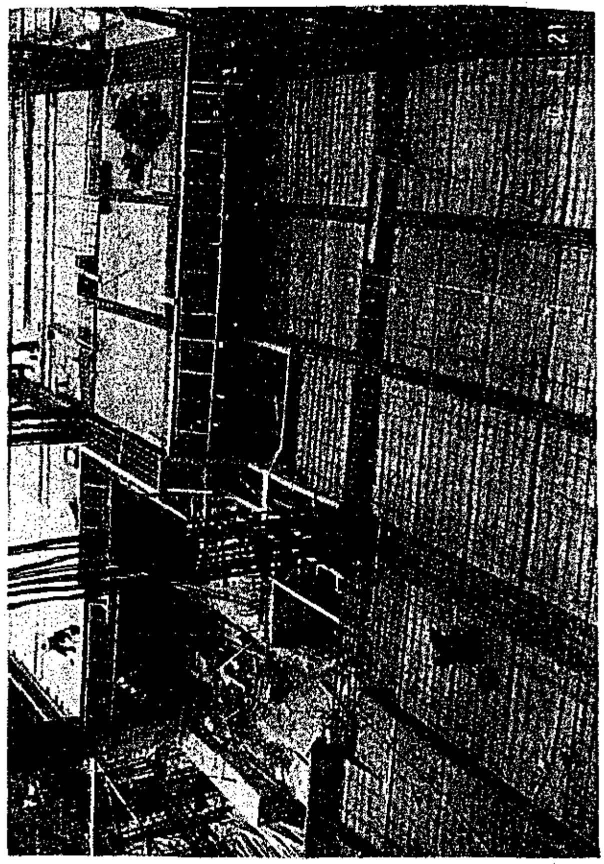
Form Work - Columns and Beams

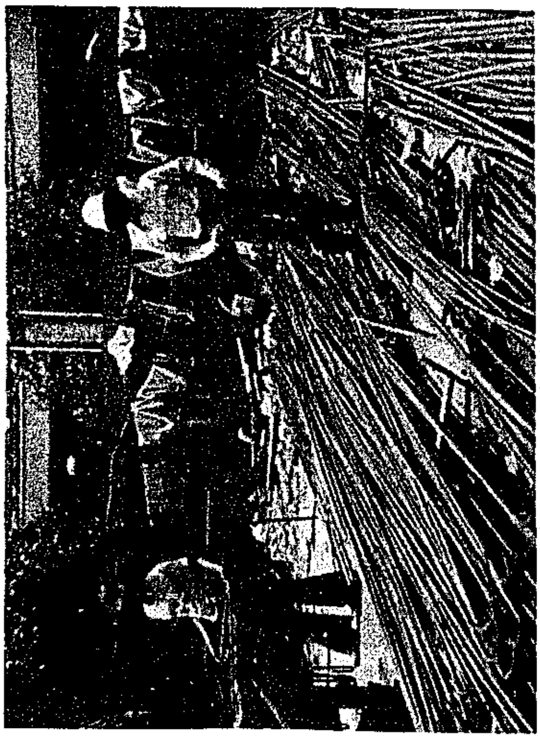


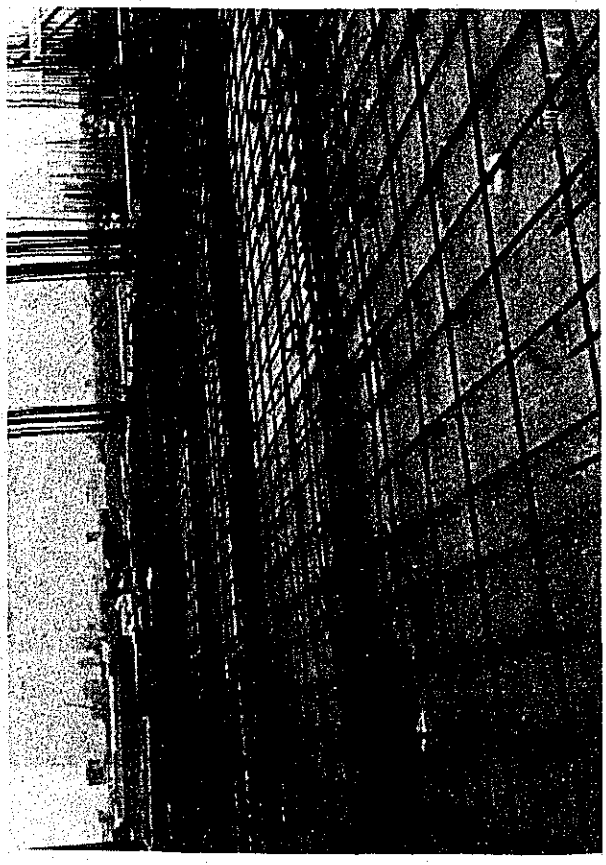


Reinforcing Bar Work

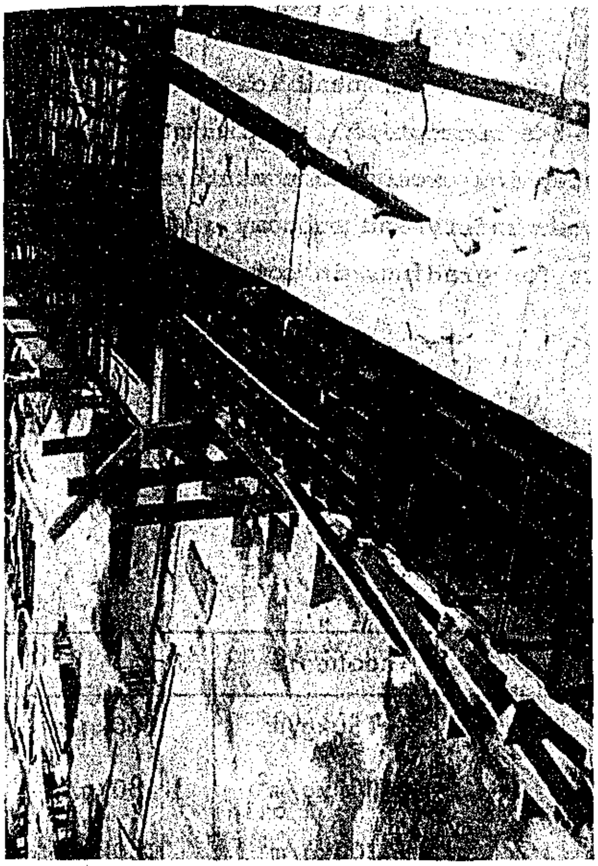


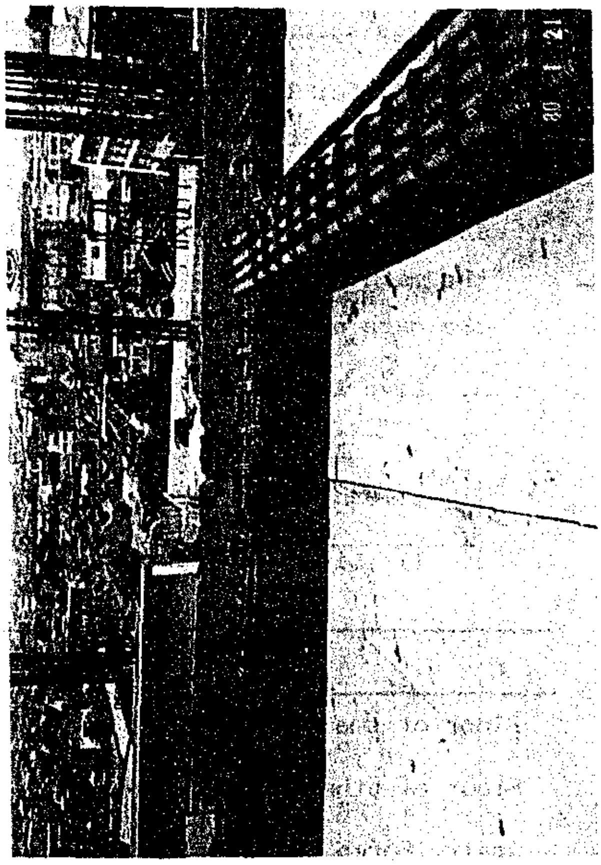






Reinforcing Bar Work





1-4 Standard and Regulation

1-4-1 Regulations on Various Loads

As for loads, regulations are provided for dead load, live load, earthquake load and wind load, and the conception is surmised to be not so different from Japanese conception except some matters. Since loads greatly affect the performance, safety and economy of buildings, the main points are summarized here for grading, in comparison with the case of Japan.

A. Live load

Live load is classified into three major categories of floor, column axial force (foundation) and earthquake.

1) Live load for floors

	Indonesia	Japan
Floor of small size house	150kg/m^2	180kg/m^2
Floor of other house (incl.2.F)	200kg/m^2	180kg/m^2
Stair, Porch and Corridor of house	200kg/m^2	180kg/m^2
Roof covered Veranda of house	200kg/m^2	180kg/m^2
Floor of office and Shop	250kg/m^2	300kg/m^2
Floor of class room in school	200kg/m^2	230kg/m^2
Stair and Corridor of office,(school)	300kg/m^2	300 (230) kg/m^2
Floor of Concert room, Exhibition room, Congress Hall, Movie Theater, Trainning room and Balcony	400kg/m^2	360kg/m^2
Floor of dance hall, Stair, Corridor of church, Concert Hall, Theatre	500kg/m^2	360kg/m^2
Floor of congress hall, Movie Theatre and Sports hall	500kg/m^2	360kg/m^2
Auditorium with only sitting seats	400kg/m^2	300kg/m^2 (fixed seat)
Auditorium with standing space	500kg/m^2	360kg/m^2
Garage for car	550kg/m^2	550kg/m^2
Factory min.	400kg/m^2	

2) *Live load for column axial force (foundation)*

In the history of buildings, masonry structure has been used for long time and the spread of rigid frame structure is delayed. Therefore, there are no regulations on the loads for rigid frames unlike Japan. However, if the number of supporting stories increases, floor load can be decreased as shown below.

Position	Correcting Coefficient	
	Indonesia*1	Japan*2
Roof	1.0	1.0
Top story	1.0	0.95
Second story from the top	0.9	0.90
Third	0.8	0.85
4th	0.7	0.80
5th	0.6	0.75
6th	0.5	0.70
7th	0.4	0.65
8th	↓	0.60
9th		↓
Bottom story	0.4	0.60

*1 : Reduction Coefficient from the floor load's.

*2 : Reduction Coefficient from the colum & girder load's.

3) Line load for earthquake

kg/ m²

	Seismic Load (Reduction Coefficient)	
	Indonesia	Japan
House	(0.3) 45 60 normal	60
Office	(0.5)125	80
Class room	(0.5)100	110
Restaurant Shop	(0.5)125	130
Factory	(1.0)more than 400	depend upon the condition

B. Seismic force

There was no standard concerning earthquake-proof design until 1964. In 1955, concrete specifications were made as a recommendation, not officially, and a lateral seismic coefficient of 0.05 was adopted for design of elevated water tanks and high-rise buildings. This was no more than a quotation from Dutch specifications. In 1970, load standard has been established. The standard for building structures is shown below, which was formulated basically in the same conception as that of Japan. Characteristically, it specifies not only horizontal force but also vertical factors and coefficients of building portions.

Conception on seismic intensity

i) Horizontal acceleration at height i is expressed by the following equation.

$$a_i = K_i \times K_d \times K_t$$

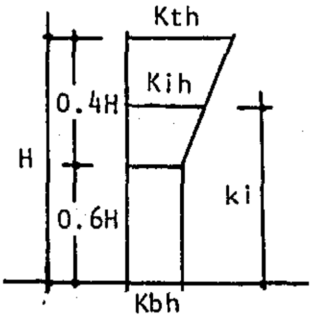
a_i ; Vertical or horizontal acceleration at height i

K_i ; Vertical or horizontal seismic coefficient at height i

K_d ; District coefficient

K_t ; Coefficient of subgrade reaction

Ki (Coefficient by height)



$H < 10\,m$; $K_o = 0.1$

$10\,m < H < 40\,m$; $\frac{K_{th}}{K_{bh}} = 1 + 0.05\,H$

K_{bh} ; $\frac{1}{10 + 0.1\,H}$

K_{th} ; top floor

K_{bh} ; bottom floor

Kd (District coefficient)

With the entire Indonesia divided into four districts (see Appendix), the following values are applied.

District	III	II	I	O
Kd	1.0	0.5	0.25	O

K_t (Coefficient of subgrade reaction)

Classification is made by bearing capacity of soil and by type of structure as shown in the following table.

TABLE I-4-5

Soil		Type of structure			
Type	Bearing cap. (kg/cm^2)	Steel	R.C.	Timber	Masonry
Hard	> 5	0.6	0.8	0.6	1.0
Average	2 - 5	0.8	0.9	0.8	1.0
Soft	0.6-2	1.0	1.0	1.0	1.0
Very soft	0 - 0.5	1.0	1.0	1.0	1.0

If H >40m dynamic analysis is obligated.

ii) Coefficient by portion of building

The basic coefficient K_{ih} shown above is increased for each portion shown below.

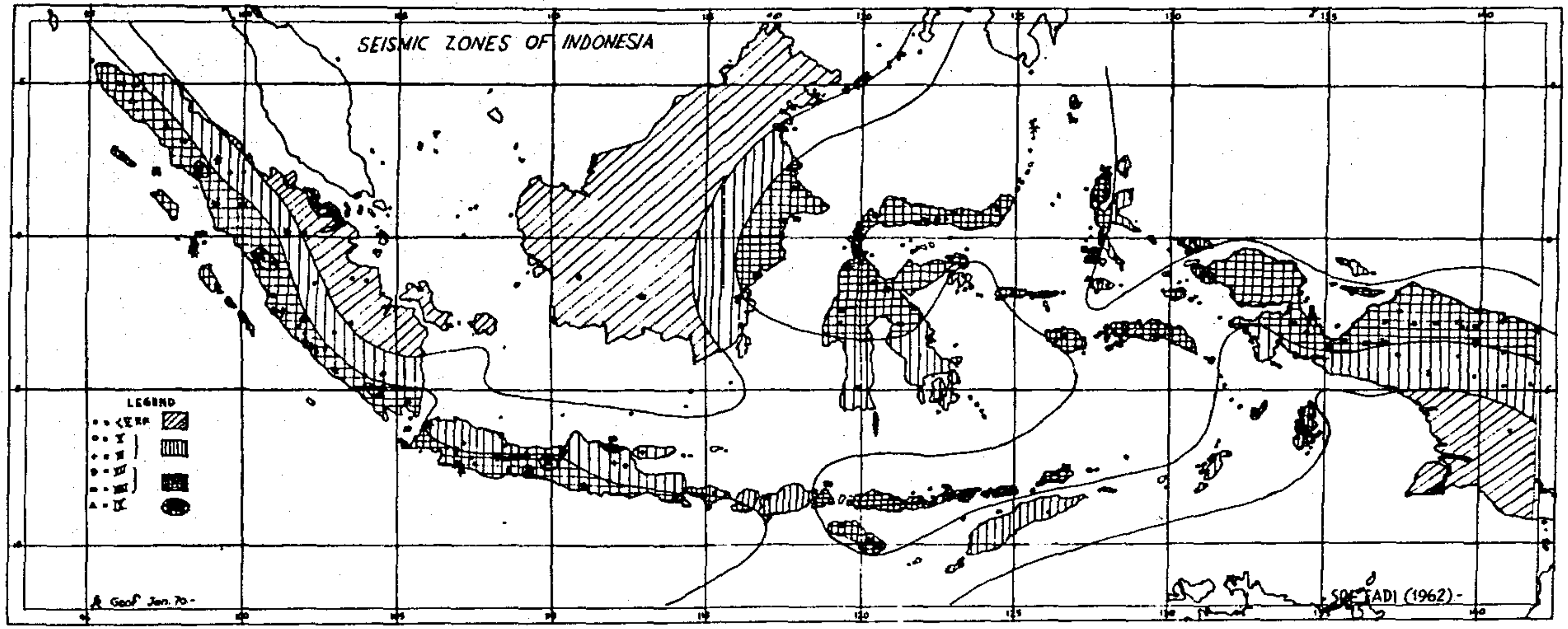
TABLE I-4-6

Portion of building	Direction of force	Seismic coefficient
1	2	3
Exterior bearing and non bearing walls, interior non bearing walls.	Horizontal	$2k_{ih}$
Cantilever parapet and other cantilever walls, except retaining walls.	Horizontal	$5k_{ih}$
a. When connected to or a part of a building : towers, tanks plus contents chimneys, smokestacks and pent houses b. Individual elevated tanks plus content (not supported by a building).	Horizontal	$2k_{ih}$
Cantilevers, balconies and any other cantilever-typed structural members.	Vertical	$5k_{ih}$

iii) Special buildings

Hospital, emergency warehouse, foods warehouse, (power plant, dam)	1.5 Ki
Monument	2.0 Ki
Nuclear power plant	3.0 Ki

SEISMIC ZONES OF INDONESIA



1-4-2 Regulations on Sound Insulation

Since regulations on sound insulation were not found, sound insulating capability of dwelling unit partition walls of a duplex or collective houses has been decided as shown below. Sound insulation in a dwelling unit is not considered this time, since it is lower than cross ventilation in priority in Indonesia, as mentioned before.

A. Sound insulating capability of dwelling unit partition walls of flat.

Frequency (Hz)	125	500	1,000	2,000
Trànsmission Loss (dB)	25	40	45	50

It should be considered to bring the sound insulating capability nearly to the above Japanese values.

B. Sound insulating capability of dwelling unit partition walls of low-rise houses

The sound insulationg capability at the time of construction should be at least about 25 dB, and will be improved by dwellers themselves according to their demand.

1-4-3 Regulations on Fire Proofing

For fire proofing, there are no unified fire proofing regulations, and the respective governmental offices have their respective regulations. Therefore in actual application, they must be applied flexibly.

A. Fire proofing regulations for flat.

Regulations for fire-resistant and semi-fire resistant structures in Japan and regulations of Indonesian Peraturan Bangunan Nasional are shown on the next page for reference. The fire resisting time cannot be compared directly since the standards for evaluationg the performance of individual materials and their combinations are different.

Fire-proof Regulation for Walk-up Flat

Section \ Regulation	PERATURAN BANGUNAN NASIONAL: Konstruksi Rangka Tahan Api	PERATURAN BANGUNAN NASIONAL: Konstruksi Dinding pemikul yan Terlindung	JAPANESE: Fire Resistant Construction	JAPANESE: Semi-Fire Resistant Construction	
Wall – Outer Wall – Bearing Wall	4hr	4hr	1hr. (2hr.)	FR	SNFM
Wall – Outer Wall – Non-Bearing Wall – within flamable distance	3hr.+NFM (upper part of wndow etc. 0.8M)	2hr.	1hr. (1hr.)	FR	FP
Wall – Outer Wall – Non-Bearing Wall – beyond flamable distance	3hr.+NFM (upper part of wndow etc. 0.8M)	2hr.	0.5hr. (0.5hr.)	FR	SNFM
Wall – Bearing Partition	4hr.	4hr.	1hr. (2hr.)		SNFM
Colom	4hr	3hr.	1hr. (2hr.)		NFM
Floor			1hr. (2hr.)		NFM+FR
Beam	3hr.	3hr.	1hr. (2hr.)		NFM
Roof			*0.5hr. (0.5hr.)*	*NFM+FP*	*FR*
Stair	FR	FR	FR		SNFM
Fire Resistant Wall+Door			every 1500m^2	every 500m^2	every 1000m^2
Cornice	3hr.+NFM($\geqq 0.6^m$)				
Wall between two houses			FR or FP	FR or FP	
Upper part of wall between two houses			FR or FP every if $\geqq 300^{m^2} \longrightarrow 12^m$	FR or FP every if $\geqq 300^{m^2} \longrightarrow 12^m$	
Note	Difinitions of fire resistance is based on the differant material combination and *performancial assumptions.*		3 ~4F (5 ~11F)	3 ~4F or 2 nd floor$\geqq 300^{m^2}$ A-Type SFR	B-Type SFR

NFM : Non- flamable material
SNFM : Semi non- flamable material
FR : fire resistant
SFR : Semi fire resistant
FP : fire proof

B. Regulations on fire proofing for low-rise houses

Since regulations on fire proofing for low-rise houses are not clear, they were decided as follows, in reference to the regulations of DKI Jakarta.

- o Fire proofing of dwelling units of a low-rise row house.
  - . In principle, fire proofing structure is to be adopted. The floor area is to be kept less than $300\,m^2$ per building.
  - . The dwelling unit partition wall shall be of fire proofing structure and reach the upper side of roof truss, being extruded beyond the outer wall surfaces and roof surface if possible.
  - . The roof shall be covered with a non-flamable material, and if the roof truss is wooden, the rear sides of eaves shall be of fire proofing structure.
- o Fire proofing of dwelling units of a low-rise duplex house.
  - . If the distance between one storied (or second floor portions of) buildings (free distance) is 4 m (4.5 m) or more, fire prevention may not be considered since there is not so much the fear of the spread of a fire.

    If the distance is 4 m (4.5 m) or less, fire proofing structure shall be adopted, due to the threat of the spread of a fire.
  - . The outer walls and the rear sides of eaves which are mutually apart by 4 m (4.5 m) or less shall be of fire proofing structure.

1-5 Utilities and Furniture

1-5-1 Water Supply

- o As for the quantity, as mentioned in Part I, 400 liters (net) will be supplied per day per dwelling unit. With regard to hourly variation per day, there are peaks about 7 am and 5 pm when Mandi is taken, and the peak quantity is surmised to be about three times the mean hourly quantity.

- o In a Mandi room, a water tank will be prepared as conventional way, to alleviate the peaks and to prepare for suspension of water supply.

- o Furthermore, the outdoor shallow well will be used in case of suspension of water supply and for miscelleaneous purposes.

- o The water pipe is connected through a water meter of each dwelling unit to respective faucets. To secure a water pressure of at least $0.3\,kg/cm^2$ at the end, an elevated water tank, etc. will be used to boost the pressure if necessary in case of flat building.

- o In each dwelling unit, water will be supplied to two places of kitchen and Mandi room.

- o As the piping material, PVC will be used in light of corrosion resistance and working convenience.

- o A shower head is convenient especially for mixing cold water with hot water, but is not adopted this time since they use only cold water in dwelling houses in Indonesia and since Mandi is a traditional custom of living.

1-5-2 Sewerage

- o As for sewerage system, as mentioned in Part I, the sewerage from toilet, Mandi room and kitchen in a dwelling unit is collected in one pipe system which is connected to a sewerage pipe.

- o The drainage from the roof and the veranda is discharged through pipes to an open channel.

- o The stool is costly for houses for low-income class and the custom for using it is not yet established. Thus it is not spread sufficiently. Furthermore it requires much water for flashing. Even if a conventional bowl is used, flashing water of about 10 liters is used per once. Therefore, the influence on the sewerage treatment equipment is not so serious, and the conventional type bowl is to be used.

- o The pipe material will be PVC.

1-5-3 Solid Waste

- o Each dwelling unit stores solid waste, using a 40-liter container (polyethylene bucket).

- o Each dweller carries it to the deposit provided for 12 dwelling units.

1-5-4 Electricity

- o The mean capacity per dwelling unit will be 300 W, and be used for lighting and plug receptacles.

- o It is now used for lighting fixtures, radio and fan, but in future, a television, stereo, refrigerator, and washing machine tend to be spread.

1-5-5 Energy Supply

- o As energies for cooking, electricity, city gas, LPG kerosene and wood can be considered.

- o The use of electricity as an energy is not conceivable in the present situation.

- o The piping network of city gas of DKI Jakarta is very limited, and the extension of gas piping to Cengkareng will be impossible.

- o LPG is priced at more than double the price of kerosene.

- o Wood is not suitable for indoor cooking.
- o From the above, kerosene generally used also in existing housing complexes is a proper energy, but for low-income class, the use of wood will be inevitable.
- o When kerosene is used, the supply from a central storage by piping involves many problems such as maintenance, and is not proper. Therefore, kerosene must be stored by each dwelling unit.

1-5-6 Fire Fighting

- o Fire fighting activities are made mainly by using fire hydrants set outdoors.

1-5-7 Telephone

- o In DKI Jakarta, since the subscription fee is more than 500,000 RP, the installation of telephones in dwelling houses is difficult. Therefore, public telephones will be required.

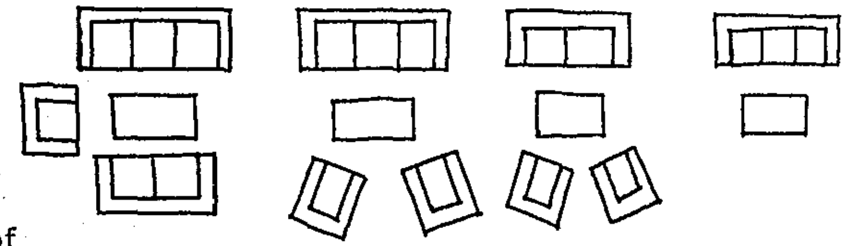
1-5-8 Furniture and Durable Consumers' Goods

A. Possession and purchase planning (based on questionnairing)

PLACE	ITEMS	yes	no	want	planning to buy	not interested	no answer	Total
Dining	Dining Table	19	-	4	4	-	-	27
Bed Room	Bed (for adult)	27						27
	Double decker Bed (for child)	12	9				6	27
	Bedside Table	15	12					27
	Mirror Stohl	0						
	Closet	10						
Children's Room	Study Table for children	5	14				8	27
Durable Consumer's Goods	Radio	21	1	3	2	-	-	27
	TV	16	3	5	2	-	-	27
	Telephone	2	13	1	2	-	8	27
	Stereo Set	4	9	5	4	-	5	27
	Refrigerator	5	9	7	6	-	-	27
	Iron	16	3	5	2	-	1	27
	Sewing Machine	12	2	8	3		2	27
	Washing Machine	2	7	6	3	2	7	27
Mandi	Shower Set	2	14	6	-	-	5	27
	Lbatory (Western style washing basin)	1	13	8	-	-	5	27
	Bath Basin	2	14	6	-	-	5	27
WC	Cnoventional Water Closet	20	7					27
	Sitting Stool only	5	22					27
	Sitting Stool with low tank	2		13	3	7	2	27

B. Sofa set

Concerning a question on the sofa set, the answers were 1 for 1-person set, 0 for 2-person set, 4 or 3-person set, 2 for 4-person set, 3 for 5-person set, 6 for 6-person set, 0 for 7-person set and 3 for 8 or more-person set (total 19 answers), and they liked generally 4-person to 6-person sets. As for style, the following were liked.



No.of Answers : 4 2 2 3

C. Volume of books

less than 50 CM	;	(6/27)
50 ∿ 100 CM	;	(9/27)
100 ∿ 200 CM	;	(4/27)
200 CM or more	;	(3/27)
Unknown	;	(5/27)

D. Bedding (Quantity for whole family)

(Total amount owned by family)

Item \ Amount	0	1	2	3	4	5	6	7	8	9	10	11	Total
pillow	-	1	8	1	4	-	4	1	2	-	6	-	27
long pillow	1	10	8	2	4	1	-	-	-	-	1	-	27
mattres	-	6	7	3	6	-	1	2	1	-	-	1	27

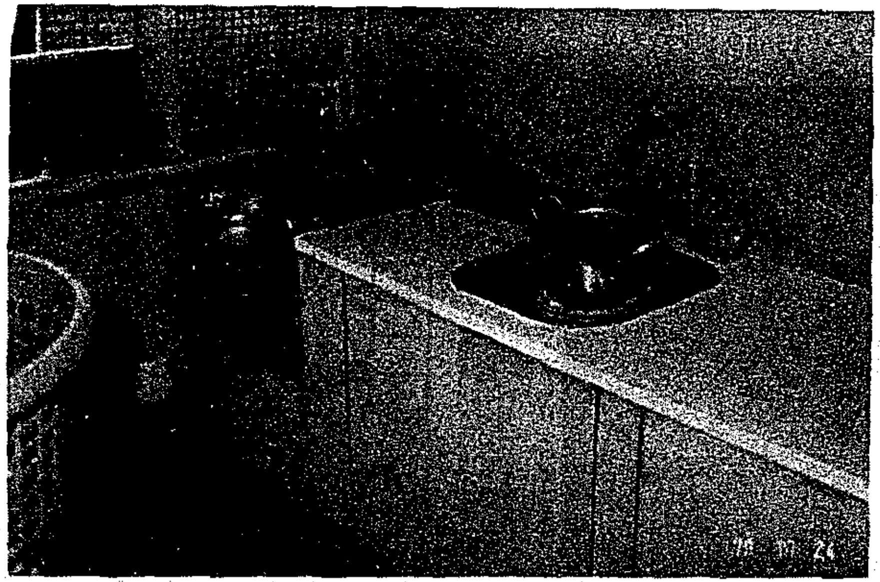
E. Clothes (Quantity for whole family)

Item \ Amount	0	1~3	4~6	7~9	10~12	13~15	16~	no answer	Total
jacket	3	14	4	1	1	-	-	4	27
sweater	9	7	1	1	-	-	1	8	27
shirts	-	1	6	4	2	1	10	3	27
trousers	-	-	9	3	4	3	7	1	27
skirt	4	-	4	2	4	1	4	8	27
undrr wears	-	-	6	2	8	2	4	5	27
socks	-	10	10	1	1	-	3	2	27
saloon	-	4	10	2	4	3	2	2	27
pajamas	4	10	3	1	1	-	-	8	27
shoes	-	9	10	2	-	2	3	1	27
sandal	-	3	3	2	-	-	-	1	27

F. Others

f) Others

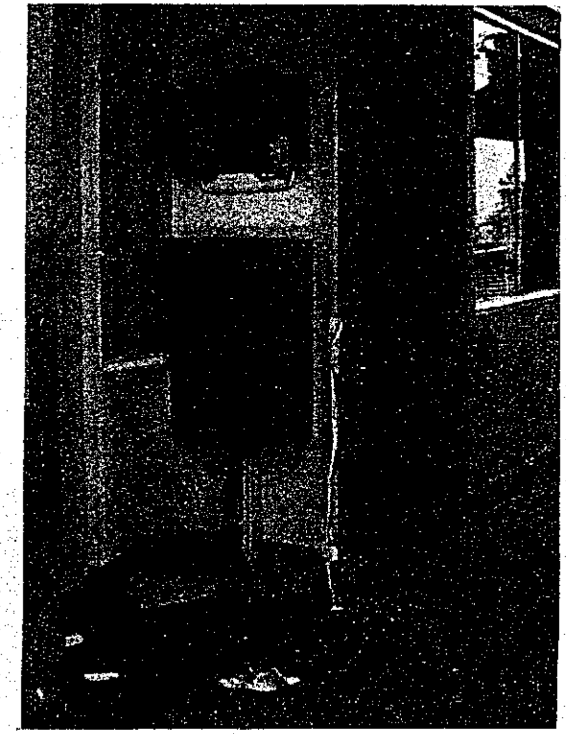
Item \ Amount	0	1	2	3	no answer	Total
car	1	4	1	-	21	27
motor cycle	1	8	1	-	17	27
bicycle	1	5	-	-	21	27
baby cart	1	2	-	-	24	27


Kitchen in Flats (PASAR JUMAT)

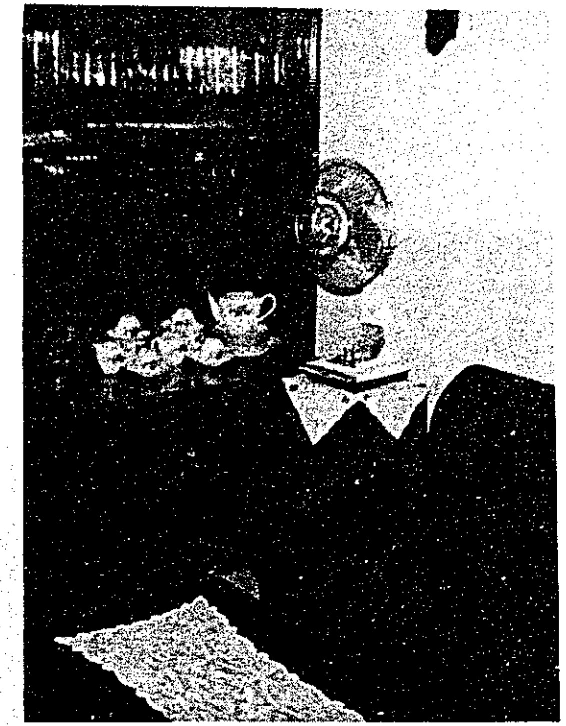

Balcony of Flats (PASAR JUMAT)


KAMAR MANDI (KLENDER)
(Bath Room)

Drawers Alcove used as
Shoes Storage (PASAR JUMAT)



Entrance of Flats (PASAR JUMAT)



Living Room in Flats (PASAR JUMAT)

2. FLAT HOUSING STUDY

2-1 Study Policy

2-1-1 Setting of Pre-conditions

Main subjects of study are as follows:

- o The plan with physical possibility of future extension;
- o Two basic unit size: 36 m^2 type and 45 m^2 type (flat maisonette (FM) has only 45 m^2 type for the reason of planning);
- o Clasification of performance level as far as possible in structural strength, fire resistance, safety and livability;
- o Introduction of outdoor life into flat —— connection of veranda with access.
- o Use of local materials; and
- o Study of lightening building weight.

2-1-2 Process of Making Images more Concrete

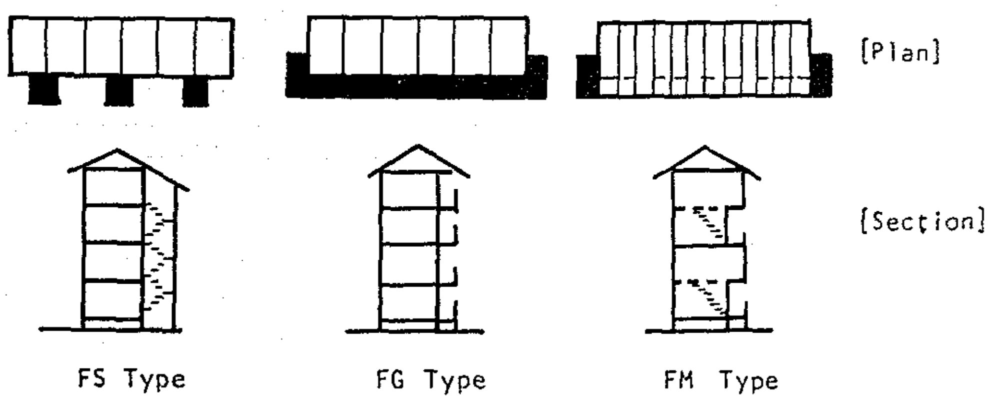
Study of three general types of flat will be studied.

a) Staircase access type (FS series)

b) Gallery access type (FG series)

c) Flat maisonette type (FM series) ⟶ every second floor is wooden floor

These are illustrated as follows:



2-1-3 Study Process

Understanding the above mentioned basic conditions, we began with making several types of housing models in the process of flat planning.

The ultimate objectives of this model study are to estimate the rough building cost of flat by model and to determine its structural system, access type, number of stories, number of units per one floor, method of lightening building weight by replacing materials, utilization of attics, etc. in terms of cost and performance comparison.
In the Republic of Indonesia, this process is inevitable because there are few examples of flat housing for such comparison.

The chart in the next page illustrates this study process. At the phase of pre-feasibility study, this process is roughly classified into the following five steps:

I Setting of Fundamental Conditions for Flat Housing Study

↓

II Formation and Sellection of Structural Models

↓

III Formation of Basic Models of Flat Unit and Flats Building

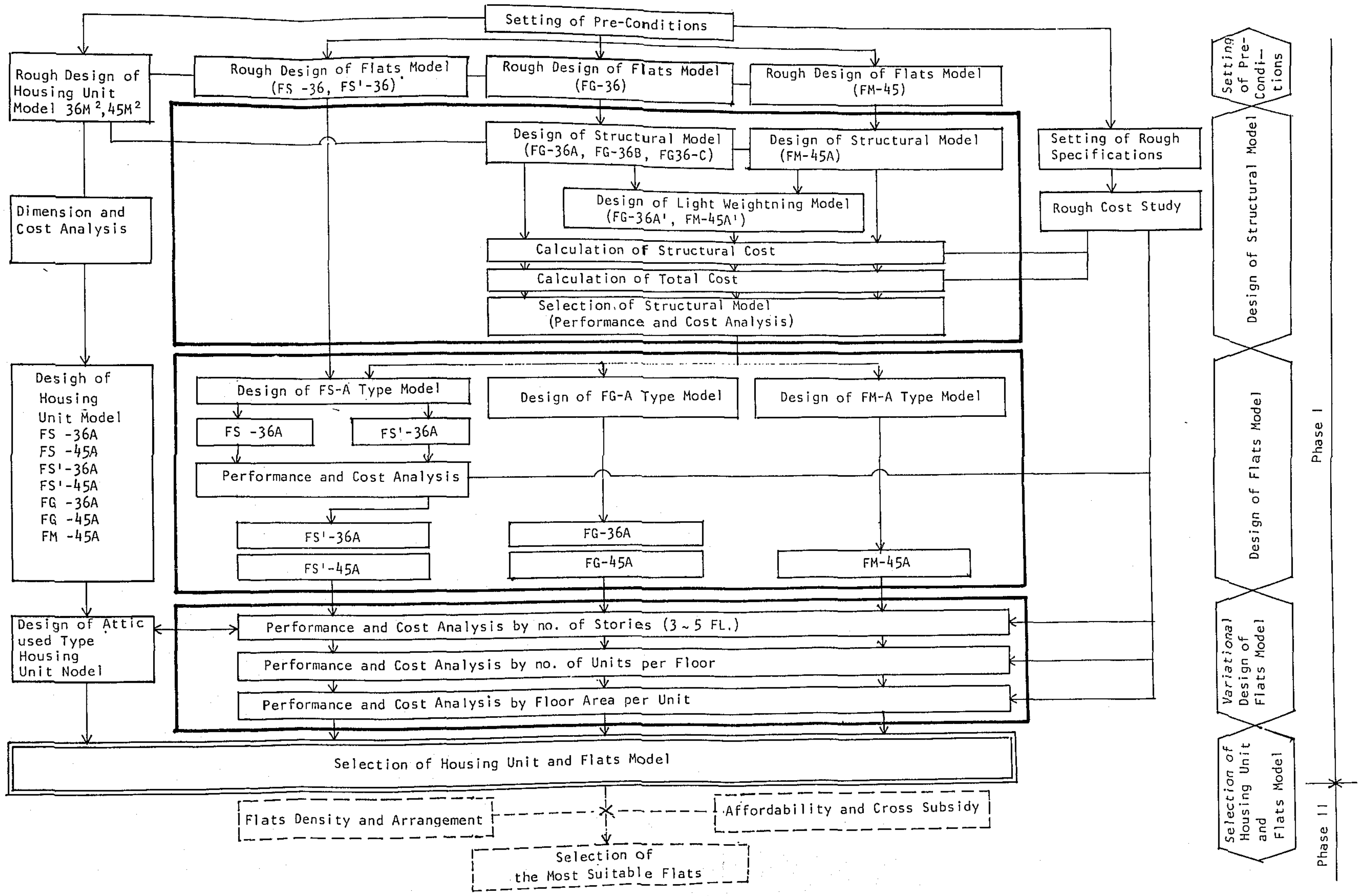
↓

IV Sellection of Model Variations of Flat Unit and Flats Building

↓

V Sellection of Alternatives of Flat Unit and Flat Building

FIG. II-2-1 STUDY PROCESS OF FLATS



2-2 Structural Model Study

Comparison of building cost was made based on the rough structural calculation for different structural models according to the plan of gallery access type flat (4 F) explained in the architectural planning.

2-2-1 Conditions of Structural Design

As for upper structure, loads (live load and seismic load) are in conformity with the regulations N1-2 and N1-18 of Indonesian Standard. Especially for the seismic load, seismic coefficient 0.1 is adopted because the structural calculation is rough calculation. Strength of concrete is 175 kg/cm^2 and the reinforcing bar U-24 (mild steel) is used. Standard finishing materials for 4-story flat are as follows: tiles for the roof, batacos, bricks and concrete blocks for the external wall and the boundary wall (between units), bamboos or woods for the interior wall.

As for lower structure, concrete piles cast in place are driven by a diesel hammer approximately 10 m from ground level. The specification for safety complies with the Japanese standards. Strength of concrete is 400 kg/cm^2. This is higher than the one for upper structure so as to avoid the destruction of pile head caused by stress concentration while it is driven.

2-2-2 Characteristics of Each Structural Models

A. Type model FG36-A:

This type model is characterized by the plans composed of the columns with following three types of sections: —, L and T-shape. The structure wall rahmen in both directions. It is for the purpose of creating effective inner space and interior comfort. Section of each part are; one or two piles for each footing, three types of columns with possibly same dimensions of components for 1st - 4th floor (such as length and thickness), two beam sections of 20 x 50 CM and 20 x 60 CM, and slab thickness 10 cm.

B. Type model FG36-B:

The column section is square unlike those in the former type model. It is intended to unify the dimensions. Other features are the same as those of type model 36-A.

C. Type model FG36-C:

In this model, a walled rahmen, as an earthquake resisting wall, is allocated to every 3rd unit in the beam-direction so as to cope with the future extension of unit. The difference of this model from that of the 36-A is the change of column span from 2.7 m to 5.4 m as the result of removing inner columns of housing unit to allow for flexible interior space.

2-2-3 The List for Comparison of Structural Models and the Structural Costs

The figure II-2-2 shows the costs of reinforcement, concrete and form according to structural elements. The dotted line on the left shows percentage (%) of each cost by element (to whole structural cost). This shows the structural cost in each type does not have big difference unless the conditions like performance setting or materials to be used etc. are not changed.

Figure II-2-3 presents the table of quantity estimation for main structural elements.

FIG. II-2-2 CONSTRUCTION COST BY SEVERAL TYPES OF STRUCTURES
(36-A Type Construction Cost is shown as 100)

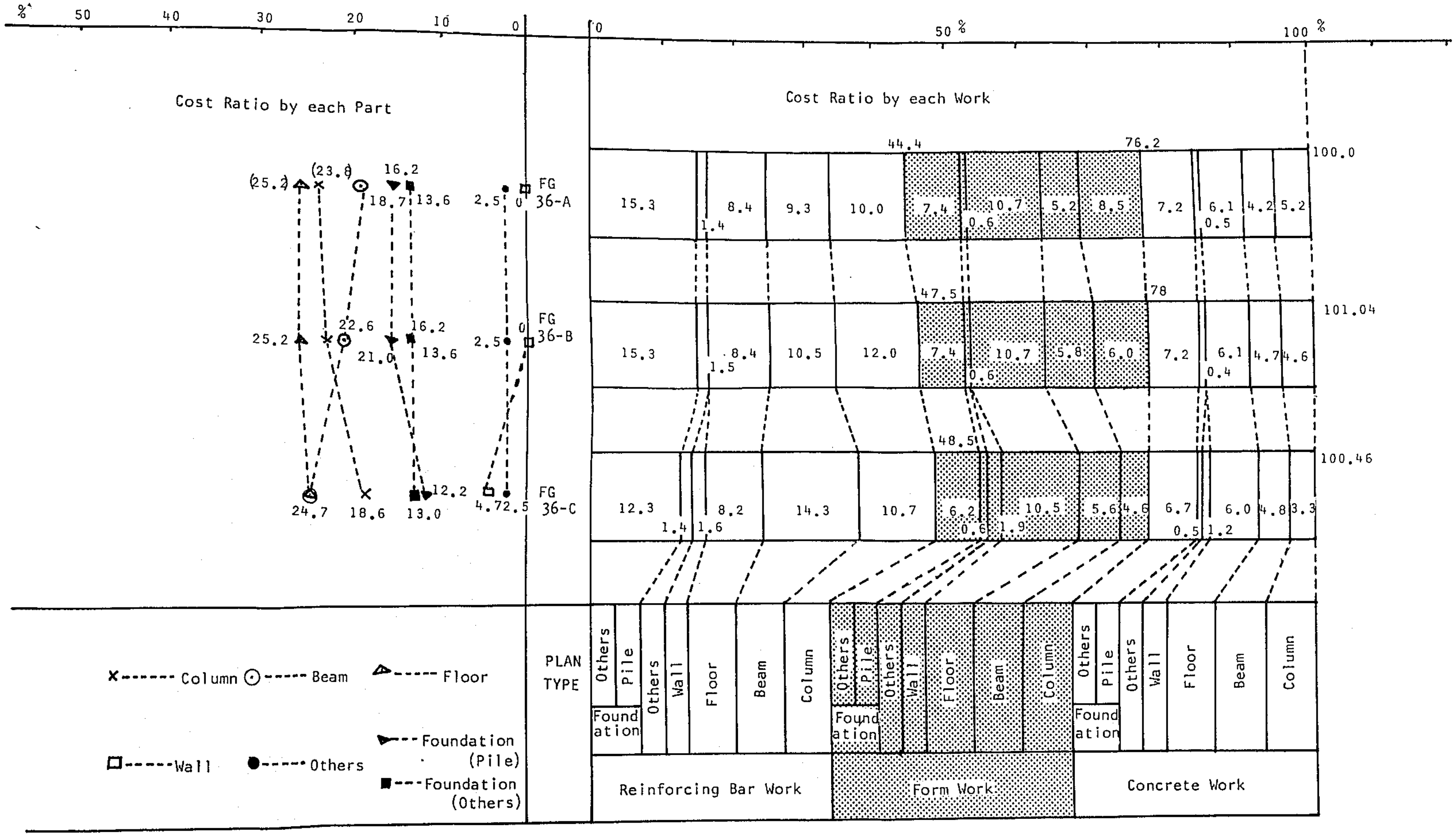


FIG. II-2-3 VOLUME OF CONSTRUCTION MATERIALS

PLAN TYPE	part \ Volume		Concrete M^3	Concrete M^3/Total Floor Area	Form M^2	Form M^2/Total Floor Area	Form M^2/M^3 of Concrete	Reinforcing Bar Tons	Reinforcing Bar Kg/Total Floor Area	Reinforcing Bar Kg/M^3 of Concrete
FG36-A	Column		107.64	0.0898	1309.28	1.0922	12.1635	10.30	8.5919	95.6893
	Beam		85.88	0.0716	884.18	0.7376	10.2955	9.56	7.9746	111.3181
	Floor		124.56	0.1039	1297.50	1.0823	10.4167	8.58	7.1572	68.8825
	Others (Canopy)		9.81	0.0082	102.82	0.0858	10.4811	1.43	1.1929	145.7696
	Founda-tion	Pile	48.75	0.0407	780.00	0.6507	16.0	8.72	7.2739	178.8718
		Others	84.5	0.0705	677.99	0.5656	8.0217	6.88	5.7391	81.4009
		Sub-Total	133.27	0.1112	1457.99	1.2162	10.9401	15.60	13.0130	117.0556
	Total		461.16	0.3847	5051.77	4.2140	10.9545	45.47	37.9296	98.5992
FG36-B	Column		93.18	0.0777	931.84	0.7773	10.0004	12.28	10.2436	131.7879
	Beam		95.84	0.0799	986.96	0.8233	10.2980	10.68	8.9089	111.4357
	Floor		124.70	0.1040	1299.00	1.0836	10.4170	8.59	7.1655	68.8853
	Others (Canopy)		7.94	0.0066	108.19	0.0902	13.6259	1.52	1.2679	191.4358
	Founda-tion	Pile	48.75	0.0407	780.00	0.6507	16.0	8.72	7.2739	178.8718
		Others	84.52	0.0705	677.99	0.5656	8.0217	6.88	5.7391	81.4009
		Sub-Total	133.27	0.1112	1457.99	1.2162	10.9401	15.60	13.0130	117.0556
	Total		454.93	0.3795	4783.98	3.9906	10.5159	48.67	40.5989	106.9835
FG36-C	Column		67.20	0.0561	716.80	0.5979	10.6667	10.92	9.1091	162.50
	Beam		97.78	0.0816	946.80	0.7898	9.6830	14.59	12.1705	149.2125
	Floor		123.26	0.1028	1284.00	1.0711	10.4170	8.42	7.0237	68.3109
	Wall		23.88	0.0199	318.60	0.2658	13.3417	1.64	1.3680	68.6767
	Others (Canopy)		10.26	0.0086	105.12	0.0885	10.3431	1.48	1.2346	144.2495
	Founda-tion	Pile	41.45	0.0346	596.00	0.4972	14.3788	6.24	5.2052	150.5428
		Others	83.84	0.0699	656.59	0.5477	7.8315	6.35	5.2970	75.7395
		Sub-Total	125.29	0.1045	1252.59	1.0449	9.9975	12.59	10.5022	100.4869
	Total		447.67	0.3734	4839.95	4.0373	10.3462	49.64	41.4081	106.1137

2-2-4 Structural Models and the Total Costs

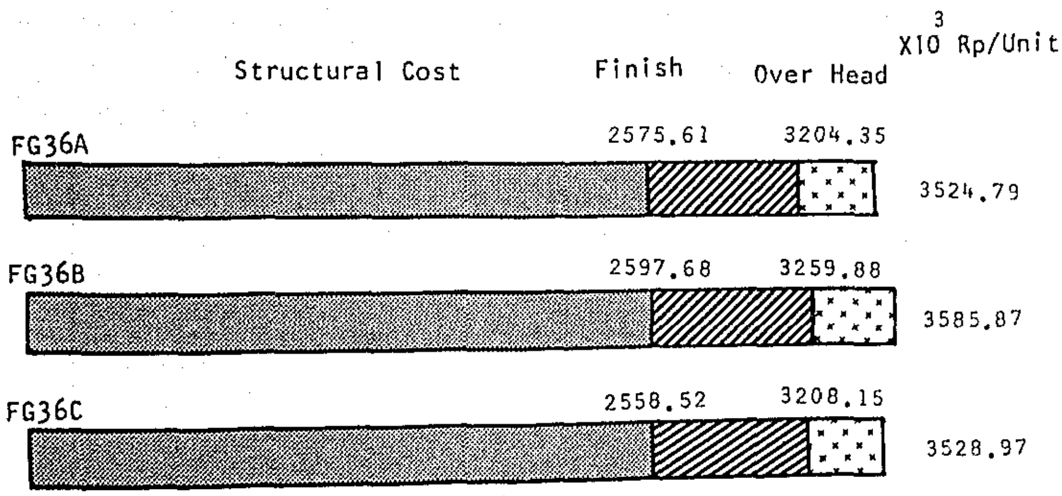
Furthering comparison of structural cost estimated in 2-2-3, the total costs of those structural models are as follows: in case of 24 units/4F . 36 m^2 type.

	x 10^3 RP/M^2 (net)
FG-36A (Wall-rahmen system)	83.68
FG-36B (Rahmen system)	85.13
FG-36C (Wall-rahmen + rahmen system)	83.78

The cost does not vary so much by structural system. There is little difference between A-type model and C-type model. C-type model, however, has advantage in performance in the following respects:

- o C-type model features its RC walls (end walls and every 3rd unit-wall) which have better performance in sound insulation, fire & weather resistance, and what is better, those walls function as the earthquake resisting walls and also have great advantage in structural strength.
- o Interior colums within the unit is not necessary in this model and as a result, more flexibility is obtainable for interior planning.

The details of the costs of this model are illustrated as follows:



The figure shows: A-type model is the cheapest in structure itself, but in C-type model cost of pile is cheaper and C-type model is the cheapest in total structural cost. C-type model, however, is a little more expensive than A-type model with respects the costs of exterior finish, doors and windows, interior partitions, etc. B-type model is the most expensive in every respect. As a result, C-type model can be recommended.

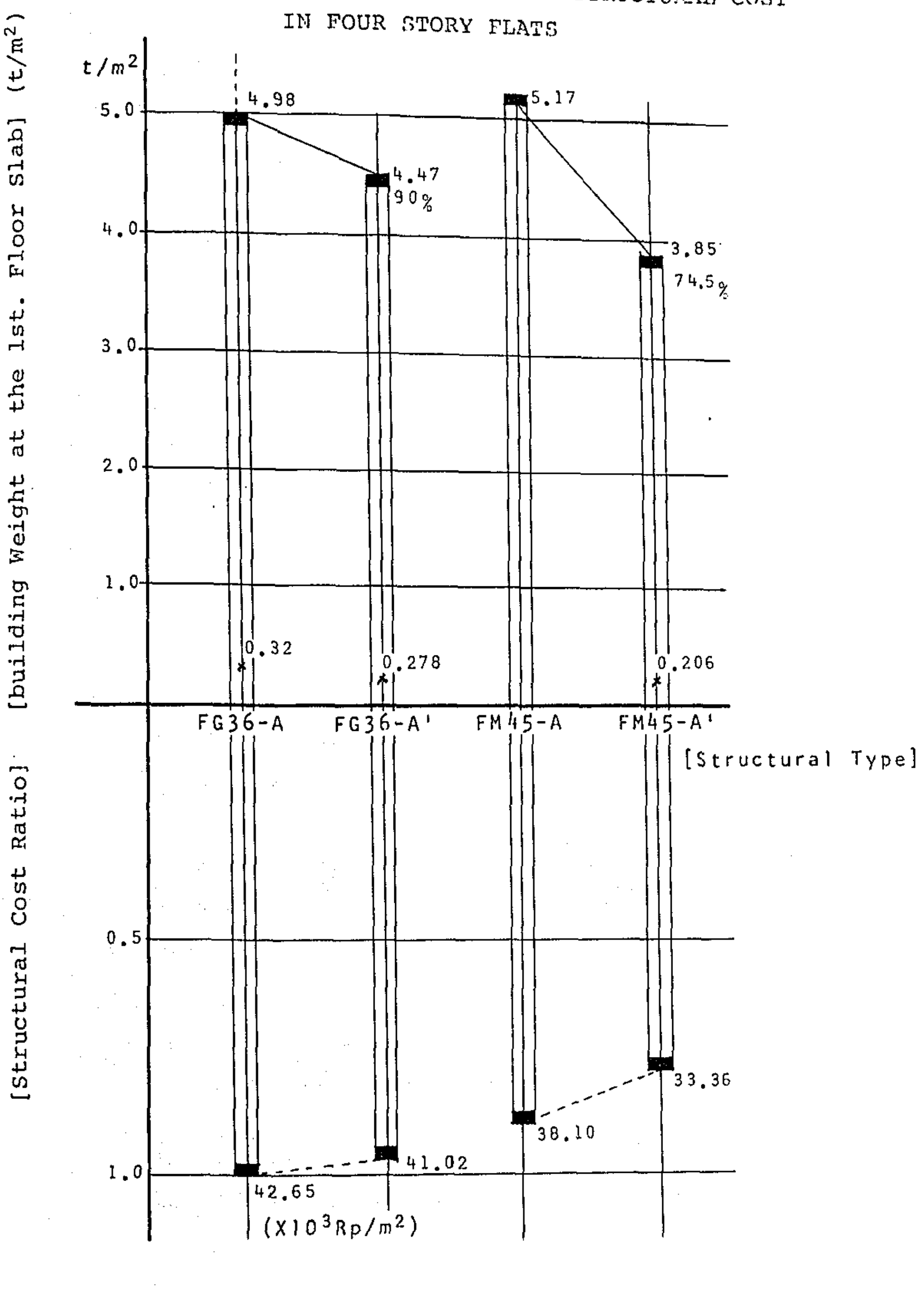
2-2-5 To Lighten Building Weight and the Structural Costs (FG-36A' type and FM-45A' type)

In the figure II-2-4, the horizontal coordinate shows each structural type, and the vertical coordinate shows each building weight and structural cost. This figure gives the comparison between FG-type model (above mentioned) and FM-type model (newly proposed) in the non-structural part of which lightweight materials such as * batacos and bricks for interior and exterior walls. (The symbol A' means the lightweight type of A.)

* Cement fibre board and asbestos plates are used instead of heavy-weight ones such as

As a result, FG36-A' type model reduces weight by about 10 % and FM45-A' type model does by about 25 %. The reason of such great difference between these two percentage points of weight reduction is that more interior walls are used in the later than in the former. The relation between the costs and the weights shows that in the same type models the lightweight one is the cheaper, and that the structural type also causes much difference of costs. Numerically speaking, FG36-A' compared to FG36-A, allows for cost reduction of about 4 %, 10 % in FM45-A and 22 % in FM45-A'.

FIG. II-2-4 BUILDING WEIGHT AND STRUCTURAL COST IN FOUR STORY FLATS



2-2-6 To Lighten Building Weight and the Total Costs

Based on the structural costs mentioned in 2-2-5, a study was done on how total costs are influenced by lightening the building weight. Comparison was made on 4-storied building with 24 units. The results are as follows:

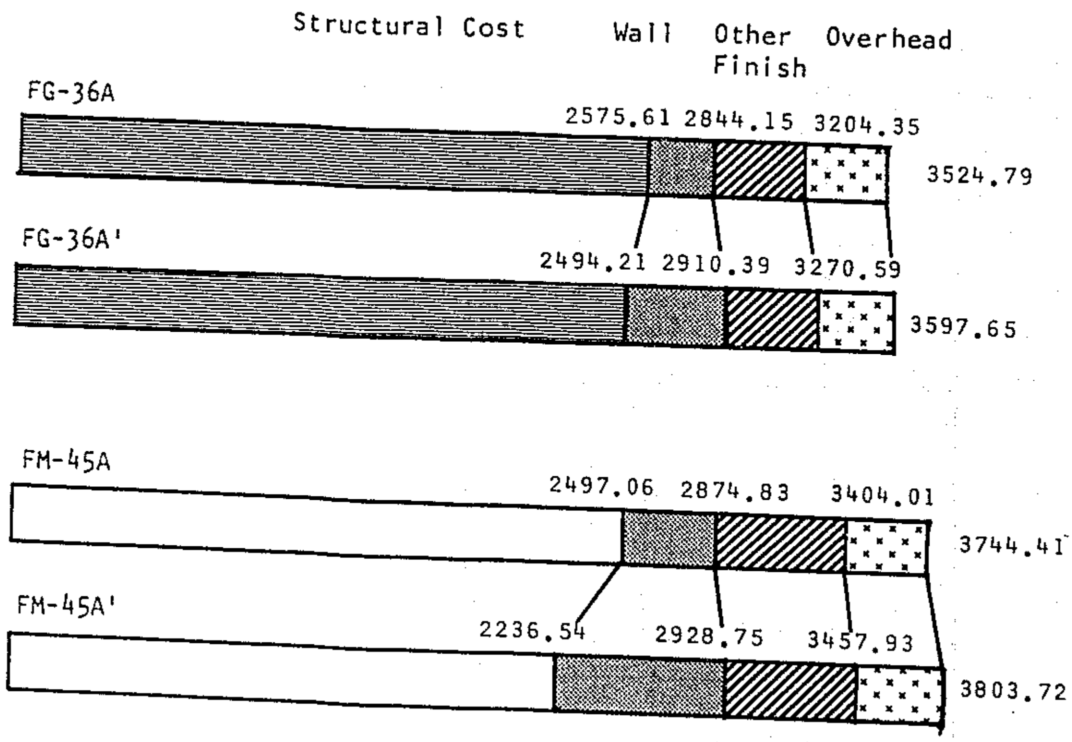
a) FG36-A' type (lightweight type for FG36-A)

85.41×10^3 RP/m^2 net (originally 83.68×10^3 RP/m^2 net)

b) FM45-A' type (lightweight type for FM45-A)

79.00×10^3 RP/m^2 net (originally 77.77×10^3 RP/m^2 net)

In both cases, unexpectedly, the total costs of the lightweight types have proved to be more expensive and lightweightning of building is not succeeded. Above illustrated details of the cost of each type explains the reason.



These figures reveal the fact that the increase of wall work cost exceeds the reduction in structural cost, leading to the higher total cost. This is especially distinct in the case of FM-type, in which bataco is replaced by cement fibre board and timber stud for walls between units and the lightweight walls become more expensive in order to maintain the same performance level, especially in fire resistance and sound insulation. This means that at present there is no appropriate lightweight materials to compete in price with batacos or concrete blocks in Indonesia.

2-3 Dwelling Units Model Study

2-3-1 Introduction of Outside Life into Flat

Unlike the way of living in traditional low-rise housing, the common problem of flat housing is that the planning tends to force people to lead their indoor life abruptly isolated from the outside life by one door. This arouses a big problem to the residents as they may suffer from 'psychological isolated' feeling. Our purpose of this study is to make such space arrangement as to mitigate their feeling of solitude and to introduce, as much as possible, the way of living generally observed in the traditional low-rise housing (especially in Perumnas houses) to the proposed flat housing. This will be achieved by arranging hierarchical space between access (public) and private space, that is the combination of access and veranda.

2-3-2 Veranda

Veranda has usually various usages as:

a) living veranda: used as a part of a living room (rest space) and as a part of garden;

b) service veranda: used as washing space (cleaning and dish-washing), drying space, storage space, etc. located near a kitchen or a toilet in Indonesia;

c) safety veranda: used as a refuge or as an escape route in case of fire or emergency.

As for the size of verande (a) presupposes a certain wide space (usually more than 1.3 m, hopefully more than 1.5 m in width), (b) of 1.0 - 1.2 m in width is usually used as service veranda even though designed as a living veranda, and (c) only requires space wide enough for a people to pass through.

Our purpose is to combine (a) - living veranda-with access, and consequently, to create spatious veranda which serves as a semi-private space. This is our recommendation, although this becomes inevitably more costly. Furthermore, it is hopeful that the housing unit has another veranda which is used as both (b) - service veranda - and (c) - safety veranda - so as to serve as two-way inerior escape route (especially in FS type and on the second floor of the FM-type).

2-3-3 Consideration to Future Extensions

Needless to say it is very difficult to expand flat. This is partly because that a plan with at least physical capacity of future extensions has not yet been selected. Indeed, its most difficult problem is caused by social aspects (especially such as the resident's right of occupation and the difficult coordination between the timing of extension and the economic capacity of the residents etc.): In case our plan if this starts from flat of 36 m^2, it is suspected that the plan may cause a big problem in future. Therefore, it is important to study at least the physical possibility of future extension: part of walls between units will be built of such materials as to be easily demolished. Examining each type, FG-type allows for easy future extensions, but FS-type has difficulty in extension because of its staircase in the middle.

2-3-4 Space Distribution

a) Space distribution in existing flats.

	Distribution (m^2) & (%)								Total (m^2)	
	B_1	B_2	K	L	D	wc/m	Stor.	Balco	net	gross
Pasar Jumat Type 2 (FS' Type)	12.6 (25.0)	12.6 (25.0)	5.0 (9.9)	13.1 (26.0)		3.2 (6.4)	- -	3.8 (7.6)	50.3 (100)	57.3
Flat-64 (Bandung) (FS' Type)	11.7 (20.2)	10.8 (18.7)	6.3 (10.9)	17.3 (29.9)		2.7 (4.7)	3.6 (6.2)	5.4 (9.3)	57.8 (100)	64.4
Conpetition A (Double FG Type)	9.8 (26.0)	8.8 (23.3)	4.1 (10.9)	4.9 (13.0)	6.5 (17.2)	2.3 (6.1)	- -	1.3 (3.4)	37.7 (100)	44.4
-do- B (Claster Type)	7.6 (20.5)	7.6 (20.5)	5.3 (14.3)	12.6 (34.1)		2.3 (6.2)	- -	1.6 (4.3)	37.0 (100)	47.0
-do- C (FS' Type)	17.2 (44.8)		3.6 (9.4)	13.7 (35.7)		3.9 (10.2)	- -	- -	38.4 (100)	44.1

b) Space distribution in the proposed flat plan.

	Distribution (m^2) & (%)								Total (m^2)	
	B_1	B_2	K	L	D	wc/m	Stor.	Balco	net	gross
FG-36A	8.8 (20.9)	9.5 (22.6)	16.8 (39.9)			2.3 (5.5)	- -	4.7 (11.2)	42.1 (100)	53.9
FS'-36A	9.7 (22.6)	9.7 (22.6)	15.9 (37.1)			2.3 (5.4)	- -	5.2 (12.1)	42.9 (100)	48.2
FM-45A	10.2 (21.2)	9.8 (20.3)	16.4 (34.0)			2.3 (4.8)	4.1 (8.5)	5.4 (11.2)	48.2 (100)	57.5

Compared with (a), (b) are added by veranda space, and the other space distribution is more or less equal:

B1 : 8 - 10 m^2

B2 : 8 - 10 m^2

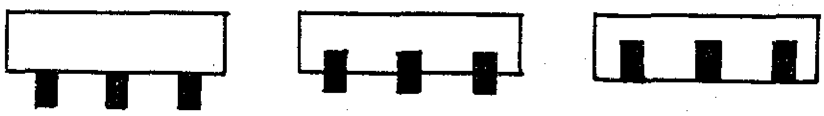
LDK : 16 - 17 m^2

WC/M : 2.5 - 3.5 m^2

2-3-5 Study of Flats Model Type

A) FS-type Flats Models (Staircase Access Type Models)

This is the most typical throughout the world. Also in the Indonesia, this has been experienced in Pasar Jumat, etc. The advantage of this type is that the productive ratio is quite high, with high privacy level. This types are roughly classified into three categories according to the location of staircases. These are 1) external staircase type (FS), 2) semi-internal staircase type, and 3) internal staircase type (FS').



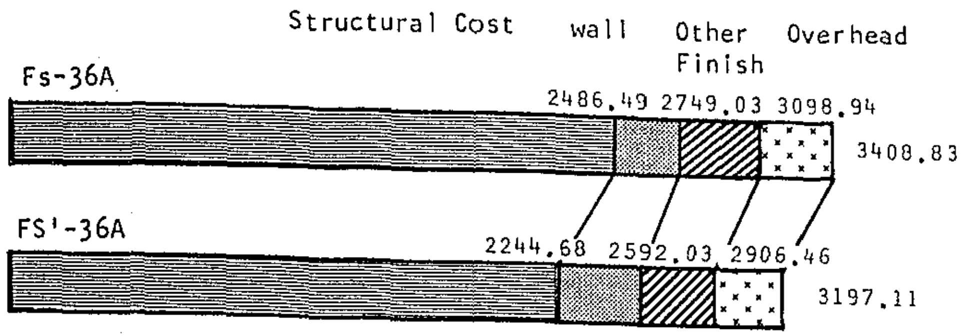
FS Type   FS' Type

In this study, FS-type and FS'-type are examined. Compared with FS-type, FS'-type is cheaper in terms of cost, but it is apt to have closed space. The following figure shows the comparison of rough estimates between these two types.

	($\times 10^3$ Rp) Total Cost	($\times 10^3$ Rp) Cost/m^2 (net)
FS-A (Outside Staircase Type)	3408.38	80.93
FS'-A (Inside Staircase Type)	3197.11	74.51

(In case of 4F. 24unit/building 36m^2 type)

Here the cost of FS'-A type offers considerable cost reduction compared with FS-A type. In order to understand the reason, it is necessary to examine the distribution of costs as illustrated in the following figure:



The result shows that the reduction in structural costs exceeds the increase in wall costs. To be more concrete, there is a great advantage of internal staircase which functions as a part of structure of unit itself. This is desirable from the point of view of structural performance, especially against horizontal forces.

For this reason, the semi-internal staircase type may be placed in the middle of these two types in terms of costs. Future extension for FS'-type, however, will be the most difficult, and further study will be required in order to leave room for, at least, the pshysical possibility of extension.

B) FG-type Flats Models (Gallery Access Type Models)

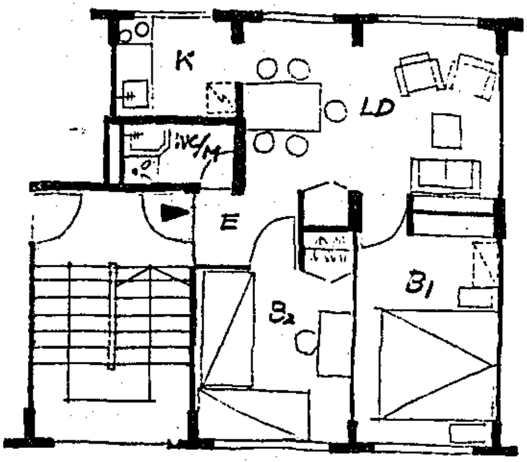
This type is relatively popular as a flats type in Japan, but in other countries is not so popular. In this type, the productive ratio is low and with lower privacy level for rooms facing a gallery, but this type is suitable to the districts with warm climate with open spacious feeling. Another advantage of this type is that the external corridor facilitates as escape route in case of emergency and requires smaller number of elevatos in higher flats.

C) FM-type Flats Models (Flat Maisonette Type Models)

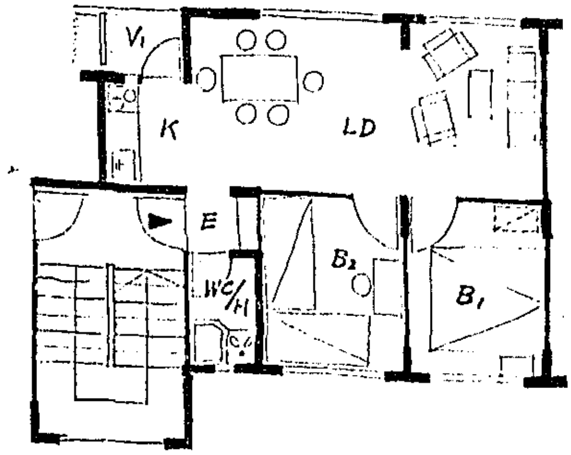
This type will be situated in the character between FG-type and FS-type and has advantages in compensating the defects of both types. The productive ratio is relatively high. The problem of privacy for the rooms facing an external corridor is solved to some extent by having bed rooms in the upper floor, but it still leaves problems of performance (in water-proofing and sound insulation) to the rooms under the corridor. In this plan, the model is proposed to build middle floor (of a units) of wooden structure instead of reinforced concrete structure in order to lighten the building weight.

In terms of fire resistance, this model is planned so as to confine fire within a unit. The performance in sound insulation between two in-unit stories turns much lower, but this may not cause such a big problem of noise because upper floor is used as sleeping space while lower floor is used as a living space, a kitchen, WC/M, etc.

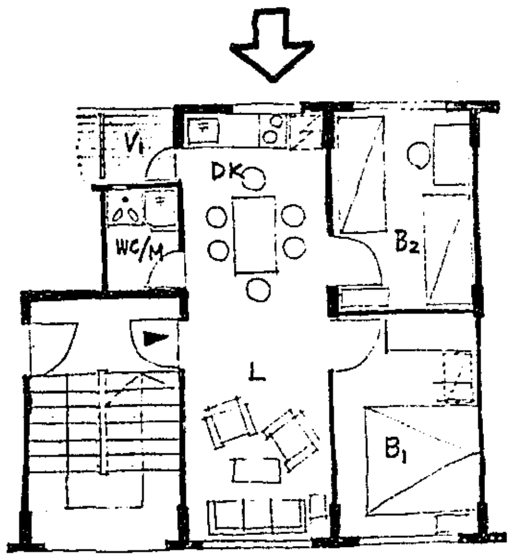
FIG. II-2-8 DEVELOPMENT OF FS' TYPE



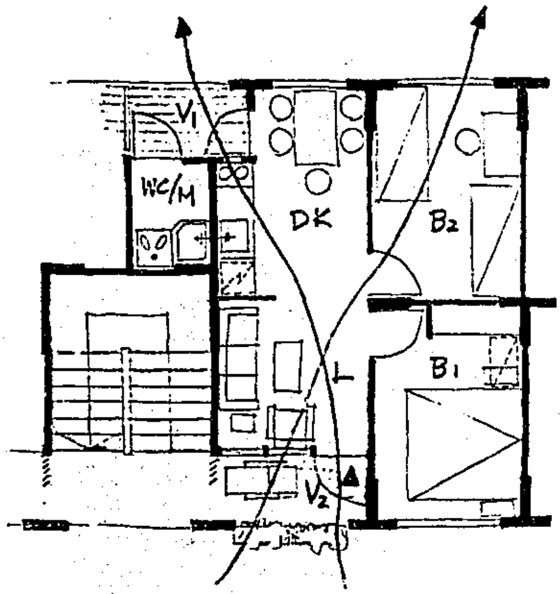
- Not suitable for a tropical country
- Mechanical Ventilation system is necessary
- Noise problem at B_2



- Introduction of Service veranda
- Disconnected Utility space
- Complicated service route
- Too wide frantage

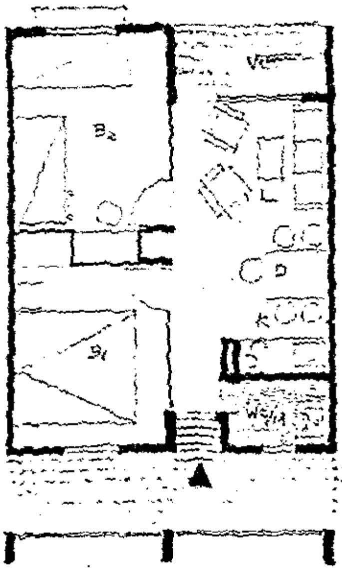


- Combination with service veranda, Mandi and kitchen
- Too close arrangement of dining room and wc.

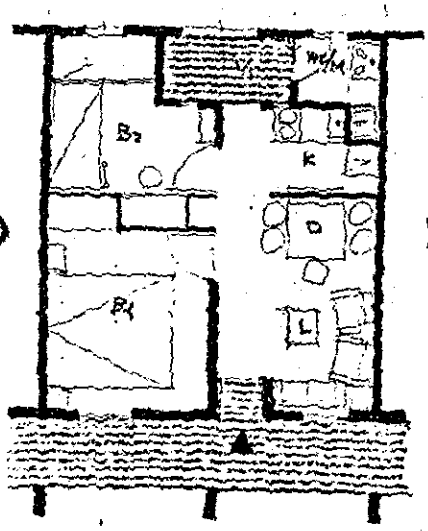


- Introduction of living veranda
- Establishment of hierarchy of Privacy
- Concentration of Utility space
- Simplication of service route
- Change position of staircases

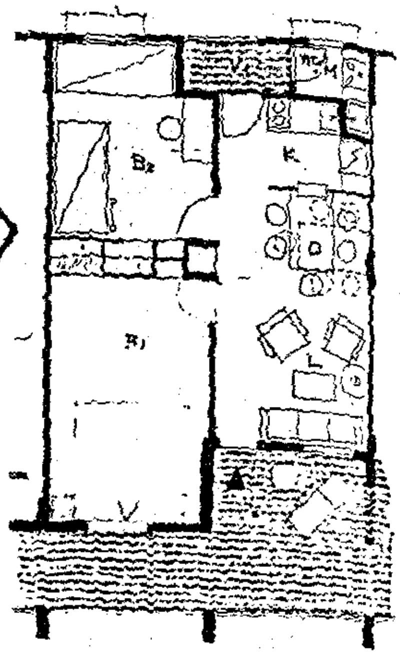
FIG. II-2-9 DEVELOPMENT OF FG TYPE



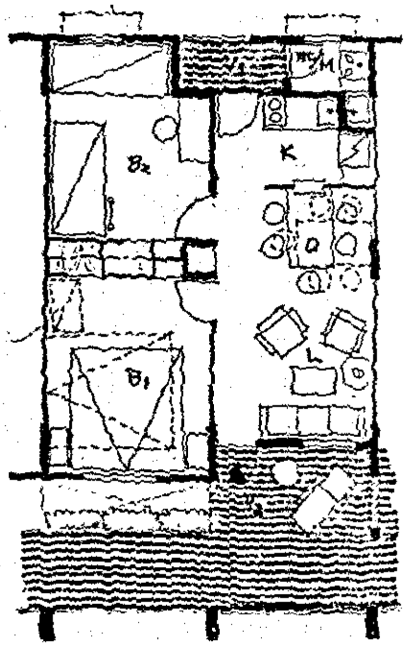
- European style efficiency type
- Not suitable for a tropical country
- Mechanical ventilation system is necessary
- *No good condition for privacy at* B_1



- *Combination with mandi and service veranda*
- Natural ventilation at kitchen

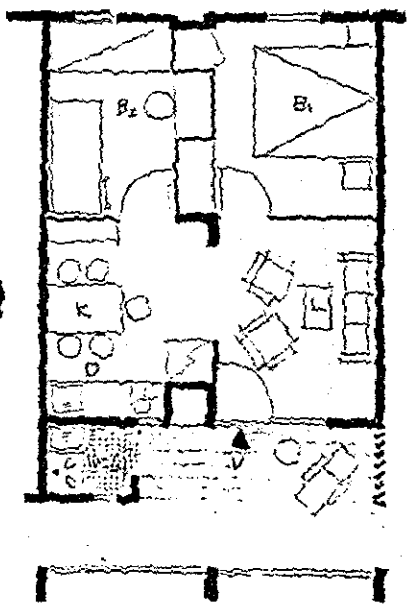


- *Introduction of Living veranda*

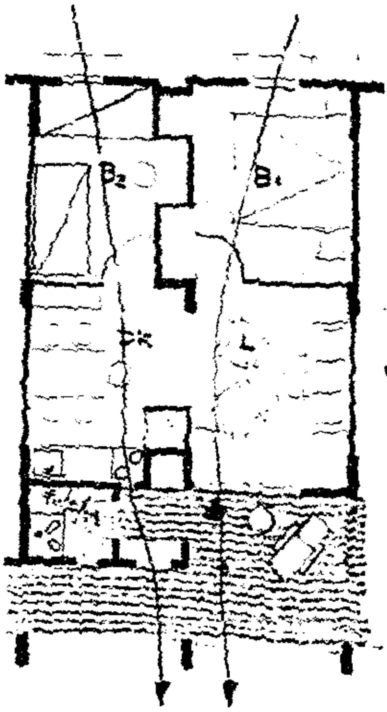


- *Development of privacy at* B_1 *by separated corridor*

Cost increase

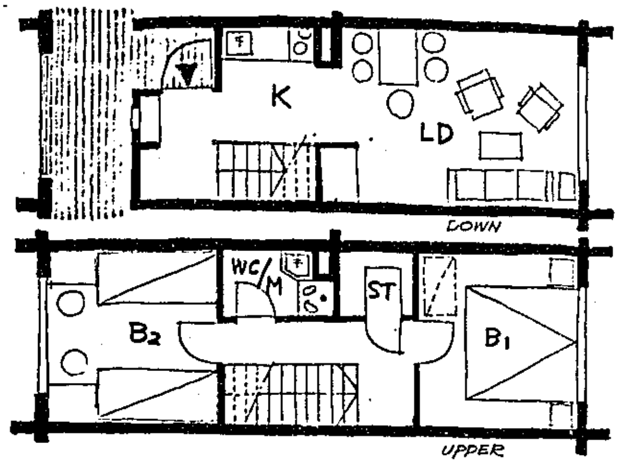


- Combination with service veranda and living veranda by transfer of mandi and kitchen
- *Establishment of hierarchy of privacy*
- No good condition for privacy at mandi
- Good natural ventilation

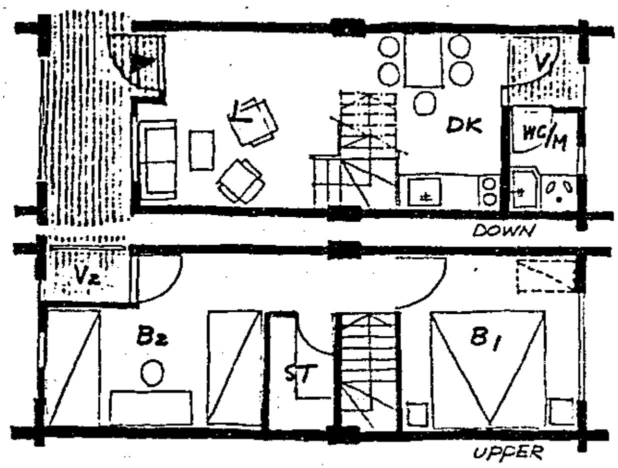


- *Introduction of semi-private space beside mandi*

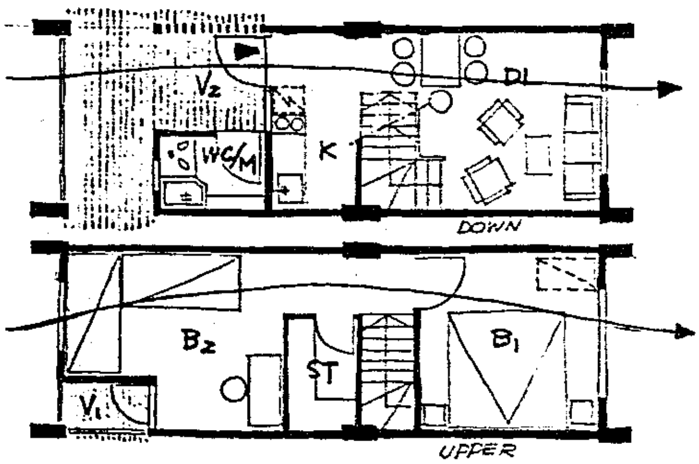
FIG. II-2-10 DEVELOPMENT OF FM TYPE



- European style efficiency type
- Not suitable for a tropical country
- Mechanical ventilation system is necessary
- Difficulty of Piping maintenance
- Waterproof treatment of 2nd floor wc



- Combination with mandi and service veranda
- Introduction of two way emergency routes in a housing unit



- Combination with service veranda and Living veranda by transfer of mandi and kitchen
- Establishment of hierarchy of privacy

2-4 Flat Model Study

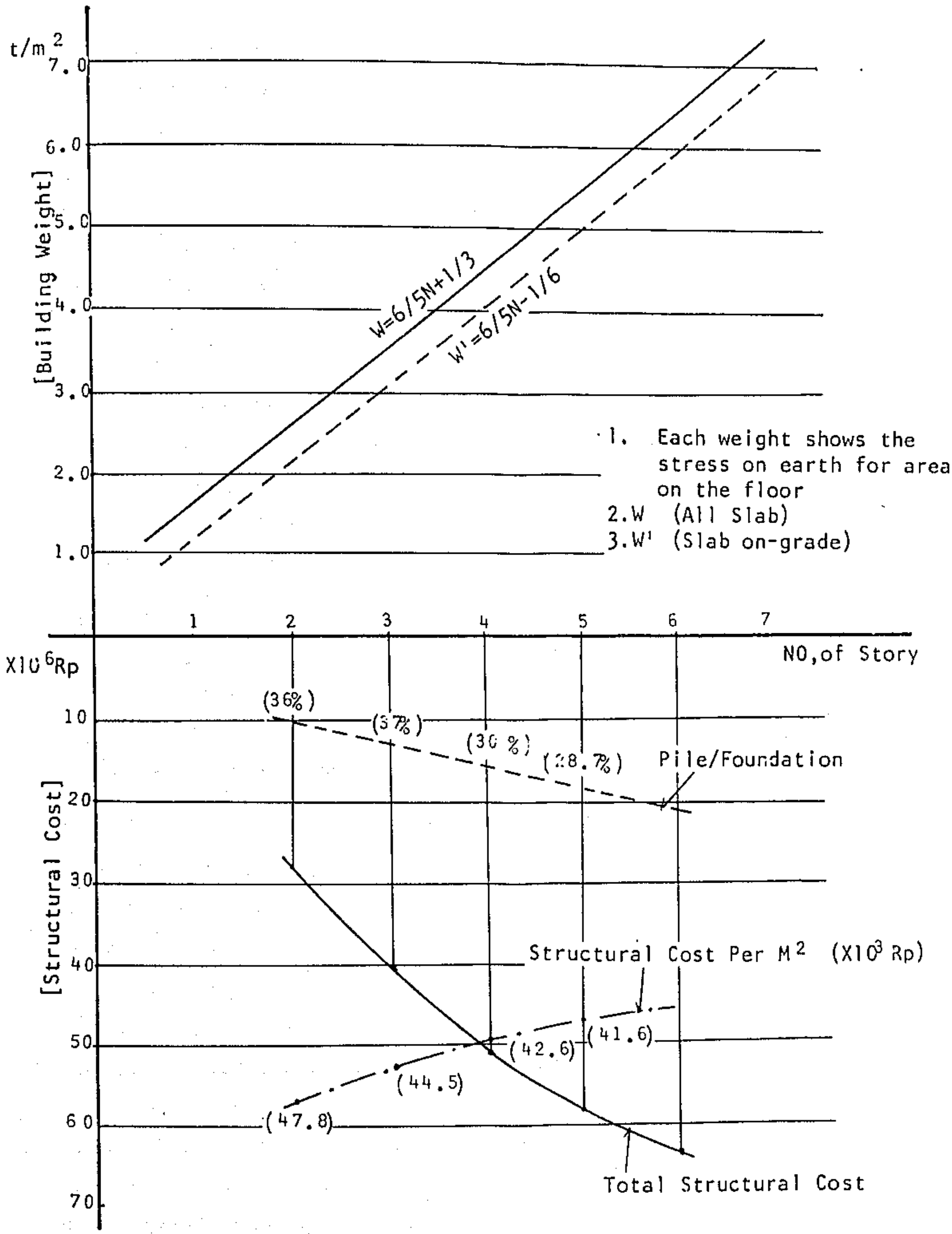
2-4-1 Number of Stories and the Cost

This section is devoted to the study of how the cost varies according to the number of stories from 3 to 6.

A) Building weight by the number of stories and the structural cost

This study shows that how the total structural cost, structural cost per m^2, and the ratio of foundation and pile cost varies according to the number of stories in case of Cengkareng site. Figure II-2-11 shows the estimation based on FG36-A-type. It follows that the larger the number of stories becomes, the structural cost increases linearly. Of course, the cost and weight differ by the first floor slab system (raised slab or slab on grade system). The curve of total structural cost tends to loosen according to the increase of story. On the contrary, the cost per unit floor area proves to become cheaper little by little according to the increase of story. The figure also shows that the cost of foundation and piles has the same impacts on the total structural cost and that the proportion of this decreases according to the increase of story.

FIG. II-2-11 STRUCTURAL COST BY SEVERAL NO. OF STORY



B) Number of stories and the total cost

Figure II-2-12 illustrates the total building costs according to the number of stories adding the structural costs obtained in A) to the other costs. The total cost per unit is necessarily reduced according to the increase of story but the cost order of each type never changes — FS'-type is always the cheapest. The cost difference between FG-type and FM-type does not depend so much upon the number of stories. Supposing the building cost per unit of 4-storied flat is 100, there is an approximate 4.5 % increase in the 3-storied and an approximate 2.5 % decrease in the 5-storied. This shows that the 5-storied building is advantageous in cost comparison and 3-storied is rather expensive as RC structure flat. The 5-storied flat, however, gives physical burden to the residents on the 5th floor, especially to the aged people who have to go up approximately 12 m, and further checks will be needed from the structural and hazard protectioning point of view. On the other hand, 5-storied flat will psychologically discourage people from purchasing these units. At this phase of our study, the 4-storied flat will be recommended in general point of view.

2-4-2 The Number of Units per Floor and the Costs

Figure II-2-13 shows the natural decrease in the building costs per unit due to the increase of the number of units per floor. The comparison by rough estimation will be given here as the structural impact on cost can be neglected.

The cost reduction in FS'-type is naturally quite small, and both costs of FM-type and FG-type decrease in parallel, so that there is no change of the order when the number of units per floor is between four and ten. Supposing the cost of six units per floor (12 units per 2-floors in FM-type) is 100, in case of 4 units per floor there are a 5 % increase in the costs of both FG-type and FM-type, 0.2 % increase in the FS'-type. In case of 8 units per floor there are a 2.5 % decrease in both FG-type and FM-type and a 0.1 % decrease in FS'-type. In case of 10 units per floor there are a 4 % decrease in both FG-type and FM-type and a 0.2 % decrease in FS'-type. FM-type and FG-type have problem of escape distance. If the distance should be within 30 m - 40 m, the flats with 6 units per floor is the most advantageous, and if the distance may be up to 45 m, the flats with 8 units per floor (only in FG-type) is the most advantageous. As the frontage for a unit is a little bigger in FM-type, it may well be concluded that the flats with 12 units per 2-floors is the most appropriate. FS'-type has no problem concerning escape distance but it has little advantage in cost reduction, but in this type the proportion of the width to the total building length shall not be so big (slenderness is structurally disadvantageous) and total length shall be within 50 M where expansion joint is not necessary to be considered. Therefore, the flats with 8 units per floor is the most recommendable.

FIG. II-2-12

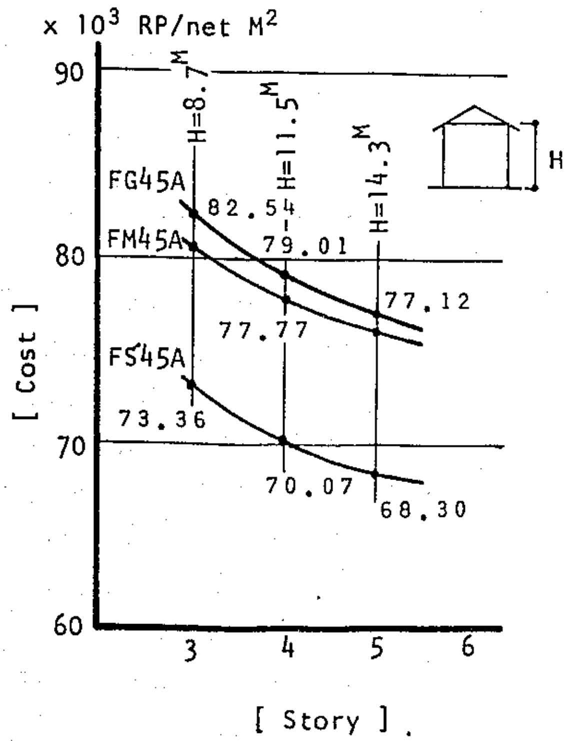
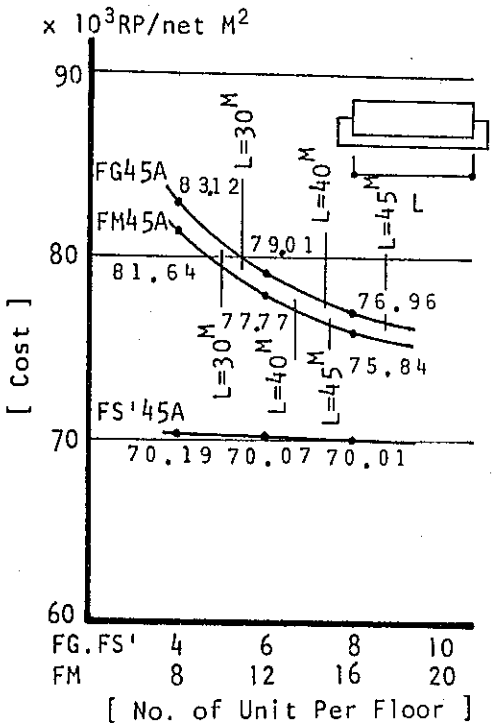


FIG. II-2-13



2-4-3 Utilization of Attic Space and the Costs

In this proposal, unglazed tiles are adopted as roof finishing materials. Consequently, the roof slope should be steep (approximately 35 degrees or 10 : 7), and the utilization of the attic space can be taken into account when assuming the horizontal reinforced concrete slab be retained above the uppermost story, because this will largely reduce the cost per unit. In the case study of FG-45-R (the type of FG45-A utilizing attic space. See the detatched drawings), there is a 8400 RP/m^2 (approximately 10 %) decrease in net cost as shown in the following table:

	Floor Area Per Unit A (M^2)	Net Floor Area Per Unit B (M^2)	B/A (%)	Total Cost Per Unit C (x 10^3RP)	C/B (x 10^3RP/M)
(1) Ordinary Type Housing Unit	63.90	52.11	81.5	4117.23	79.01
(2) Attic Type Housing Unit	63.90	56.88	89.0	2270.42	39.92
$\frac{(1)\times 24^u + (2)\times 6^u}{30^u}$	63.90	53.06	83.0	3747.87	70.63

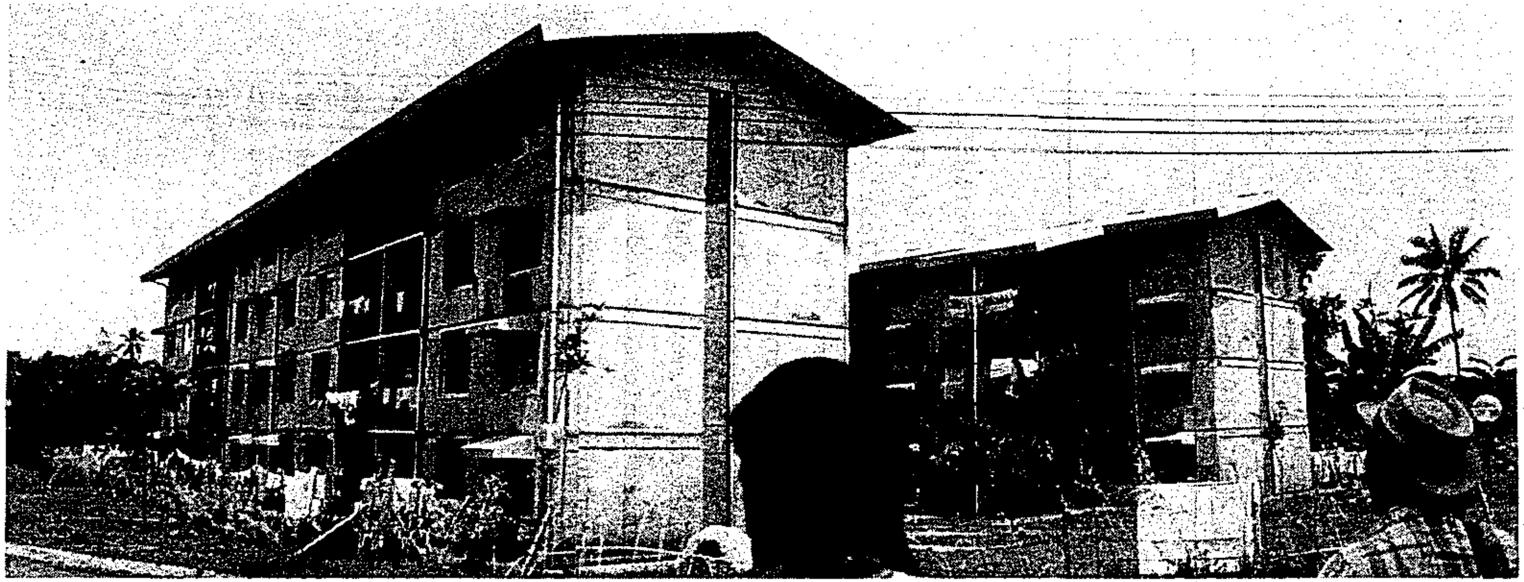
The utilization of attic space is very attractive in terms of costs, and the 4-storied flats with usable attic space (that is 5-storied in practice) is more advantageous than the 5-storied. Since there are still problems of livability such as rain leakage and over-heating caused by direct sunshine, further technical study must be done to compensate these defects. If these problems are technically solved (by insulation beneath the roof, prevention of rain leakage, etc.), the building costs will necessarily rise, yet it is still worth consideration. It might also be a way of utilizating attic space to sell it at a cheaper price or to use it as a room for servant.

2-4-4 Floor Area and the Costs

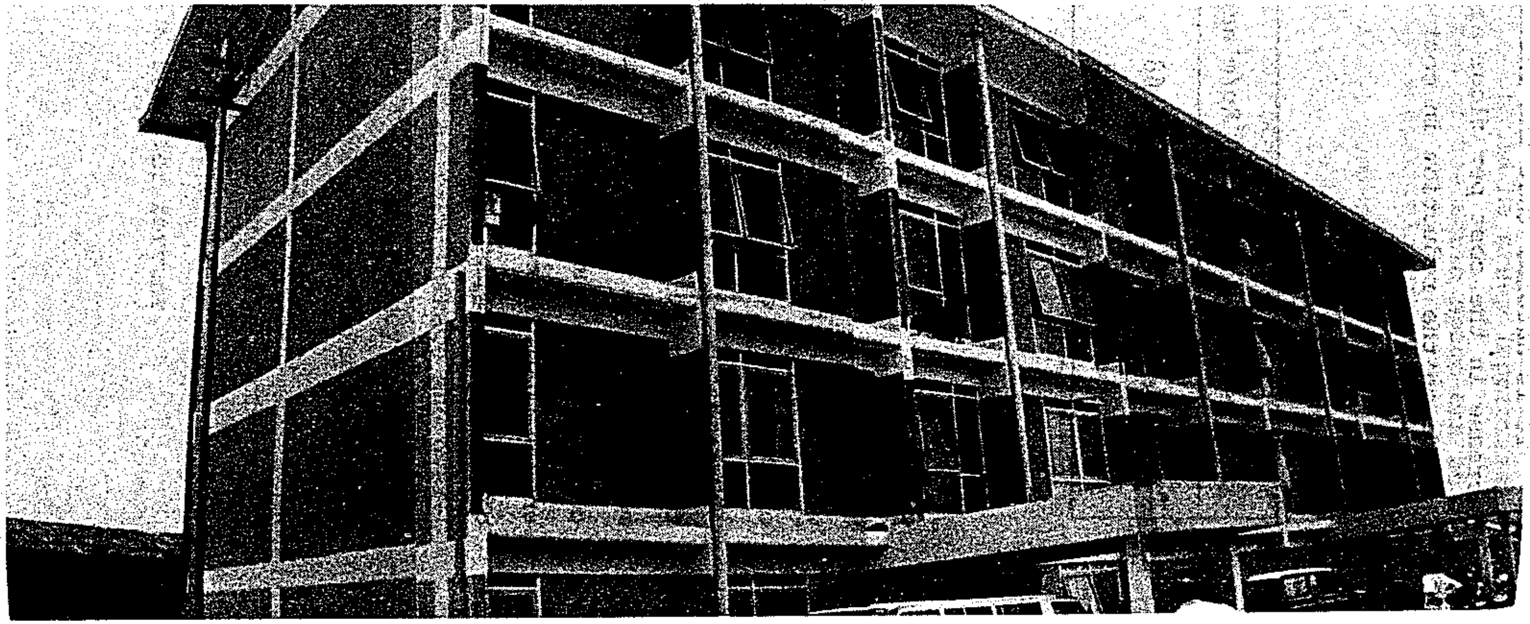
It is natural that the increase in floor area contributes to the decrease in the cost per floor area. In this section, consideration is made on the reduction in cost according to each type (except FM-type).

	$36m^2$ $(\times 10^3 Rp/m^2 net)$	$45m^2$ $(\times 10^3 Rp/m^2 net)$
FG-Type	83.68	79.01
FS'-Type	74.51	70.06

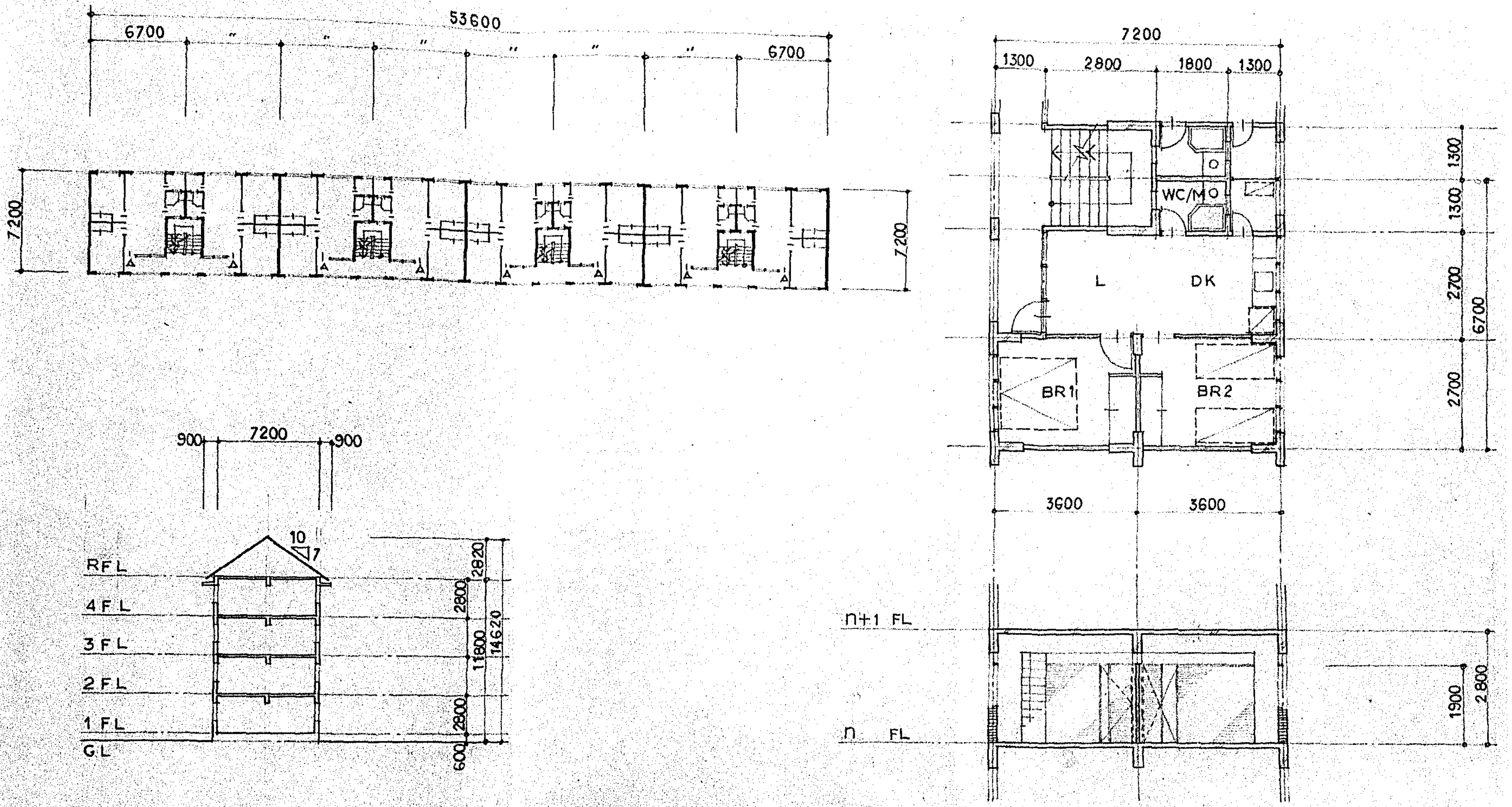
In FG-type, there are a 4700 RP/m^2 (5.5 %) decrease in building costs and a 4500 RP/m^2 (6 %) decrease in FS'-type. However, if floor area is more than 45 m^2 (for example 54 m^2), the cost per floor area will be expected more than that of 45 m^2 type, because 54 m^2 type needs one more room and if this is done without changing frontage (2 spans), inappropriate room without window will be born, and it is inevitable to add one span which causes the cost increase. However, adding one more room (63 - 70 m^2 type) serves the considerable cost reduction compared with the 54 m^2 type. Degree of such cost reduction is large enough that the cost per floor area may be expected to fall below that of the 36 m^2 type.



Experimental Flats by BRECAST System (PASAR JUMAT)

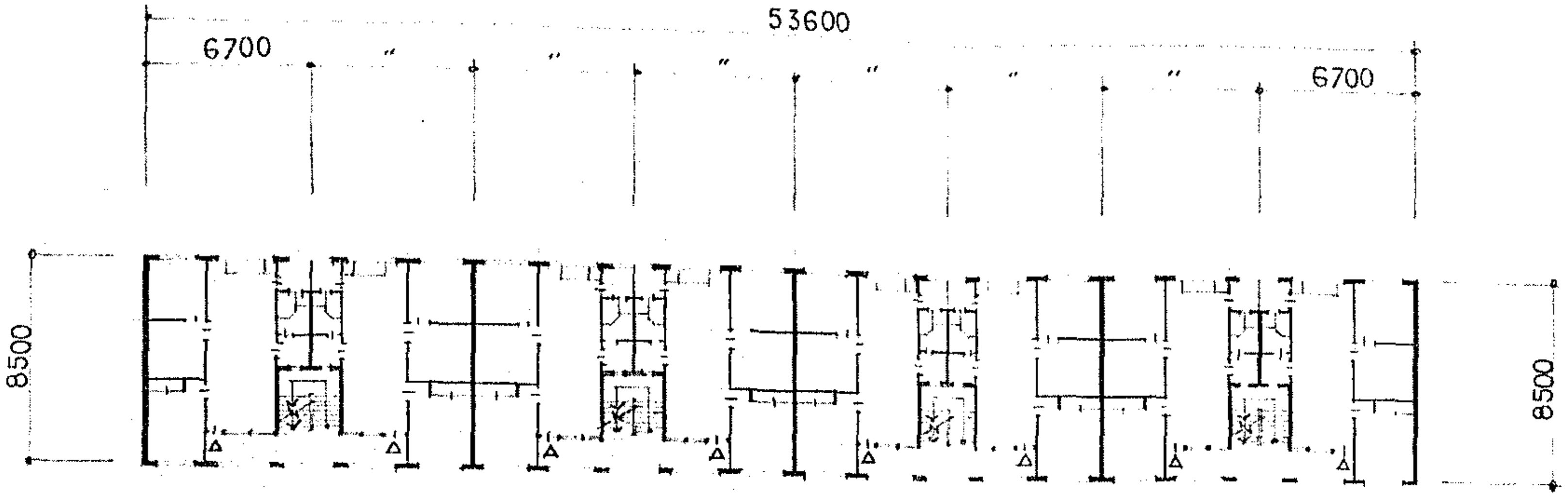


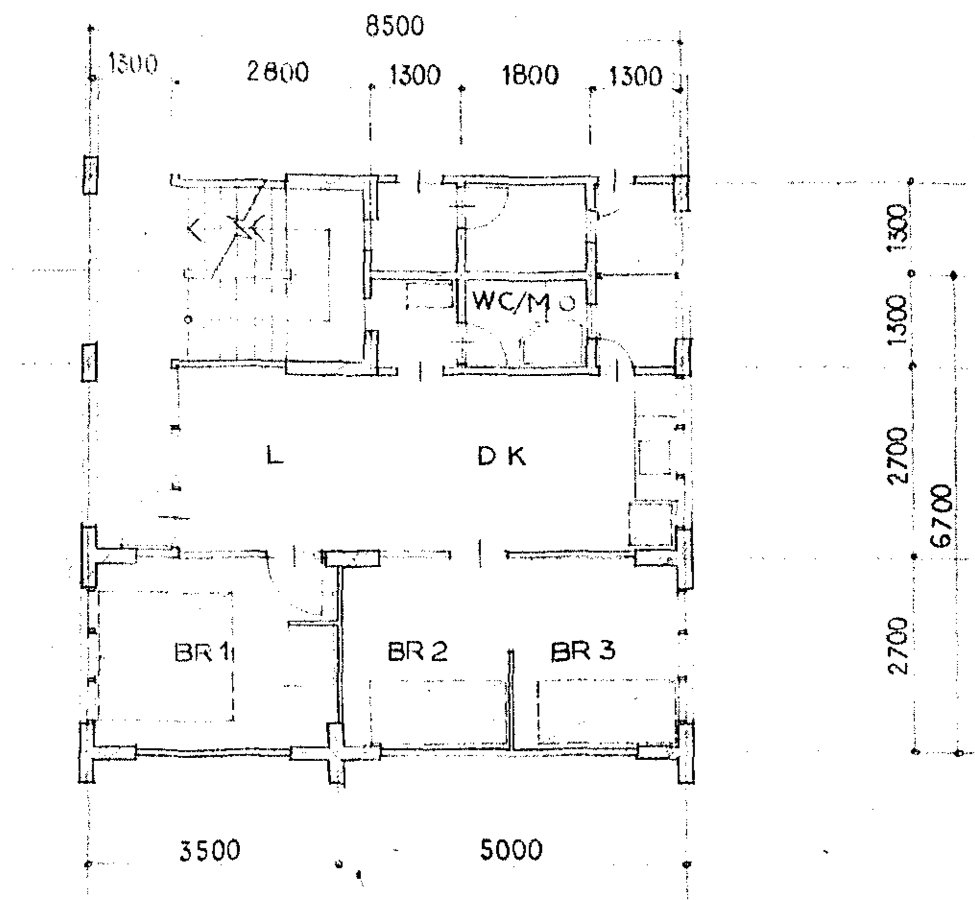
Experimental Flats by DPMB (BANDUNG)

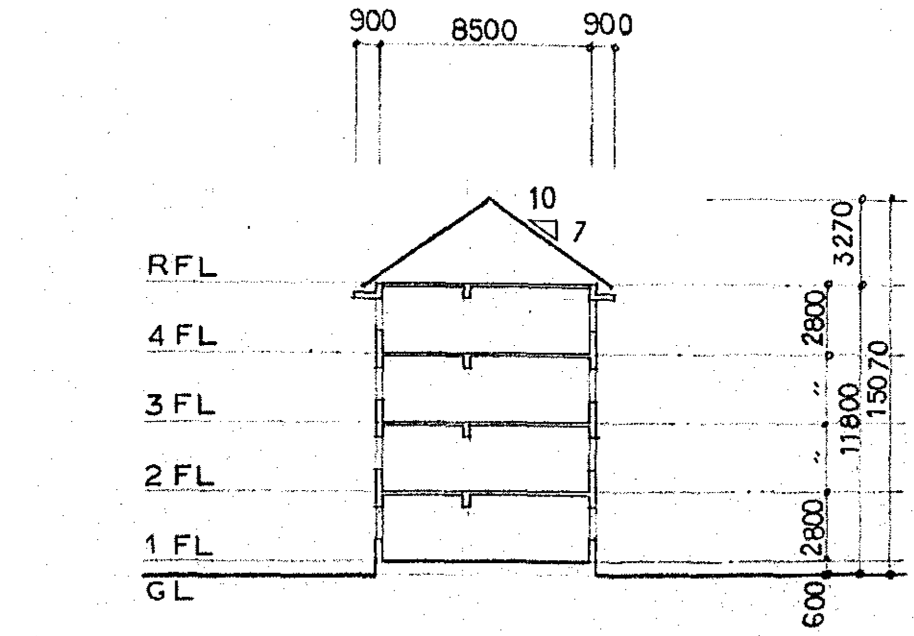


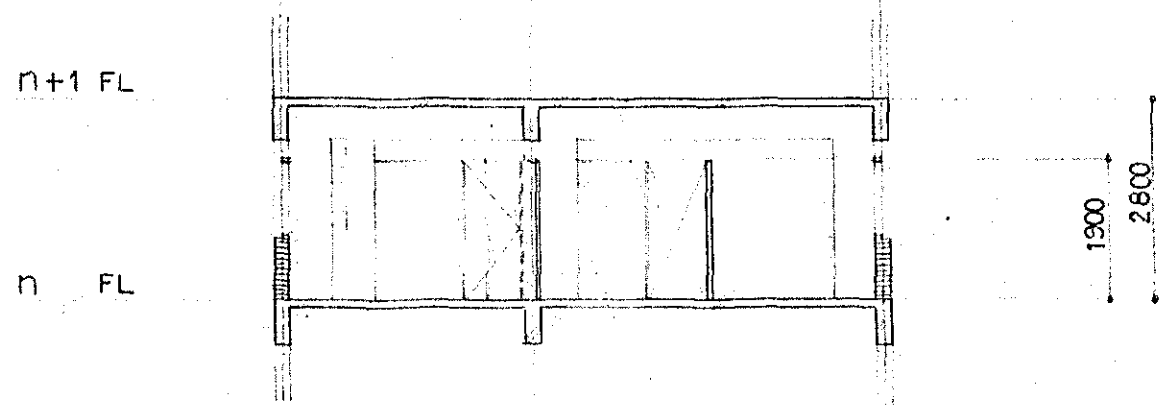
Specification	Roof	Unglazed roof tile, Borneo Truss	Floor Area	Net Floor Area M²/Unit	Living Floor Area	37.71	
	Outerwall	RC wall plastering t=15; Brick exposure			Veranda	5.20	
	Floor	RC slab t=100 Mortar t=30			Sub Total	42.91	FS'-36
	Wall between Houses	Bataco exposed t=100		Common Floor Area		5.33	STAIR CASE ACCESS FLAT TYPE
	Inside Wall	RC exposed; Bataco exposed; Bamboo mat		Gross Floor Area		48.24	
	Structure	RC Wall rahmen structure	Scale	1/300		1/100	THE STUDY OF LOW COST HOUSING PROJECT (KTA-20) PHASE I
	Foundation	Pile foundation					

No.









Specification	Roof	Unglazed roof tile, Borneo Truss
	Outerwall	RC wall plastering t=15; Brick exposure
	Floor	RC slab t=100 Mortar t=30
	Wall between Houses	Bataco exposed t=100
	Inside Wall	RC exposed; Bataco exposed; Bamboo mat
	Structure	RC Wall rahmen structure
	Foundation	Pile foundation

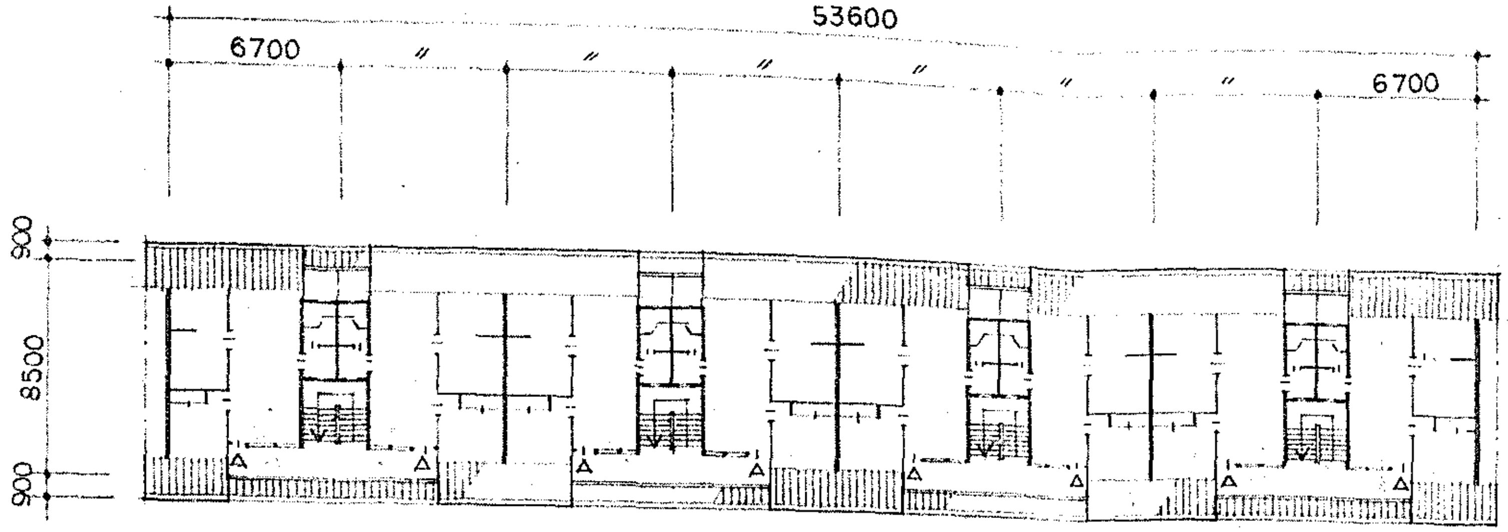
Floor Area	Net Floor Area M²/Unit	Living Floor Area	46.42
		Veranda	5.20
		Sub Total	51.62
	Common Floor Area		5.33
	Gross Floor Area		56.95
Scale	1/300	1/100	

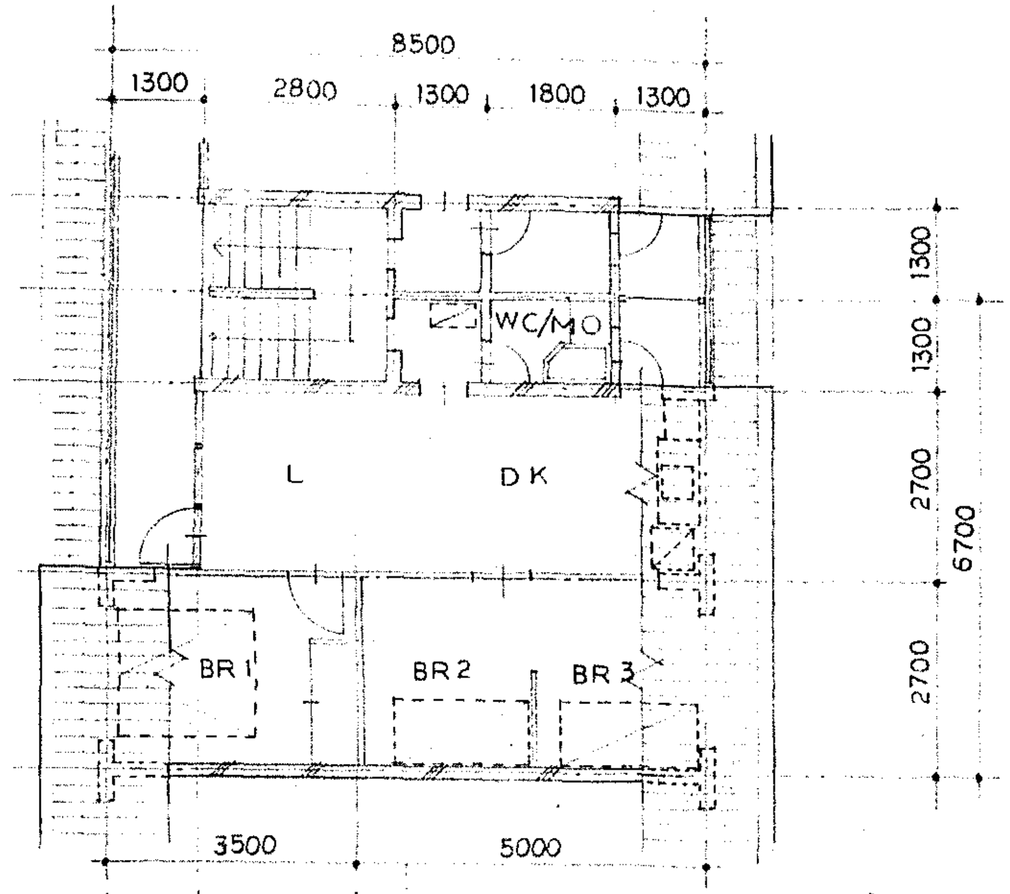
No.

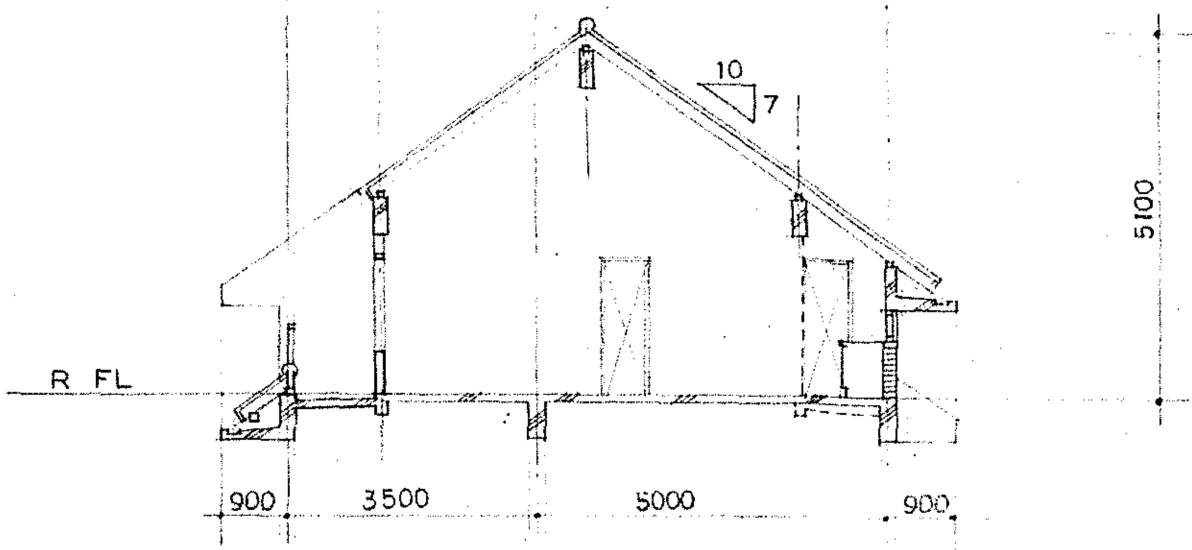
FS'-45

STAIR CASE ACCESS FLAT TYPE

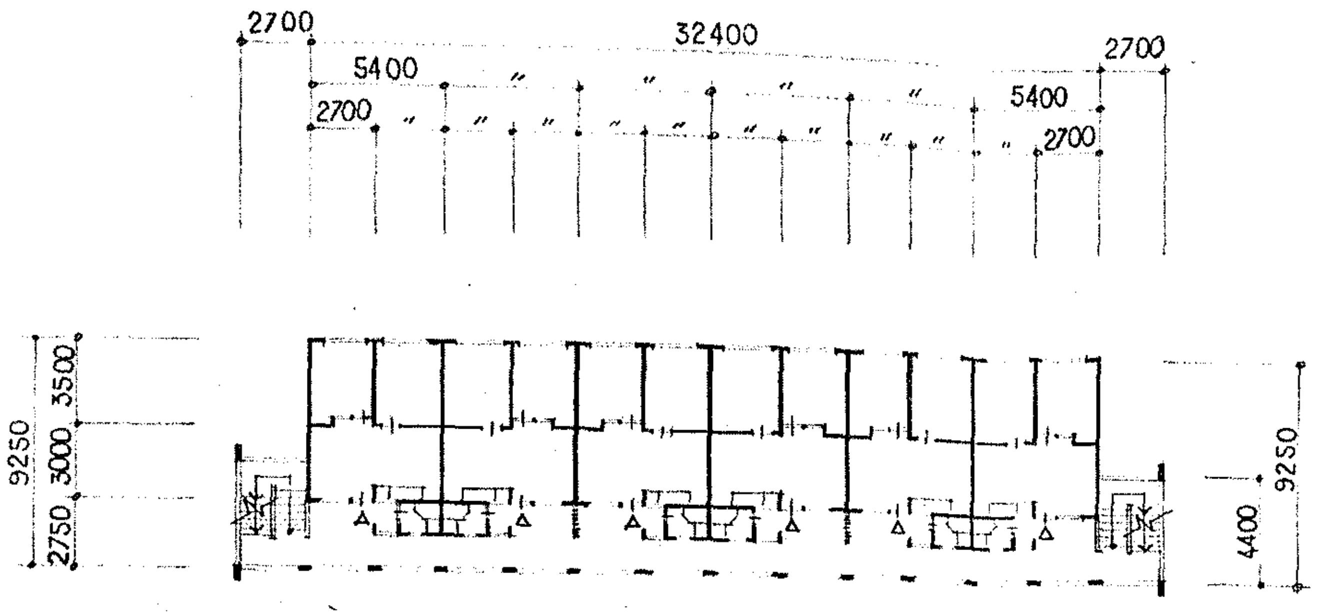
THE STUDY OF LOW COST HOUSING PROJECT (KTA-20) PHASE I

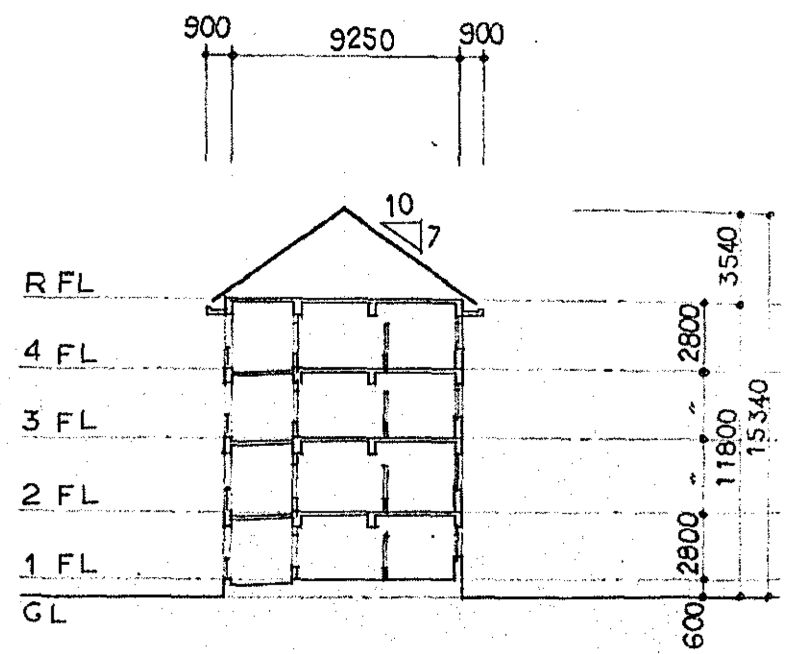


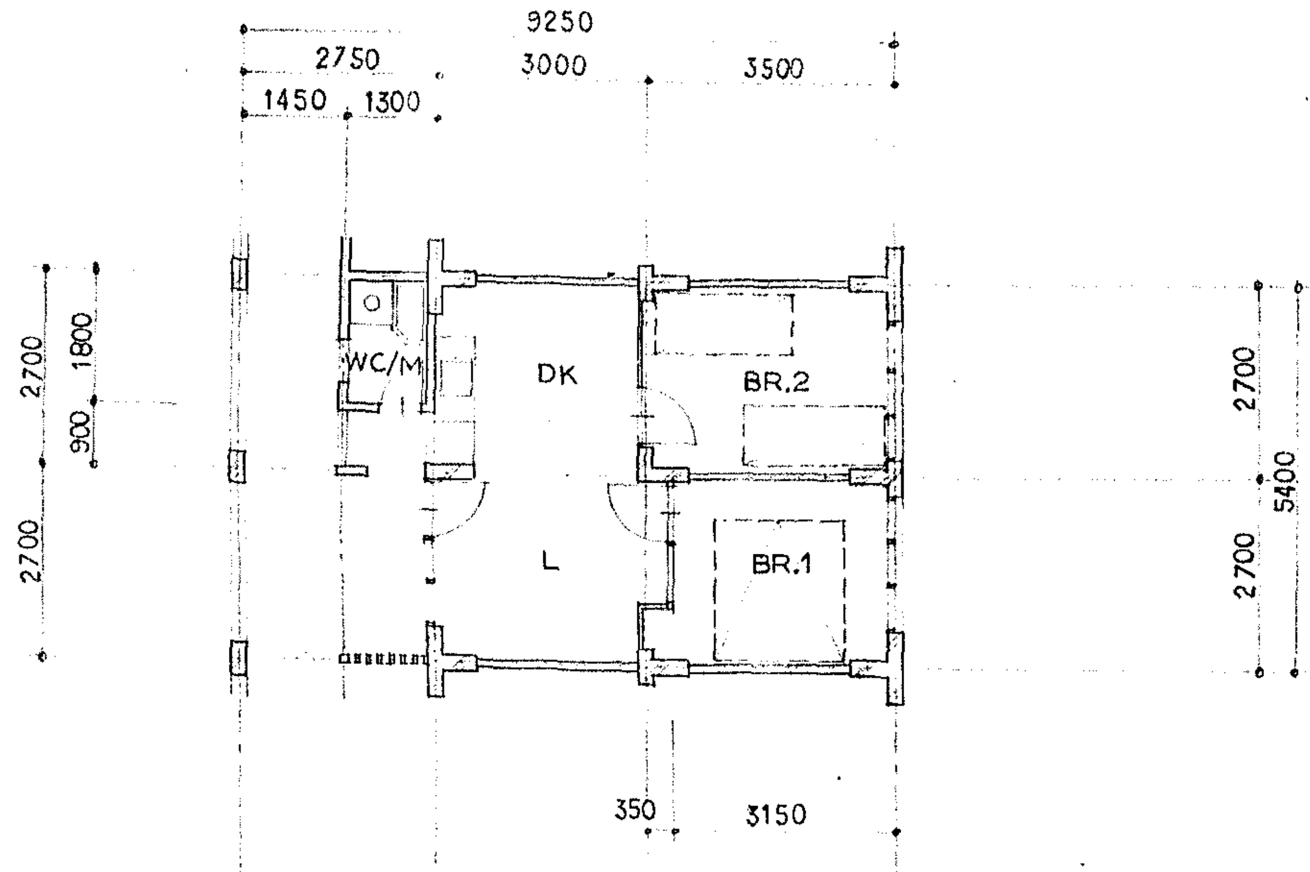


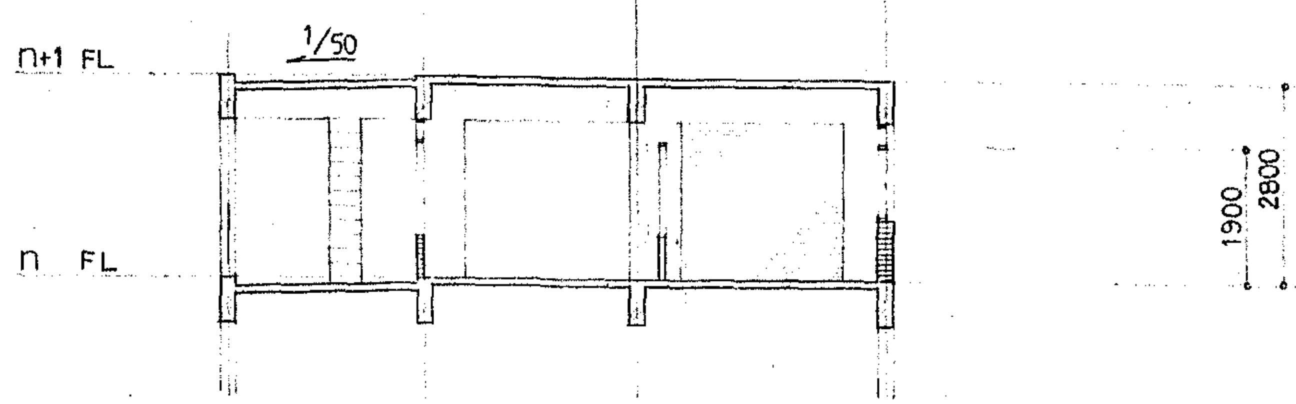


Specification	Roof	Unglazed roof tile	Floor Area	Net Floor Area M²/Unit	Living Floor Area	46.42	FS'-45R ATTIC USED FLAT TYPE	No.
	Outerwall	RC Wall plastering t=15			Veranda	5.20		
	Floor	RC slab t=100; Mortar t=30			Sub Total	51.62.		
	Wall between Houses	RC wall t=150		Common Floor Area		5.33		
	Inside Wall	RC exposed; Pataco exposed; Bamboo mat.		Gross Floor Area		56.95		
	Structure	RC wall rahmen structure	Scale	1/300	1/100		THE STUDY OF LOW COST HOUSING PROJECT (KTA-20) PHASE I	
	Foundation	Pile foundation						

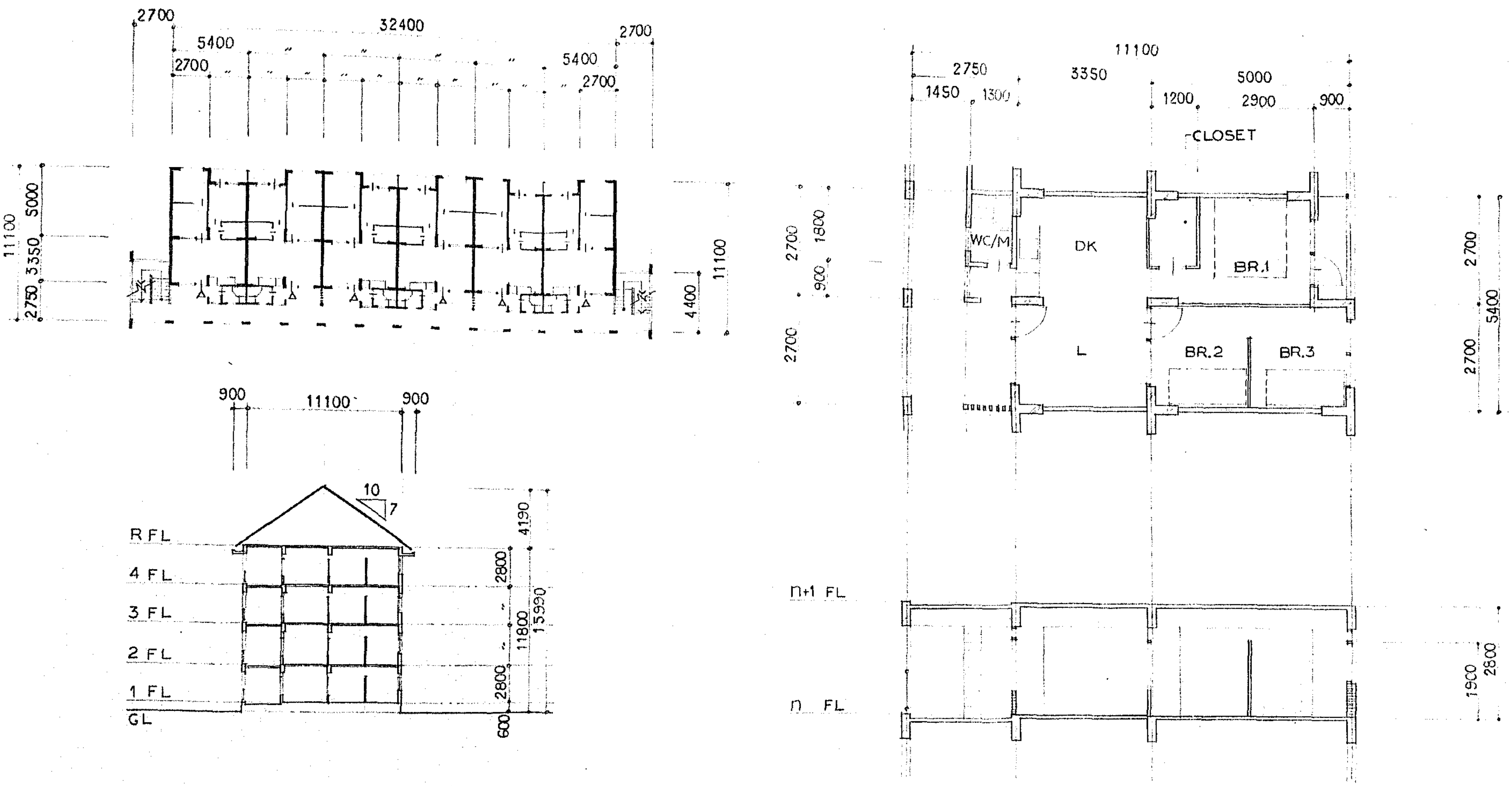






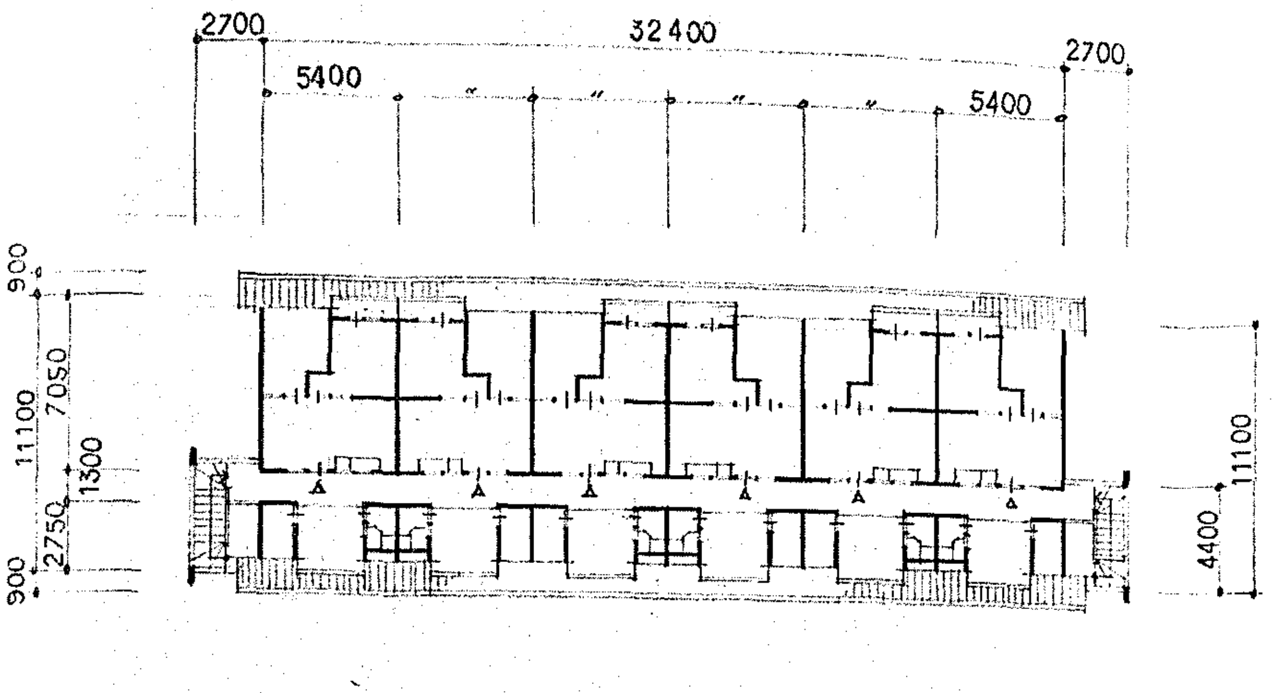


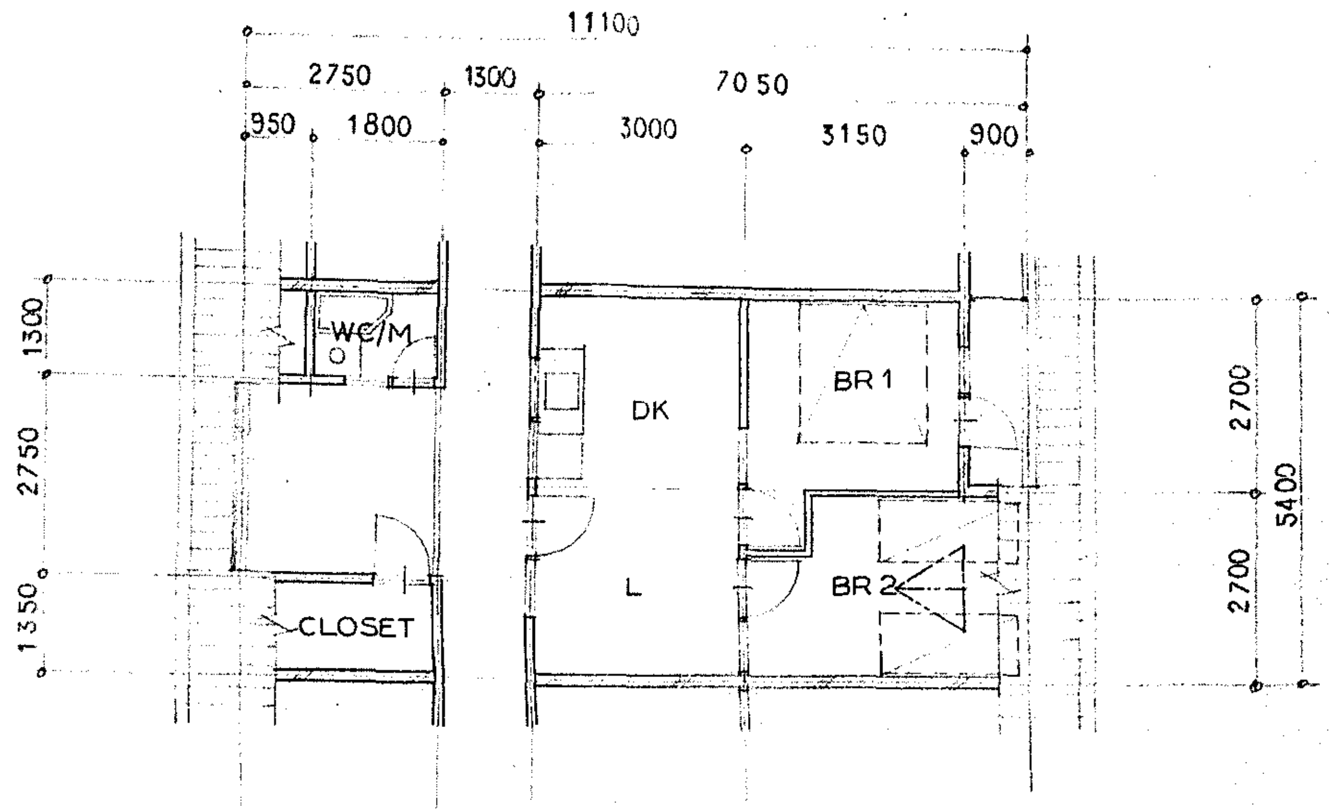
Specification	Roof	Unglazed roof tile, Borneo Truss	Floor Area	Net Floor Area M²/Unit	Living Floor Area	37.44	FG-36
	Outerwall	RC wall plastering t=15; Brick exposure			Veranda	4.68	GALLERY ACCESS FLAT TYPE
	Floor	RC slab t=100 Mortar t=30			Sub Total	42.12	
	Wall between Houses	Bataco exposed t=100		Common Floor Area		7.83	
	Inside Wall	RC exposed; Bataco exposed; Bamboo mat		Gross Floor Area		49.95	No.
	Structure	RC Wall rahmen structure	Scale	1/300		1/100	THE STUDY OF LOW COST HOUSING PROJECT (KTA-20) PHASE I
	Foundation	Pile foundation					

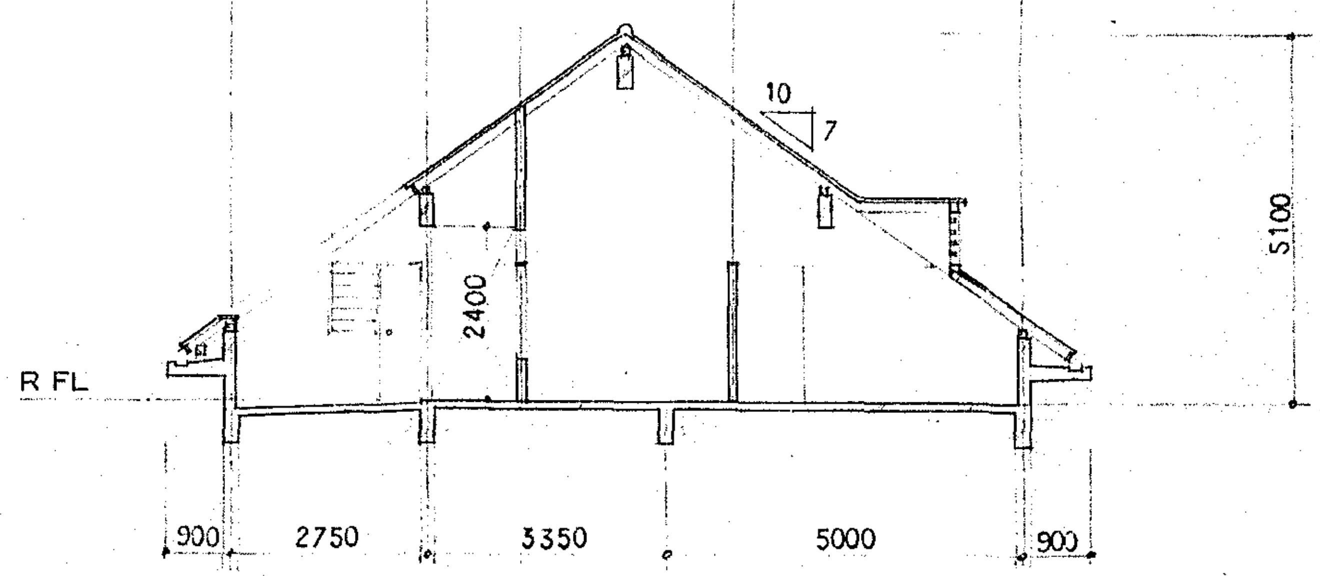


Specification	Roof	Unglazed roof tile, Borneo Truss	Floor Area	Net Floor Area M²/Unit	Living Floor Area	45.00	FG-45 GALLERY ACCESS FLAT TYPE
	Outerwall	RC wall plastering t=15; Brick exposure			Veranda	7.11	
	Floor	RC slab t=100 Mortar t=30			Sub Total	52.11	
	Wall between Houses	Bataco exposed t=100		Common Floor Area		7.83	
	Inside Wall	RC exposed; Bataco exposed; Bamboo mat		Gross Floor Area		59.94	
	Structure	RC Wall rahmen structure	Scale	1/300 1/100			THE STUDY OF LOW COST HOUSING PROJECT (KTA-20) PHASE I
	Foundation	Pile foundation					

No.







Specification	Roof	Unglazed roof tile
	Outerwall	RC Wall plastering t=15
	Floor	RC slab t=100; Mortar t=30
	Wall between Houses	RC wall t=150
	Inside Wall	RC exposed; Bataco exposed; Bamboo mat.
	Structure	RC wall rahmen structure
	Foundation	Pile foundation

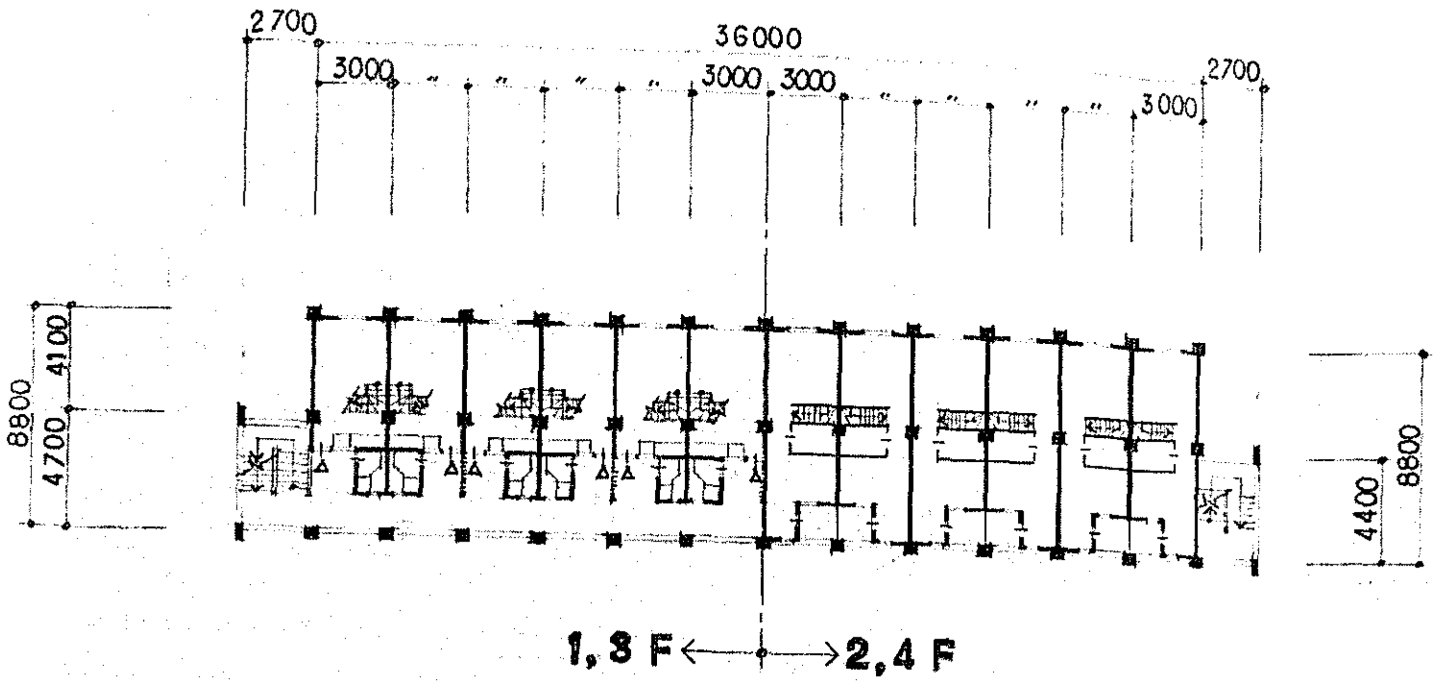
Floor Area	Net Floor Area M^2/Unit	Living Floor Area	41.69
		Veranda	9.99
		Sub Total	51.68
	Common Floor Area		8.26
	Gross Floor Area		59.94
Scale	1/300	1/100	

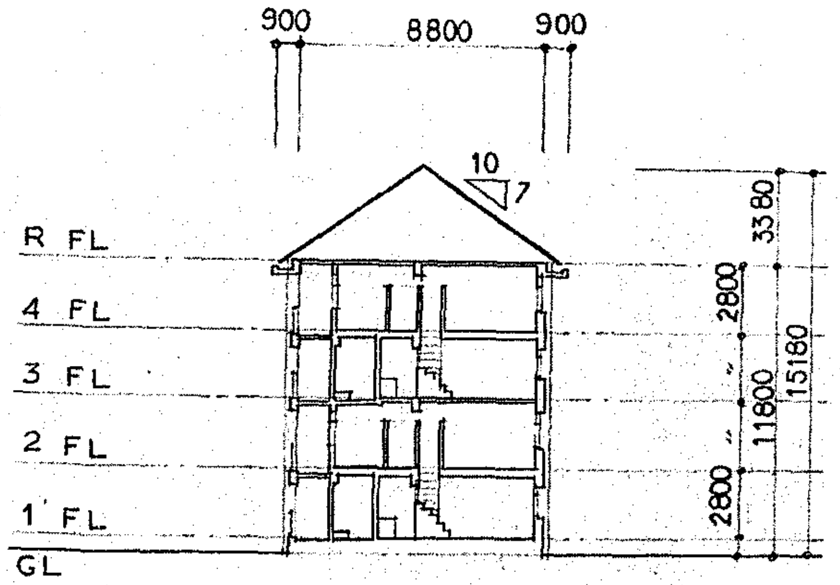
No.

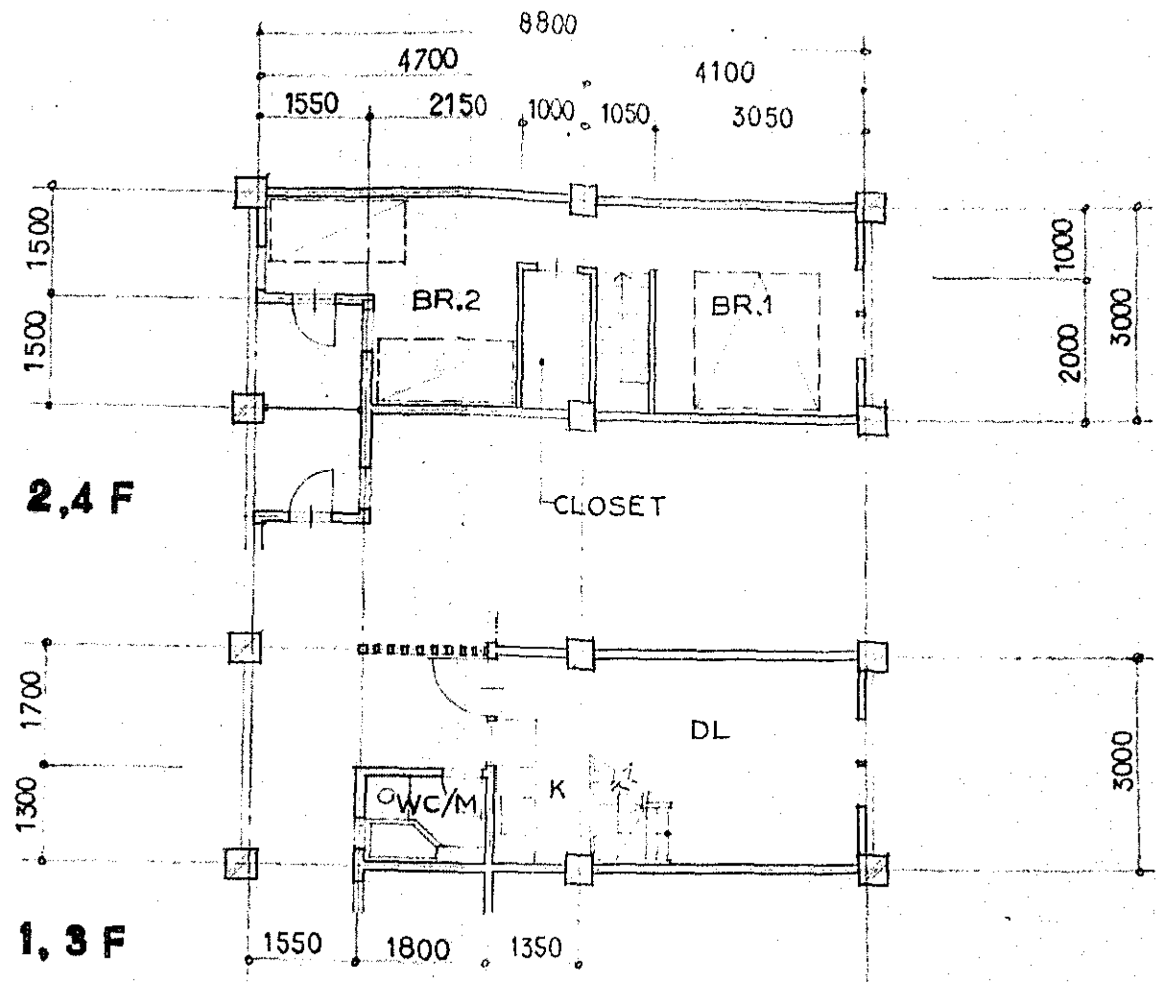
FG-45R

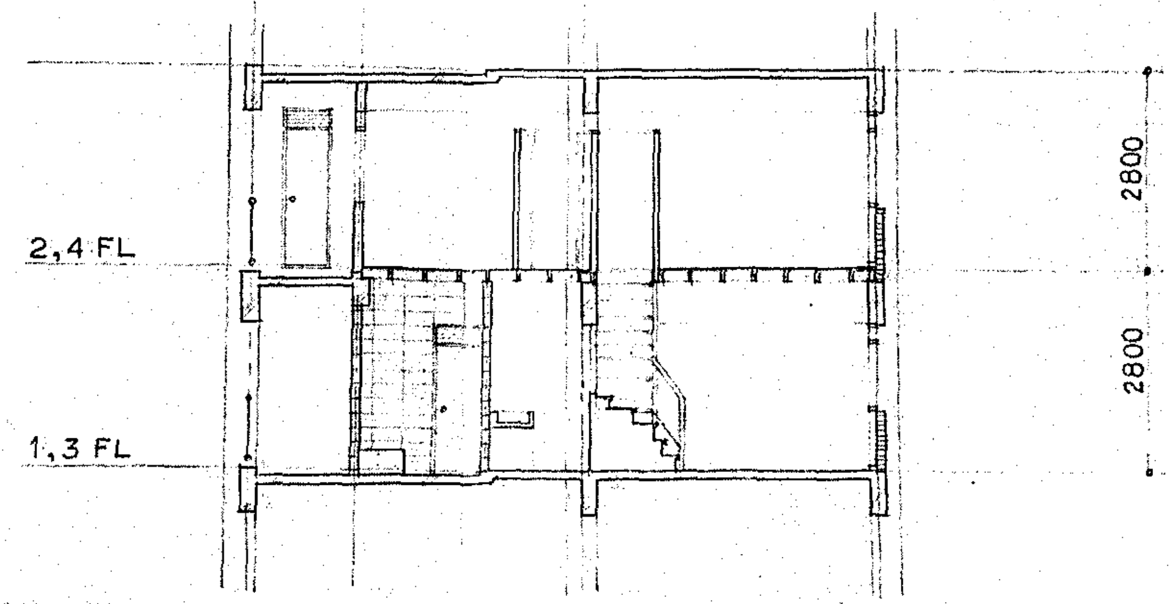
ATTIC USED FLAT TYPE

THE STUDY OF LOW COST HOUSING PROJECT (KTA-20) PHASE I









Specification	Roof	Unglazed roof tile, Borneo truss.	Floor Area	Net Floor Area M²/Unit	Living Floor Area	42.76
	Outerwall	Cement fiber board t=15, Asbesto board siding t=5			Veranda	5.39
	Floor	RC slab t=100; Particle board wooden floor.			Sub Total	48.15
	Wall between Houses	Bataco exposed t=100		Common Floor Area		4.65
	Inside Wall	Bataco exposed; Bamboo mat		Gross Floor Area		52.80
	Structure	Cloum beam rahmen structure	Scale	1/300	1/100	
	Foundation	Pile foundation				

No.

FM-45

MAISONETTE FLAT TYPE

THE STUDY OF LOW COST HOUSING PROJECT (KTA-20) PHASE I

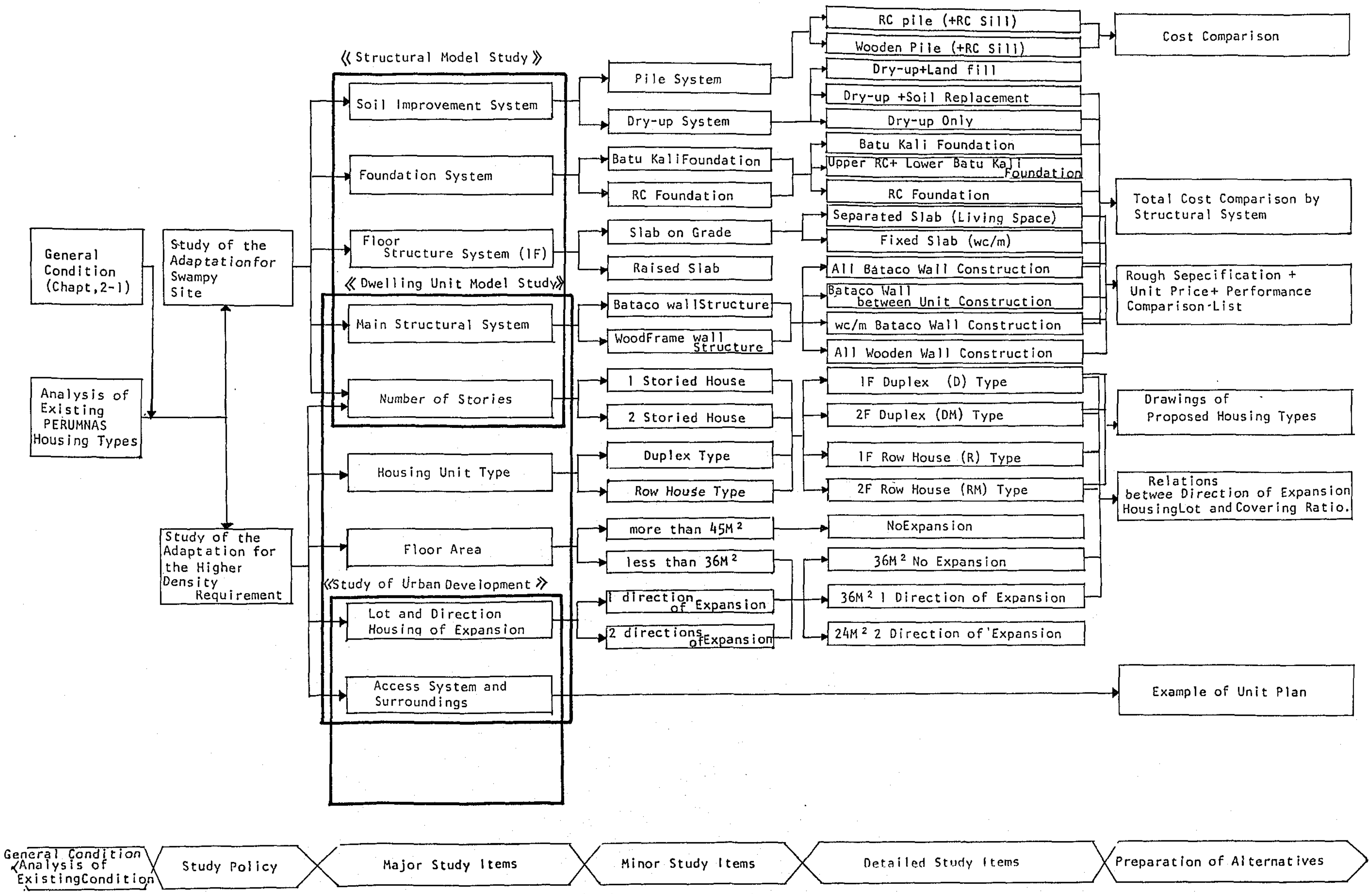
3. LOW RISE HOUSING STUDY

3-1 Study Policy

The purposes of this study are:

- o Development of low-rise housing types suitable for the site of Cengkareng; —— light-weighting + improvement of foundation, soil, etc.
- o Development of low-rise housing in response to the request of higher density.

Based upon these two purposes the studies will be done which type of the low-rise housing can be regarded as practical from the economic and technological point of view. Concretely speaking, two alternatives are proposed for each studied items and the cost/performance will be compared from individual and general points of view. The process is illustrated as follows:



General Condition (Chapt,2-1)
Analysis of Existing PERUMNAS Housing Types
Study of the Adaptation for Swampy Site
Study of the Adaptation for the Higher Density Requirement
《Structural Model Study》
Soil Improvement System
Foundation System
Floor Structure System (1F)
《Dwelling Unit Model Study》
Main Structural System
Number of Stories
Housing Unit Type
Floor Area
《Study of Urban Development》
Lot and Direction Housing of Expansion
Access System and Surroundings
Pile System
Dry-up System
Batu Kali Foundation
RC Foundation
Slab on Grade
Raised Slab
Bataco wall Structure
WoodFrame wall Structure
1 Storied House
2 Storied House
Duplex Type
Row House Type
more than 45M²
less than 36M²
1 direction of Expansion
2 directions of Expansion
RC pile (+RC Sill)
Wooden Pile (+RC Sill)
Dry-up+Land fill
Dry-up +Soil Replacement
Dry-up Only
Batu Kali Foundation
Upper RC+ Lower Batu Kali Foundation
RC Foundation
Separated Slab (Living Space)
Fixed Slab (wc/m)
All Bataco Wall Construction
Bataco Wall between Unit Construction
wc/m Bataco Wall Construction
All Wooden Wall Construction
1F Duplex (D) Type
2F Duplex (DM) Type
1F Row House (R) Type
2F Row House (RM) Type
NoExpansion
36M² No Expansion
36M² 1 Direction of Expansion
24M² 2 Direction of Expansion
Cost Comparison
Total Cost Comparison by Structural System
Rough Sepecification + Unit Price+ Performance Comparison List
Drawings of Proposed Housing Types
Relations betwee Direction of Expansion Housing Lot and Covering Ratio.
Example of Unit Plan
General Condition Analysis of Existing Condition
Study Policy
Major Study Items
Minor Study Items
Detailed Study Items
Preparation of Alternatives

3-2 Structural Model Study

3-2-1 Types of Upper Structure and the Foundation Costs

The types of upper structure are classified into the buildings (1 or 2-storied) of wood, bataco and reinforced concrete, in which the first floor slab is the raised one or the slab on grade while the foundation is built of RC or Batukali. The structural cost is estimated according to the expected value of the bearing capacity of soil. The results show that RC foundation is the cheaper so far as the width of foundation is less than 0.9 m.

Conditions for calculations are as follows:

Upper Structure:

Elements	Finishing materials	Design loads (kg/m^2)	
Roofing	Tiles (20 mm thick, $\gamma = 1.6$)	40	60
Truss		20	
Flooring	Wooden board + joist		40
External wall	Asbestos slate (4.5 mm thick)	20	30
	Fiber cement board (15 mm thick)	5	
	Wood stud	5	
Internal wall	Bataco (100 mm thick)		200
	Bamboo + Wood stud		10
Unit wall	Fiber cement boards (25 + 50 + 25 mm thick)		35

Lower structure: RC foundation (continuous footing).

The calculation is made on each work of concrete, reinforcement, forms and earth. The dimensions of foundation are assumed as shown in the figure II-3-1 and the table II-3-1, but for its heights the fixed value of 50 cm is adopted.

FIG. II-3-1 R.C. Foundation
(Wall Footing)

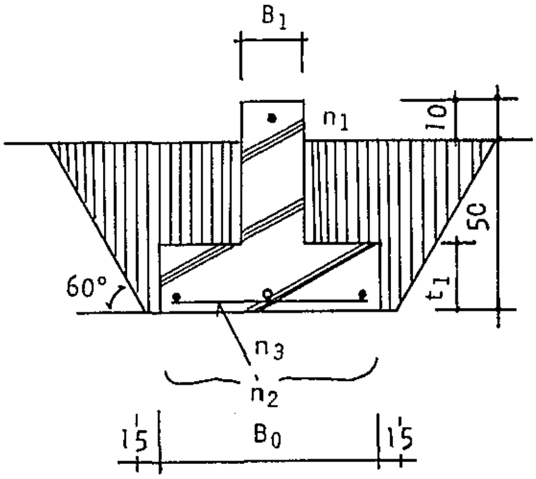


TABLE II-3-1

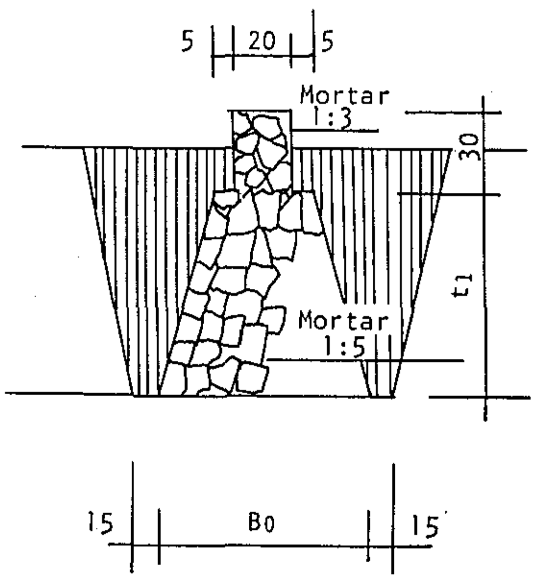
cm

B0	B1	t1	Reinforcing Bar		
			n1	u2	u3
50	15	15	1-13φ	3-13φ	-
70	15	15	1-13φ	3-13φ	9φ-300@
100	15	20	1-13φ	4-13φ	9φ-300@
150	20	20	2-13φ	4-13φ	9φ-200@
200	20	25	2-13φ	6-13φ	9φ 13φ-200@

Concrete Strength: Fc ≥ 175 kg/cm

U - 24

FIG. II-3-2
BATU KALI FOUNDATION (WALL FOOTING)
(RIVER STONE)

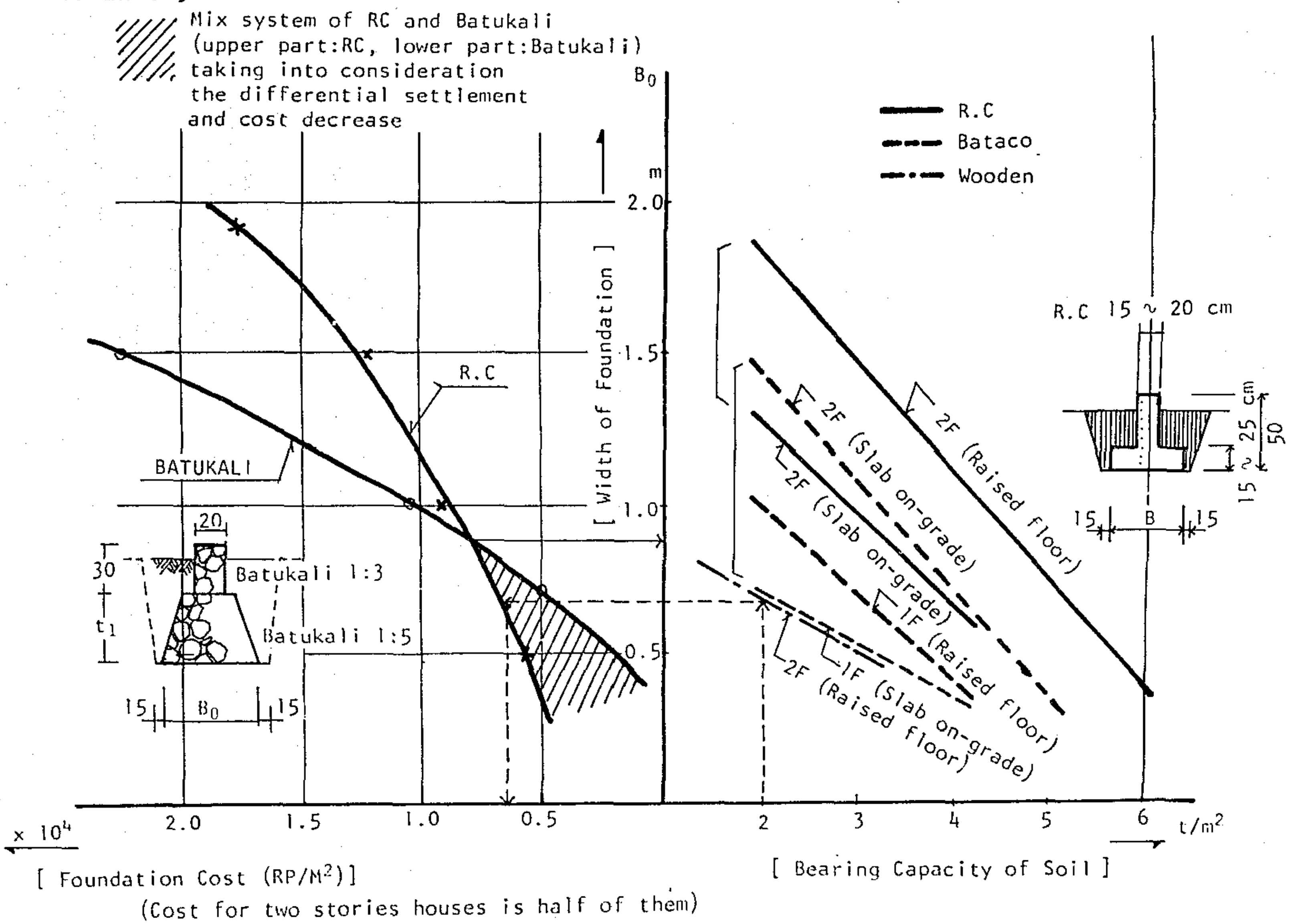


cm

B0	t1
50	20
70	55
100	80
150	150
200	

SEVERAL TYPES OF HOUSINGS AND FOUNDATION COST

FIG. II-3-3



3-2-2 Soil Improvement for Foundation and the Costs

As the site is now used as rice field, the following methods can be considered for soil improvement for foundation:

A. Dry-up Method:

Further classified into:

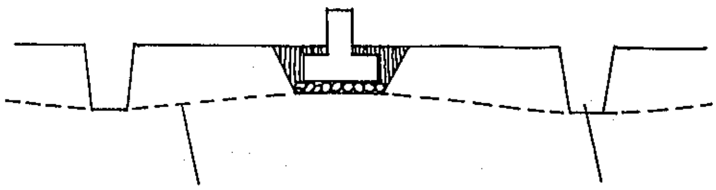
- o dry-up only;
- o dry-up and soil replacement; and
- o dry-up and landfill;

B. Pile Method:

The details of the above methods are expalined as follows:

A) Dry-up method:

Foundation is set on the existing ground after the ground-water level is lowered. The water level has to be lower than the bottom of the foundation.



a) Determining depth, width, interval of drainage ditches to lower the ground-water level:

(For this purpose, the survey must be done to see how deep the water level becomes and how deeply the soil get dry when the irrigation canals are closed at the dry season. Drainage by ditches may not be always required, depending on the level of the groundwater. However, surface drainage, as well as prevention of water inflow, will be necessary after foundation is completed.)

- o The ditch drainage will be done after closing irrigation canals. The depth, width, interval, etc. of the ditches are determined according to the water permeability of the soil and the level of the lowered groundwater.

- o A method is proposed: it may be practical to use trenches for continuous footing as the drainage ditches. If location of the continuous footings for each housing block is fixed, the drainage ditches can be made by combining those trenches. The foundation will be constructed after the ditches get dry.

- o It is questionable whether or not such ditches for surface drainage are required. (In practice, it may be possible to drain the in-site water from the lowest part of the site toward the adjacent land by cutting the ridges of the rice field after closing the irrigation canals.)

b) Bearing capacity of soil: the soil test has been done for the soil of more than 2 m under the existing ground level. The average soil data has been revealed as follows:

weight per volume	:	$\gamma t = 1.6\ t/m^3$
cohesion	:	$C = 3.7\ t/m^2$
angle of internal friction	:	$\phi = 10°$

It is necessary to know the sub soil condition under foundation level (bearing capacity of oil by load test, if possible), especially the data after draining surface water or lowering the groundwater level. Although the test for the swelling capacity of this soil was not done this time, the soil in Cengkareng is expected the same as in Cirebon, illitic clay and mont-morillonite clay. It is said that the volume of this soil varies between 2 % and 10 % according to the change of water content. Therefore, it is necessary to execute appropriate prewetting or compaction controle of the soil in case the continuous footings is set directly on the soil after dry-up. Prior to this, it is indispensable to do an accurate examination on the relation between change of density and water content of the soil and its bearing capacity.

c) Calculation formulas for bearing capacity of soil:

Continuous footing:

$$q_d = CN_c + qN_q + 1/2\ \gamma^{*1} BN_r \quad (1)$$

Independent square footing:

$$q_d = 1.3\ CN_c + qN_q + 0.4\ \gamma BN_r \quad (2)$$

Independent circular footing:

$$q_d = 1.3\ CN_c + qN_q + 0.3\ \gamma BN_r \quad (3)$$

q : γD_f (γ: weight per unit volume
D_f: depth of embedment)

C : Cohesion

N_c N_q N_r : coefficient of bearing capacity[*2] (function of Ø)

*1 γ is the weight in water in case the footing is below the groundwater level.

B: width of footing

*2

Ø	Nc	Nq	Nr
0	5.7	1.0	0
5	7.3	1.6	0.5
10	9.6	2.7	1.2
15	12.9	4.4	2.5
20	17.7	7.4	5.0
25	25.1	12.7	9.7
30	37.2	22.5	19.7
35	57.8	41.4	42.4
40	95.7	81.3	100.4
45	172.3	173.3	297.5

Bearing capacity in case $C = 3.0\ t/m^2$
$Ø = 10°$
$\gamma = 1.6\ t/m^3$

$$q_a = 1/3\ (3.0 \times 9.6 + 1/2 \times \underbrace{0.6}_{\text{note)}} \times B \times 1.2)$$
$$= 9.6 + 0.12\ B$$

note) 0.6 = 1.6 - 1.0)

(GL - 2.0 m, Cengkareng)

$C = 3.0\ t/m^2$

$\phi = 10°$ $\quad\quad$ $Nc = 9.6$, $Nq = 2.7$, $N = 1.2$

$\gamma = 1.75\ t/m^3$ $\quad\quad$ $Df = 0.4\ m$

$$q = 1/3\ (3.0 \times 9.6 + 0.75\ t/m^3 \times 0.4\ m + 1/2 \times 0.75 \times B \times 1.2)$$

$$= 1/3\ (28.8 + 0.3 + 0.45 \times B)$$

$$= 1/3\ (29.1 + 0.45 \times B)$$

If $B = 0.5\ m : q = 9.7\ t/m^2$

If $B = 1.0\ m : q = 9.85\ t/m^2$

If $B = 1.5\ m : q = 9.92\ t/m^2$

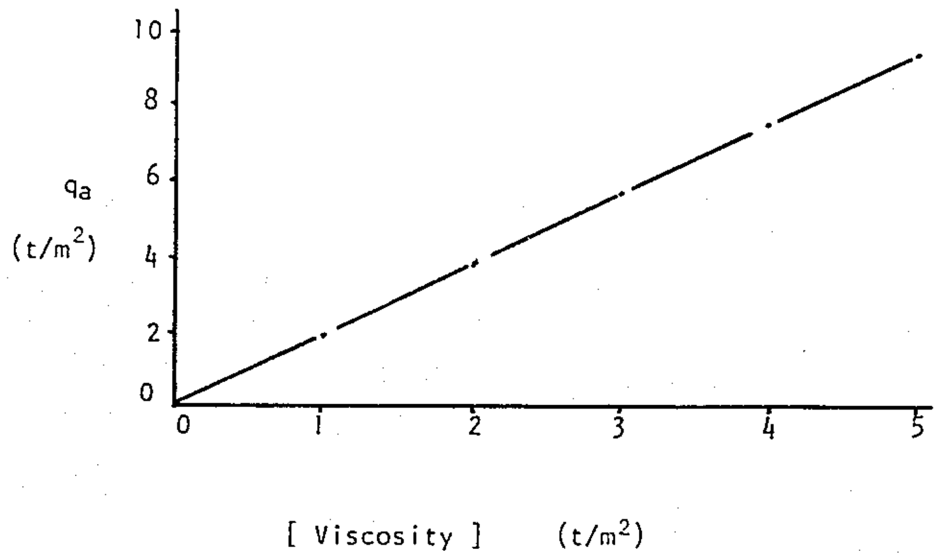
This calculation suggests that the designed bearing capacity of soil 2.0 m under the existing ground may amount to nearly 10 t/m^2. Further physical examination on the soil around -1.0 m will be required.

FIG. II-3-4

BEARING CAPACITY ALLOWANCE OF VISCID SOIL q_a

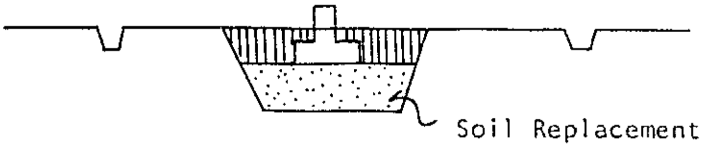
Relation between C and q_a

($\phi = 0$)



B) Soil Replacement Method:

This is the method of replacing the soil beneath the bottoms of the footings after surface drainage. The replacement sand or soil is filled after using the footing trench as a drainage ditch or after draining it by pump. In later case, the drainage ditch can be small.



a) Problems:

It is difficult to design the footing without knowing the bearing capacity of the replacement sand or soil after compaction. In case of sand, however, it is possible to design the footing even if the cohesion is presumed to be zero, because the sand can be compacted so easily as to get the internal angle of friction 25 - 30 degrees. Bearing capacity of replacement sand or soil varies with the way of compaction on which the angle of internal friction depends. Therefore, it also depends on whether replacement soil or sand is above or under the groundwater level. One example is shown in the following formulae and figures:

$$q_a = 1/3\ (1/2 \cdot \gamma \cdot B \cdot Nr)$$

γ : soil weight per unit volume

B : width of footing

Nr : coefficient of the bearing capacity (function of ϕ)

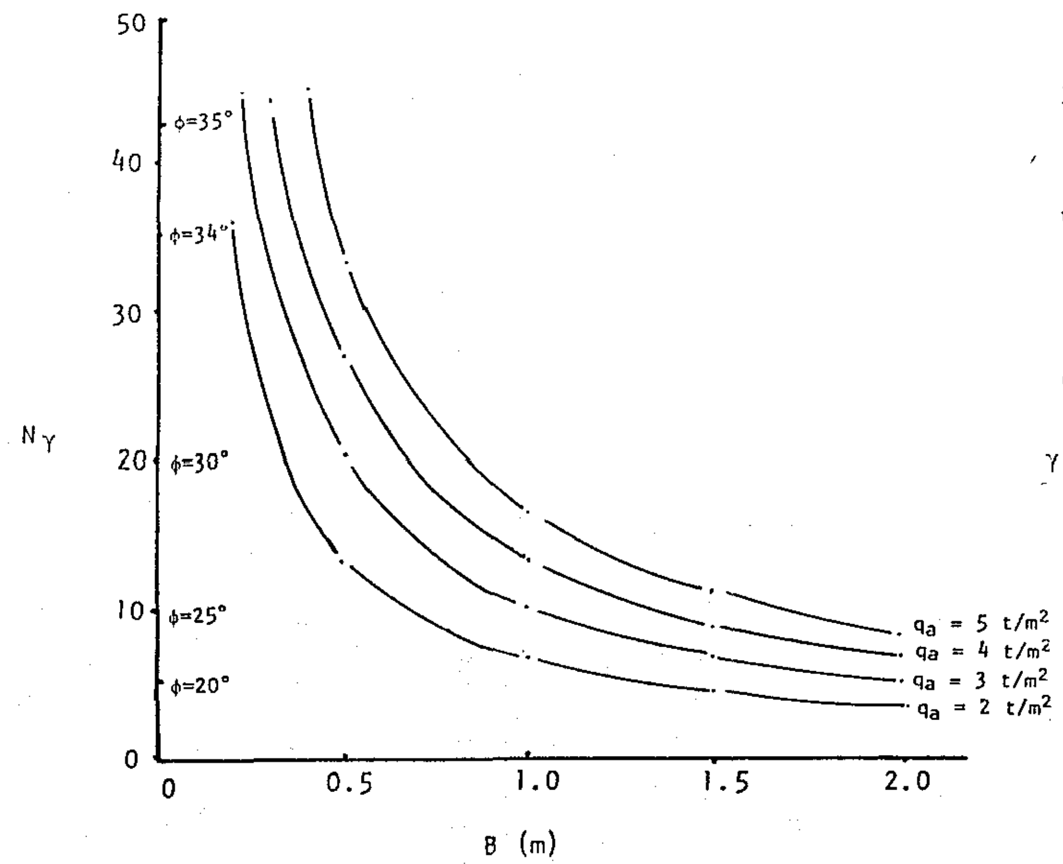


FIG. II-3-5

WIDTH OF FOUNDATION "B" AND FRICTION ANGLE "φ" COPING WITH BEARING CAPACITY OF SOIL "qa"

$$q_a = \frac{1}{3}\left(\frac{1}{2}\gamma \cdot B \cdot N_\gamma\right)$$

γ : Soil Weignt per M^3

$(\gamma = 1.8\ t/m^3)$

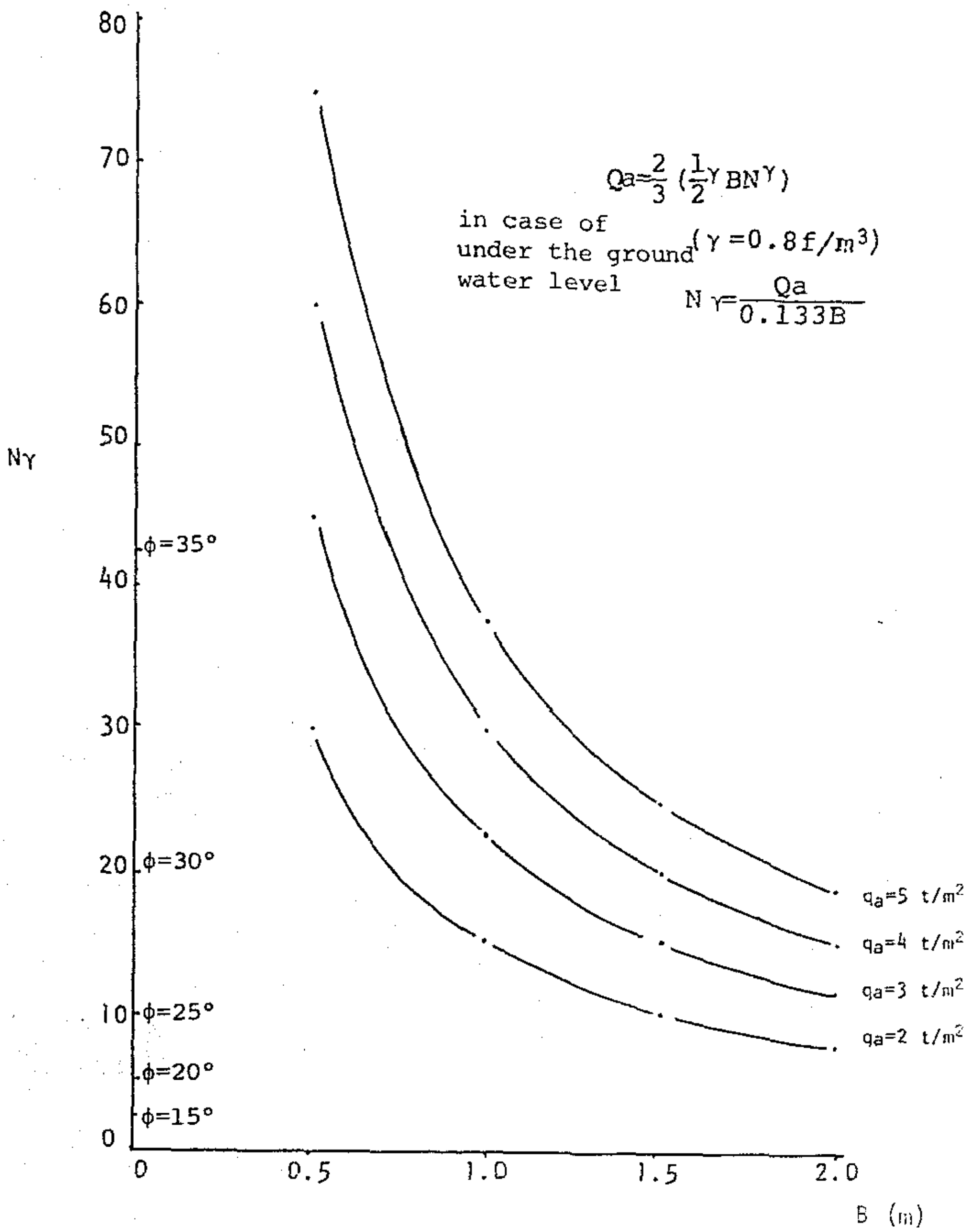


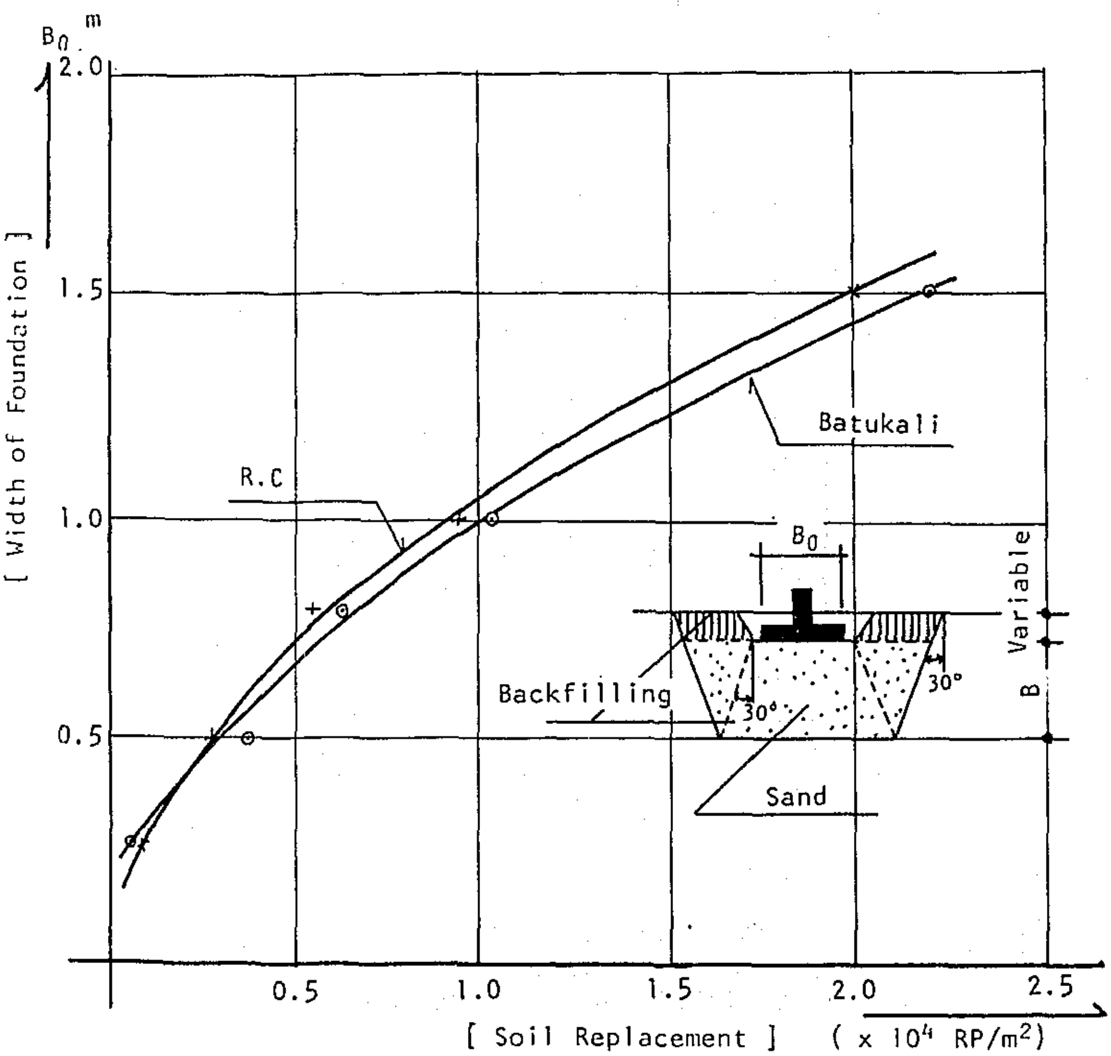
FIG. II-3-6

FRICTION ANGLE "φ" OF LAND FILLING SOIL AND WIDTH OF FOUNDATION "B" NECESSARY FOR MAINTAINING BEARING CAPACITY OF SOIL

b) Subsoil Replacement and the cost:

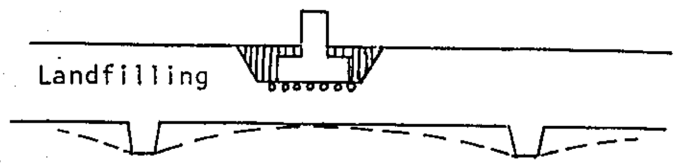
In this study, sand is used as replacement soil and the costs of subsoil improvement (sand + backfilling soil) are estimated within the limit shown in the figure II-3-7. The principal values derived from the continuous footing which is designed based on the expected bearing capacity of soil mentioned before, and its width is used as a variable. The result shows that foundation of reinforced concrete is approximately 10 % cheaper than that of Batukali.

FIG. II-3-7
SOIL REPLACEMENT AND COST



C) Landfill Method

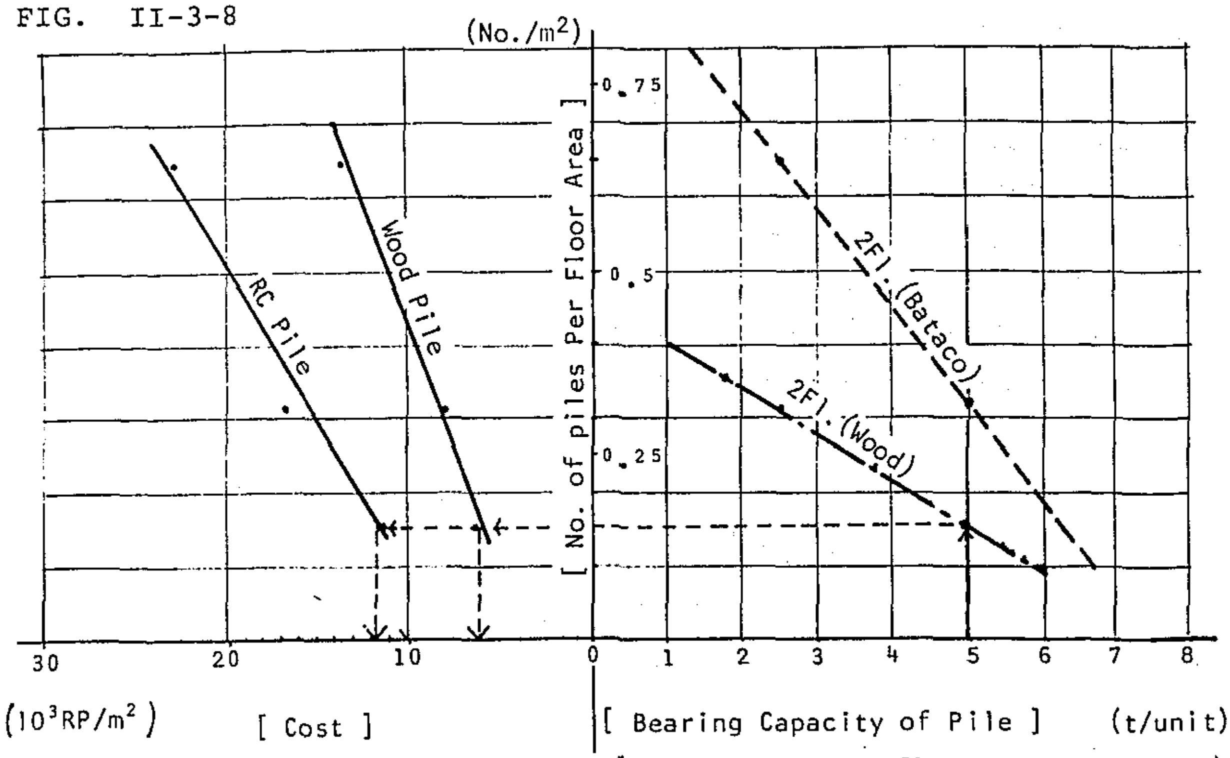
Landfill is done after surface drainage. Landfill thickness is, desirably, the same as the footing width B beneath the bottom of footing. Drainage ditch can be small because this method requires only surface drainage. If it is impossible to fill the soil as thick as B beneath the bottom of footing, it will be necessary to improve the existing surface soil by using sand (about 30 cm thick), etc., for the lower part of the filling soil.



B) Pile Method:

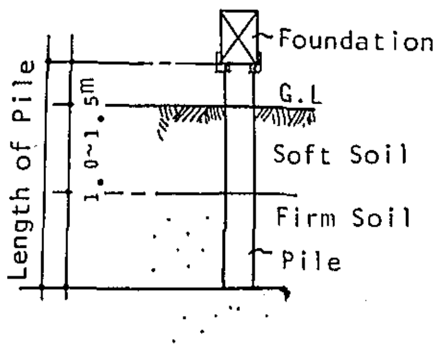
Figure II-3-8 shows how the estimated cost of piles (including base sills) varies according to the type of upper structure. In this estimation, costs of surrounding area such as foot path and gardens around buildings are not included (the estimated area is within the coverage of the buildings). Both buildings of wood and bataco are supposed to be 2-storied and costs of wooden piles and reinforced concrete piles with the base sills of 15 cm x 18 cm (wooden) and 20 cm x 30 cm (reinforced concrete) depend on the bearing capacities of pile are estimated. As a result, the cost of wooden piles is 60% of the cost of reinforced concrete piles assuming the bearing capacity of pile is equal.

FIG. II-3-8



(Cost per ground floor area is shown)

		Wooden Pile	RC Pile
Material		Borneol V Preservative Treatment: 1m Upper Part	Fc ≧ 300 kg/cm² u-24
Diameter at the Point		20^c	15^c x 15^c 4-13φ, Hoop 9φ-@300
Length	5.0 t/unit	5.0^m (Firm Soil 2.5^m)	5.0^m (Firm Soil 2.0^m)
	2.5 t/unit	3.75^m (Firm Soil 1.25^m)	3.75^m (Firm Soil 1.0^m)
Foundation		15^c x 18^c Preservative Treatment	20^c x 30^c 4-16φ, St 9φ-@300



pile method will be classified the following two major ways:

(1) Application of pile method only for supporting building:

(2) Application of pile method for supporting surrounding gardens and approaches as well as building itself; —— Idea of artificial ground.

For the purpose of (1), the application of pile method is out of question because the cost of pile is much higher than that of subsoil replacement and footings. This can be concluded from the figure II-3-3 and II-3-8.

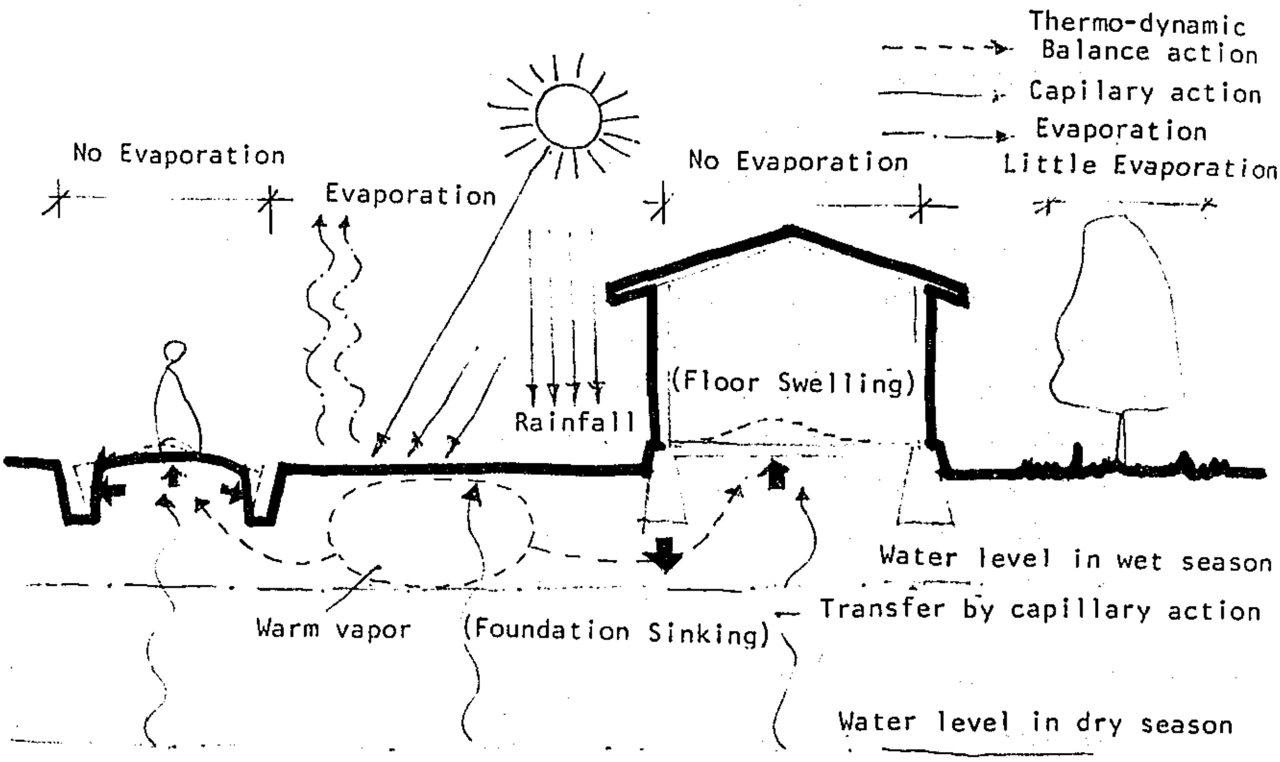
For the purpose of (2), the application of pile method is worth consideration only when the artificial ground can make it possible to omit the costs of subsoil improvement, drainage, construction of approaches, etc. Therefore, the application of this method presupposes the comprehensive study covering site planning, infrastructural design, land development, architectural design and structural design. This is considerably different from the other method at its starting stage.

3-2-3 Characteristics of Soil and its Countermeasure

As mentioned before, surface soil in Cengkareng is much probably the expansive soil as is observed in Perumnas housing estate in Cirebon, etc. The problem in this case derives from not only expansive soil, but also the complicated phenomena by differential settlement and swelling. The case of Cirebon features the following four distinct problems:

- o Damage to foundation: sinking of continuous footings caused by the differential settlement (occurs at the dry season);
- o Damage to floors: expansion of floor centers caused by the swelling (occurs at the rainy season);
- o Damage to gutter: destruction of side wall of gutters (occurs at rainy season)
- o Damage to roads: rising of road centers caused by the swelling (occurs at rainy season).

As for foundation, the countermeasure to only differential settlement is mentioned in 3-2-1 because the damage to foundation (rising) caused by expansive soil has not been observed yet even in the wooden wall types of housing in Cirebon.



As illustrated in the above drawing, swelling easily occurs in the covered places (road and house) where damp air is condensed, and cracking occurs in the uncovered places at the dry season. As the countermeasure to these problems following 5 methods are pointed out according to the report on Cirebon project by Mr. P. H. Diebel, D.H.V. Consulting Engineer:

1) Isolation method;
2) Pre-wetting method;
3) Compaction control method;
4) Soil replacement method;
5) Soil stabilization method.

Method of 2) and 3) have been adopted in Cirebon. Pre-wetting method was made as a countermeasure to the swelling of floor slab and ended in success; when the continuous footings were completed, the floor construction was executed immediately after the water was absorbed which filled the pool enclosed by continuous footings for two days. On the other hand, the compaction control ended in failure. All floors by this method were damaged. The further study must be done because those phenomena have not been clearly analyzed yet. The raised floor system (the first-floor-load is directly imposed on the foundation. Figure II-3-3) is fully effective as a countermeasure to expansive soil, but it is rather costly and the slab on grade will the optimum compromise with following countermeasures to expansion of floor which will certainly occurs in this system;

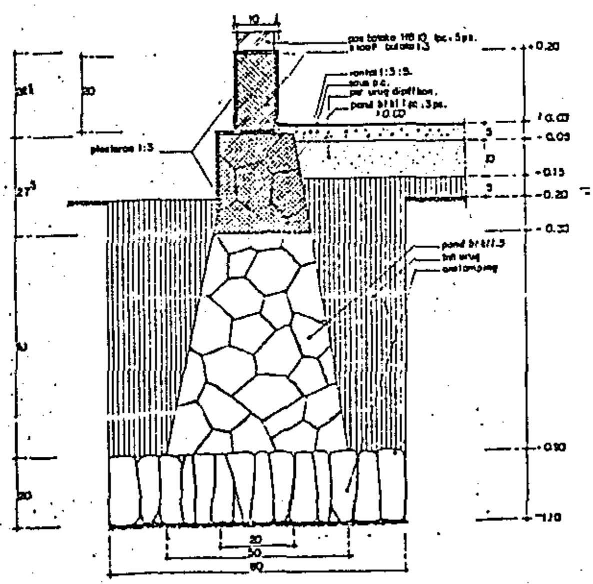
1) separation between floor slab and foundation (free floor);

2) divided floor slab for large rooms (use of floor expansion joints);

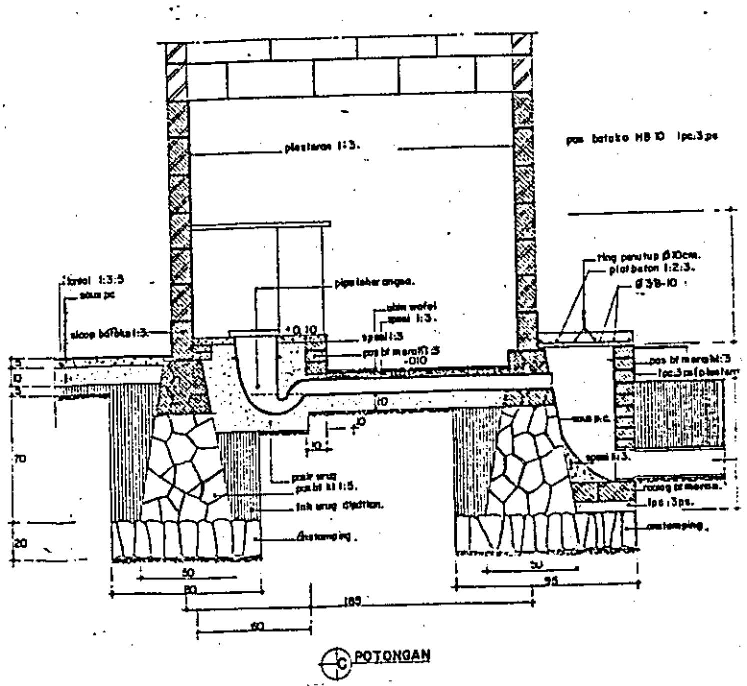
3) integration of WC/M floor slab with foundation (so that floor and pipings may move together and junction pit will be constructed.

4) prewetting just before floor work.

The details of the examples of the floor in Cirebon are shown below:



Floor and Foundation
(General)



Floor and Foundation
(wc/Mandi)

3-2-4 Total Cost Comparison by Upper Structure, Soil Improvement, Foundation System.

TOTAL COST COMPARISON BY DIFFERENT SYSTEM OF UPPER STRUCTURE, SOIL IMPROVEMENT AND FOUNDATION

Unit Type (floor Area)	Wall Structure System		1F Floor Slab System		Foundation System			Expected bearing capacity of soil after dry-up (without soil replacement) $2t/m^2$					Expected bearing capacity or soil after dry-up +soil replacement by sand under foundation $4t/m^2$					SELECTED TYPE
	BATACO	Wooden	Slab on grade	Raised slab	RC	Batu Kali	RC+ Batu Kali	EW	INSEC	F	US	TOTAL (10^3Rp/m^2)	EW+SI	INSEC	F	US	TOTAL (10^3Rp/m^2)	
1F D-20 (23.80m^2)	O		O			O		0.5	-	4.5	27.7	32.7	0.9	-	1.0	27.7	29.6	O
	O			O	O			0.9	-	8.5	32.3	41.7	2.0	-	1.5	32.3	35.8	
		O	O			O		0.3	0.7	2.5	36.3	39.4	0.9	0.7	1.0	36.3	38.9	
		O		O		O		0.3	1.9	2.6	40.9	45.7	0.9	1.9	1.0	40.9	44.7	
1F D-36 (37.25m^2)	O		O			O		0.5	-	4.5	23.1	28.1	0.9	-	1.0	23.1	25.0	O
	O			O	O			0.9	-	8.5	25.3	34.7	2.0	-	1.5	25.3	28.8	
		O	O			O		0.3	0.4	2.5	28.9	32.1	0.9	0.4	1.0	28.9	31.2	
		O		O		O		0.3	1.5	2.6	31.0	35.6	0.9	1.5	1.0	31.0	34.4	
2F DM-24 (23.94m^2)		O	O			O		0.3	0.8	2.3	33.4	36.8	0.9	0.8	1.0	33.4	36.1	O
		O		O		O		0.3	1.4	2.4	36.2	40.3	0.9	1.4	1.0	36.2	39.5	
	O		O		O			0.7	-	6.2	29.2	36.1	2.5	-	2.5	29.2	34.2	
	O			O	O			0.9	-	8.5	32.1	41.5	3.9	-	5.0	32.1	41.0	
2F DM-36 (34.56m^2)		O	O			O		0.3	0.5	2.3	29.9	33.0	0.9	0.5	1.0	29.9	32.3	O
		O		O		O		0.3	1.0	2.4	32.8	36.5	0.9	1.0	1.0	32.8	35.7	
	O		O		O			0.7	-	6.2	27.3	34.2	2.5	-	2.5	27.3	32.3	
	O			O	O			0.9	-	8.5	30.2	39.6	3.9	-	5.0	30.2	39.1	
2F M-45 (44.88m^2)	O		O		O			0.7	-	6.2	(26.3)	33.2	2.5	-	2.5	(26.3)	31.3	O
	O			O	O			0.9	-	8.5	(29.2)	38.6	3.9	-	5.0	(29.2)	38.1	
2F M-45A (47.70m^2)		O	O			O		0.3	0.3	2.3	28.8	31.7	0.9	0.3	1.0	28.8	31.0	O
		O		O		O		0.3	0.7	2.4	31.8	35.2	0.9	0.7	1.0	31.8	34.4	

EW : Earth work cost SI : Soil replacement INSEC : Insectisidation F : Foundation cost
US ; Upper structural cost ( )* : Estimated cost from DM-36

Judging from the matrix for total cost comparison in the previous page, the following can be pointed out;

A) Wall structure types and the total costs:

In comparison between bataco walls (without reinforcement) and wooden walls (unitwall and exterior wall both built of fibre cement boards and mortar), bataco wall proves to be the cheaper as supposed. At the next stage, the comparison of cost/performance will be attempted between bataco wall (with and without reinforcement), concrete block wall (with and without reinforcement) and wooden wall. This is because the cost of walls (especially unitwall and exterior wall) affects so much the total cost of the building than that of subsoil improvement and foundation in case of one-storied housing. Even if concrete block is used to improve the wall performance, this difference can not be made up with. When compared between bataco wall and wooden one for the two-storied housing, the effect of subsoil improvement cost and foundation cost is unneglectable big and the differences between building costs of the 24 m^2 type, the 36 m^2 type and the 45 m^2 type are fairly small. At the next stage, further detailed study (especially on the condition of soil, cost and material) may reveal the change of order in cost by those wall types. This will be the main subject of the next study of two-storied housing proposed in response to the request of higher density.

B) Floor structure type and the total costs:

Among the structural types of the first floor, slab on grade system is appropriate, considering its cost as shown in the comparison matrix. The cost of the raised floor largely affects the total building cost, especially in case bataco or other block are adopted. Although the cost varies depending on how to treat the expansive soil, the adoption of the slab on grade type is proposed at the present stage. As for structural type of the second floor, wooden floor has to be adopted in terms of building cost. This arouses the problem of necessary reinforcement in the middle and upper part of block walls. This cost comparison is made including RC frames (also used as joist support with corner reinforcement) of 12 cm x 15 cm (external wall) and 12 cm x 20 cm (unitwall) in section.

C) Foundation types and the total costs:

Either RC foundation or Batukali foundation is sellected in Table II-3-5 for each case based on the results shown in Fig. II-3-3. But considering the inevitable differential settlement in practice, the compromised proposal of reinforced concrete - Batukali is the most recomendable type of foundation. By adopting this, the foundation cost of the Batukali sellected type may rises a little, but RC foundation sellected types doesn't change in cost.

3-3 Dwelling Unit Model Study

3-3-1 Analysis of the Existing Housing Types of Perumnas and the Floor Area

In housing types of Perumnas, there are Duplex types: D-20, 36, 45, 54, 70 and their variations, and Maissonette types: M-45 and M-70. The analysis of the above mentioned 7 types as basic types are made.

In Duplex types, D-20 consists of one room + WC. D-36 and D-45 consist of 2 rooms and LD.K + WC and have same room composition but each room of D-45 are larger than those of the others. Both D-54 and D-70 consist of 3.LD.K + WC + storage but D-70 has 2 living rooms and 2 WCs, allowing for the rich inner spaces. Storage is considered only at the level of these two types. This is summarized as follows:

One room type - for lower low-income families
2.LD.K type - for middle low-income families
3.LD.K type - for upper low-income families

Viewing the distribution of each type in each project as listed, D-36 and D-45 types prove to dominate in percentage, and the distribution deviates according to the characteristics of each project.

project \ floor area	One room	2.LD.K		3.LD.K	
	$20\ m^2$	$36\ m^2$	$45\ m^2$	$54\ m^2$	$70\ m^2$
DEPOK I	5.1 %	26.7 %	48.2 %	-	20.0 %
DEPOK UTARA	-	9.2 %	23.2 %	-	67.6 %
DEPOK II	4.67 %	23.2 %	14.7 %	8.7 %	6.6 %
KLENDER	-	-	76.7 %	14.9 %	8.4 %

For example, Depok Utara project sets the target high with the $70\ m^2$ type as major, and the newest project among these of Depok II sets it low, with the D-20 type as major.

From the point of view of structural methods and building materials, roof (of corrugated asbestos) and floor (of P C tiles) do not make much difference in all projects. Wall types can be classified roughly into two kinds: one made of batacos and the other made of wooden frames but in both kinds, unitwalls are all built of batacos.

As for the interior finish, "Do-it-yourself" system is adopted largely, so that the interior finish is almost minimized. This makes the initial cost very low. Our impression in general after visiting those housing project is described as follows:

One room type	Many of these were extended soon after residing;
D-36 type	Some extensions are observed, but additions of covered veranda are prevalent;
D-45 type and the larger type	Very few extensions of building but many additions of covered veranda or car port are observed in general.

Each family has carried out the additions and improvement of fence or gate and the spaces around the housing at their disposal. People buy building materials from the shops spontaneously set around the housing complex. These are epitomized as follows:

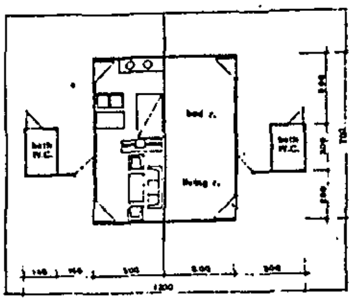
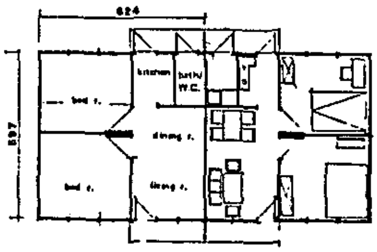
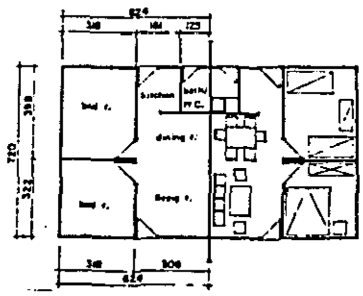
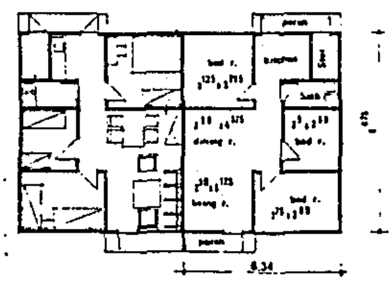
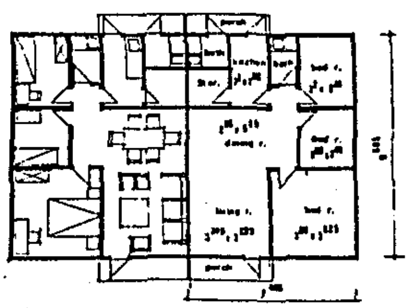
(1) Distribution of housing unit in which the 2.LD.K type dominates;

(2) Recent decreasing trend of floor area;

(3) Two structural types of walls: bataco walls and wooden frame walls;

(4) Complete introduction of "Do-it-yourself" system;
- finish is minimized;
- the 36 m^2 type is on the boarderline between extension and improvement only.

EXISTING HOUSING TYPES
OF
PERUMNAS
1. DUPLEX TYPES

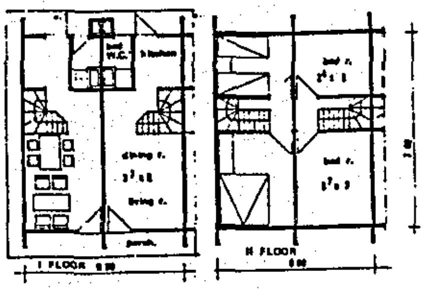
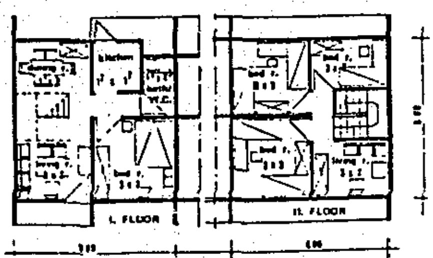
Type	Plan	Floor Area (M2)	Dinning Living	Kitchen	Bed R. 1	Bed R. 2	Bed R. 3	M/wc	Storage	Main Material: Skelton	Floor	Wall	Roof
TYPE D-20		23.8		21.0		—	—	2.8	—	Steel/concrete	con.slab	bataco	corr.asbestos
TYPE D-36		37.25	11.84	3.70	9.49	9.49	—	2.73	—	Steel/concrete	PC tile + multiplex	bataco	corr. asbestos
TYPE D-45		44.93	16.37	3.35	10.24	12.66	—	2.31	—	Steel/concrete	PC tile + multiplex	bataco/particle board	corr. asbestos
TYPE D-54		58.77	19.43	6.84	10.30	9.71	6.48	3.00	2.51	Steel/concrete	PC tile + multiplex	bataco	corr. asbestos
TYPE. D 70		72.59	27.82	6.10	13.96	7.90	6.22	5.99	3.49 + 1.11	Wood or Steel/concrete	PC tile or PC tile + multiplex	bataco or bataco/particle board	corr. asbestos

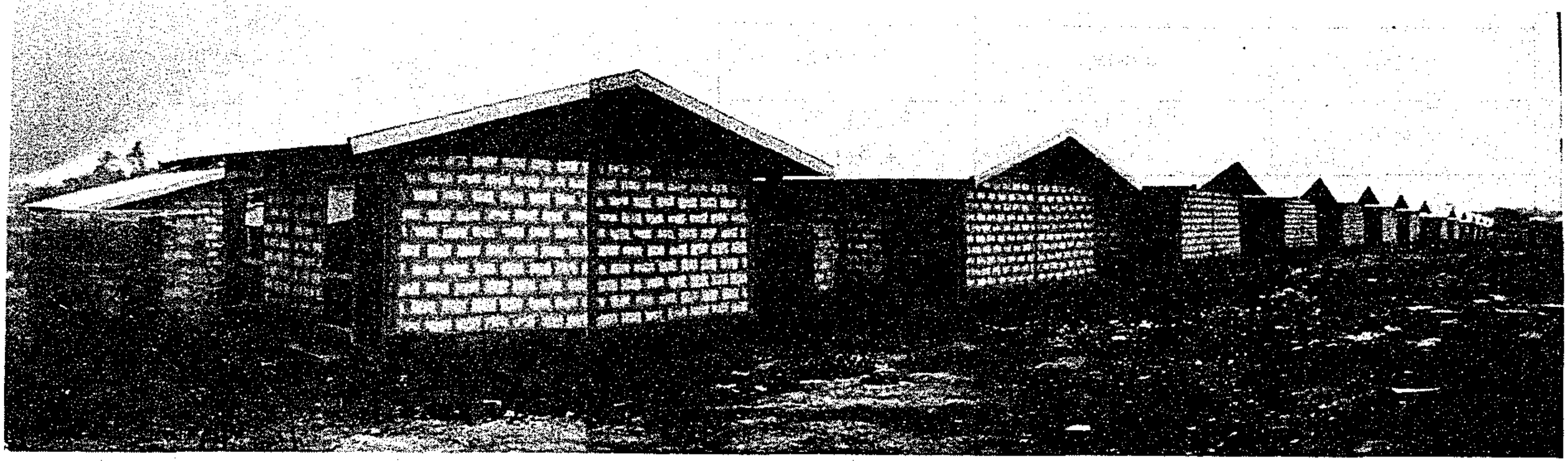
EXISTING HOUSING TYPES

OF

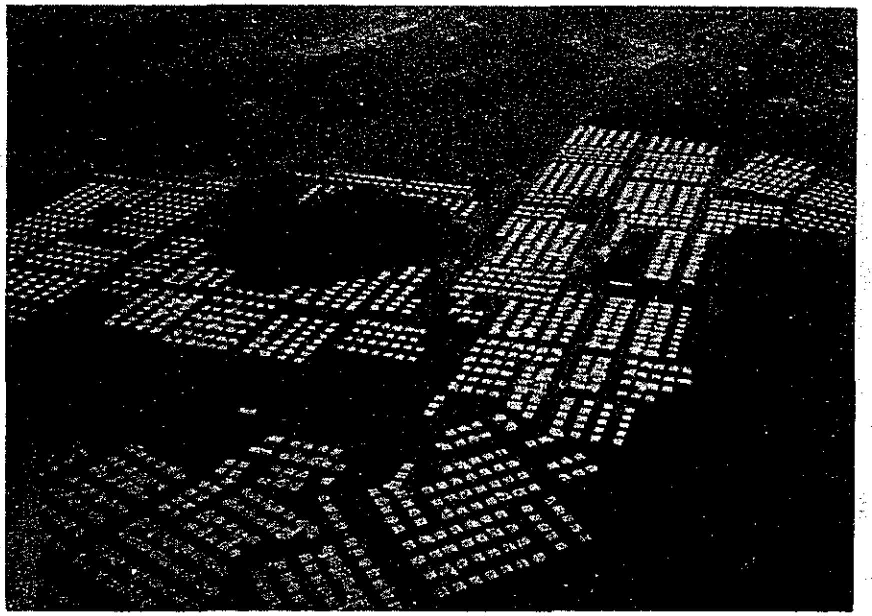
PERUMNAS

2. MAISONETTE TYPE

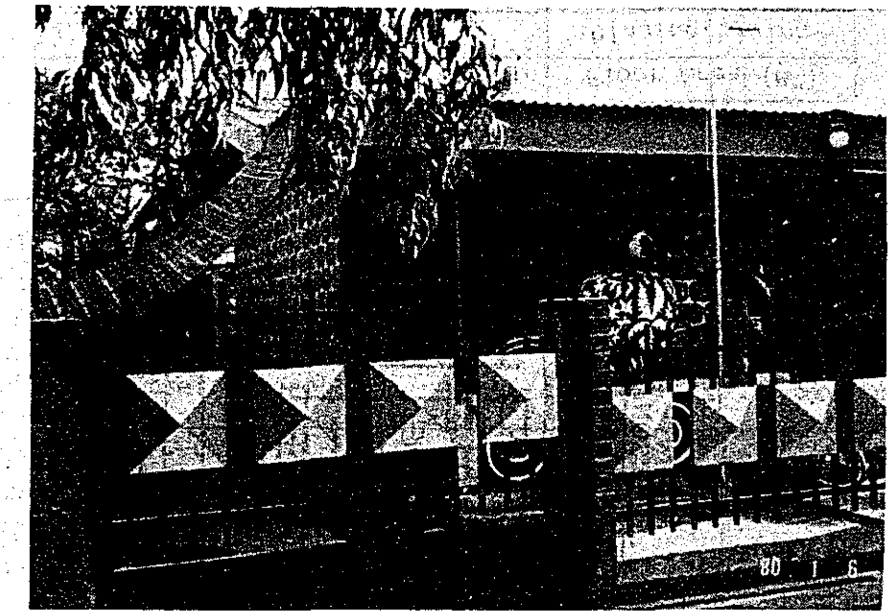
Type	Plan	Floor Area (M^2)	Dinning Living	Kitchen	Bed R. 1	Bed R. 2	Bed R. 3	M/wc	Stair	Main Material	Skelton	Floor	Wall	Roof
TYPE M-45		44.88	13.21	3.64	11.10	7.20		2.42	7.31	—	Steel/concrete	tile + multiplex	bataco	corr. asbestos
TYPE M-70		71.35	6.00+14.00	2.89	9.00	9.00	6.00+9.00	3.25	2.21+10.00		Steel/concrete	tile + multiplex	bataco	corr. asbestos



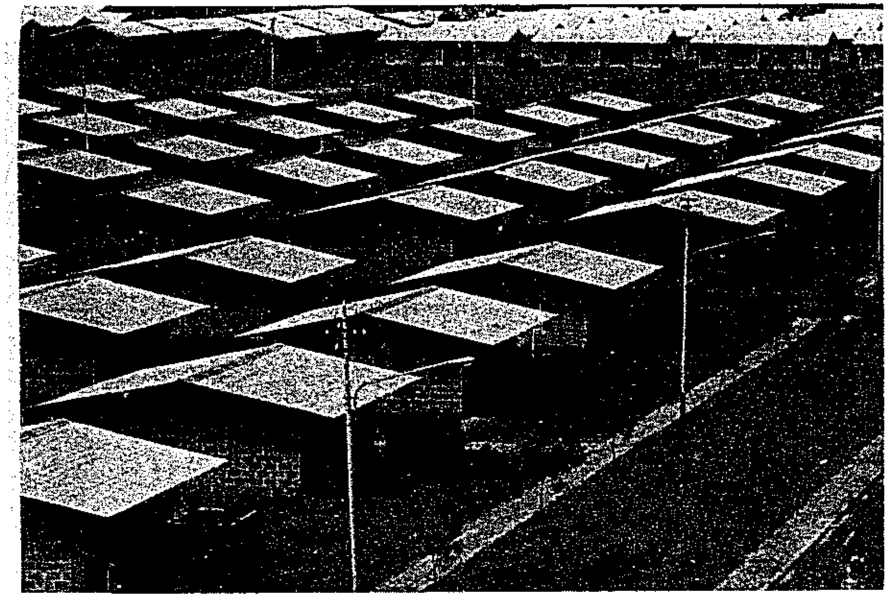
Unoccupied Houses (DEPOK II)



BEKASI Project



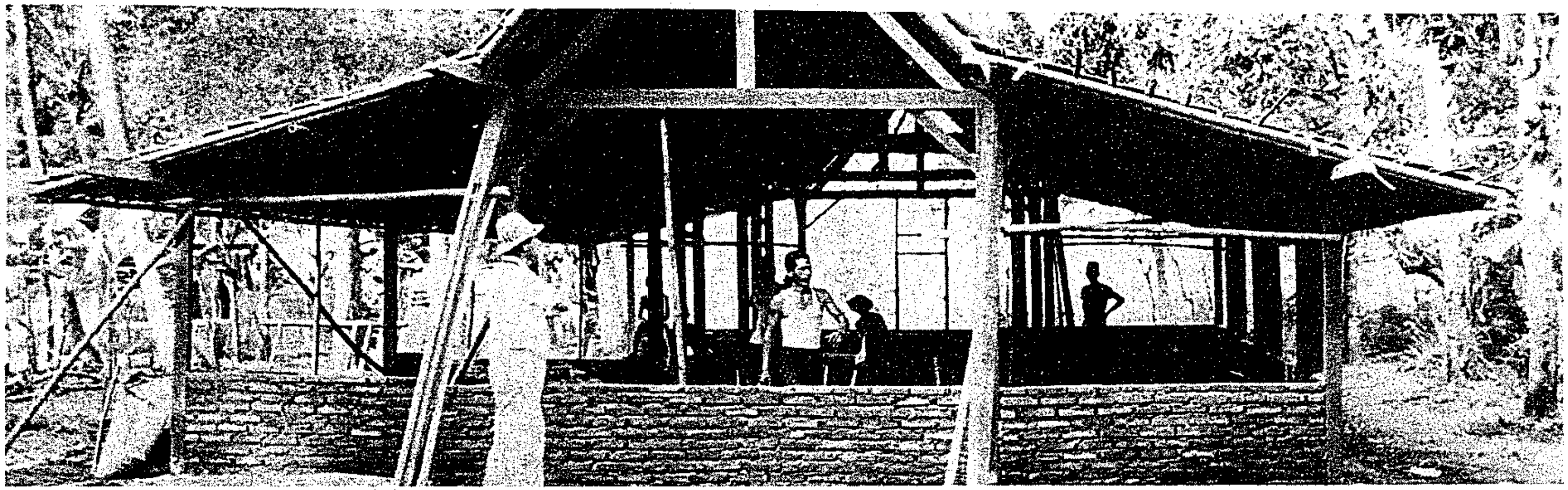
Occupied and Extended House (KLENDER)



D-20 Type with BATACO Wall

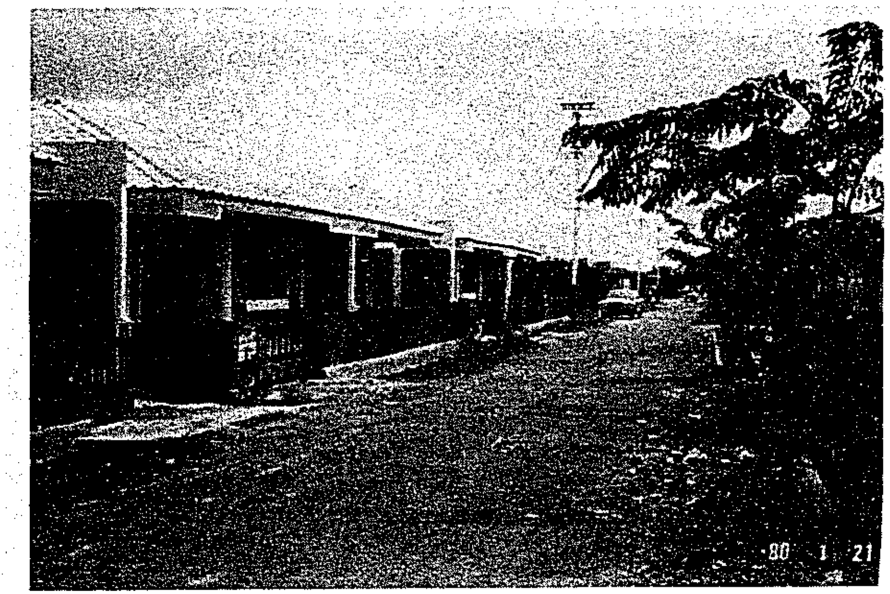
D-45 Type with Wooden Frame + Particle Board

M-70 Type (Maisonette)



Typical Construction Site of Kampung (CENGKARENG)

Private Estate (BANDUNG)



Private Housing Project (JAKARTA)

3-3-2 Housing Types and the Number of Stories

Based the existing housing types of Perumnus, new housing types are getting necessary in order to respond to increasing request of higher density and to cope with the conditions of low and swampy site in Cengkareng. At the start of examining the possibility of such housing, the following types are considered: combinations of Duplex types, Row house types, one-storied types and two-storied types.

	One-storied	Two-storied
Duplex type	D-type	DM-type
Row house type	R-type	RM-type

In these four types, DM and RM type have become advantageous in order to meet the needs of higher density.

	Existing types of Perumnas	New types
D-type	D-20, 36, 45, 54, 70, etc.	Nil
DM-type	Nil	DM-24, DM-36
R-type	Used in some projects; no standard types	Not planned at present stage
RM-type	M-45, M-70	M-45A

All D-types will be added to the menú for the Cengkareng Project by improving the foundation and the subsoil. DM-types are designed for the effective use of the site and besides the advantage of duplex, these types will keep the building coverage low even when extended in future. R-type is not planned at the present stage, but it may be considered at the next stage. RM-type will be proposed as a new wooden type (M-45A type).

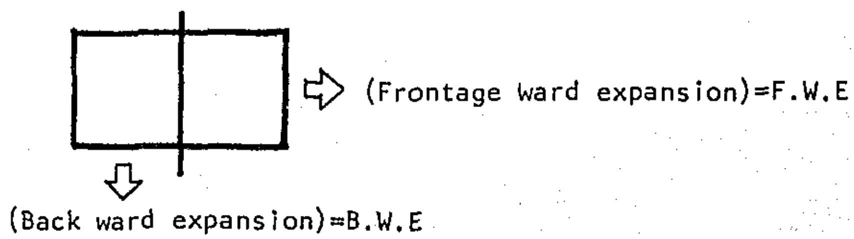
3-3-3 Lot and Extension Direction

With regard to the relationship between the lot and each type of housing, mentioned in 3-3-2, the important point is that the borderline of extension ranges about 36 m^2 of floor area as mentioned in 3-3-1. In other words:

- 20 m^2 - 36 m^2 Type: Consideration of the future extension is required.
- Over 45 m^2 Type: No consideration regarding extension is required; however, the consideration of covered veranda is required.

A. Extension direction

In 20 m^2 - 36 m^2 type housing, the form of lot and the disposition of unit depend on wether one or two extension direction will be allowed.



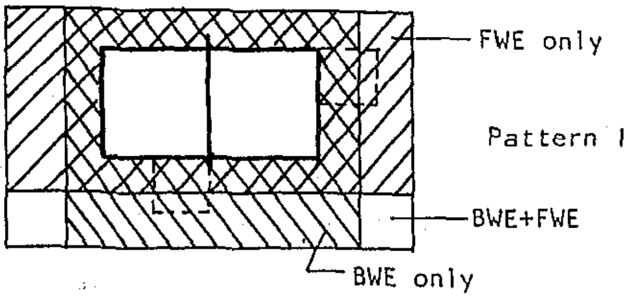
B. Relation between extension direction, the minimum lot area and coverage ratio of 36 m^2 Duplex type unit

Based on the D-36 type housing (i.e. housing type which is on the border of extension necessity), when the building line is 3 m or 2 m, the possibility of obtaining 45 m^2 floor area by extending one room (3 m x 3 m = 9 m^2) has been studied.
As extension possibilities, there are the following four types:

- o No extension
- o BWE only
- o FWE only
- o BWE + FWE

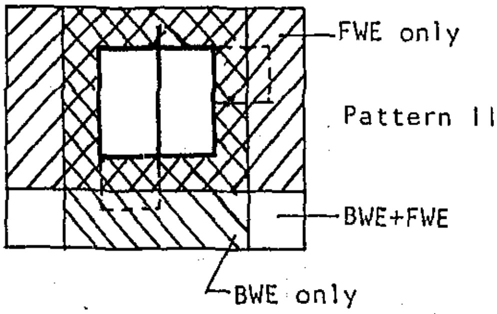
and the extension patterns by type are show in next page.

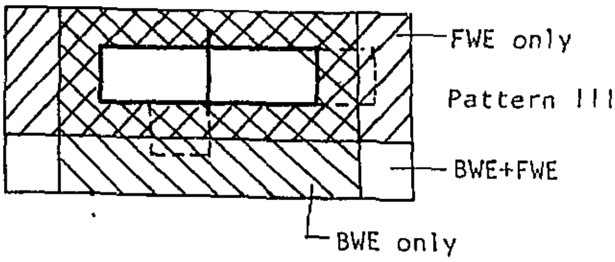
a) D-Type $6^{m} \times 6^{m} = 36^{m^2}$



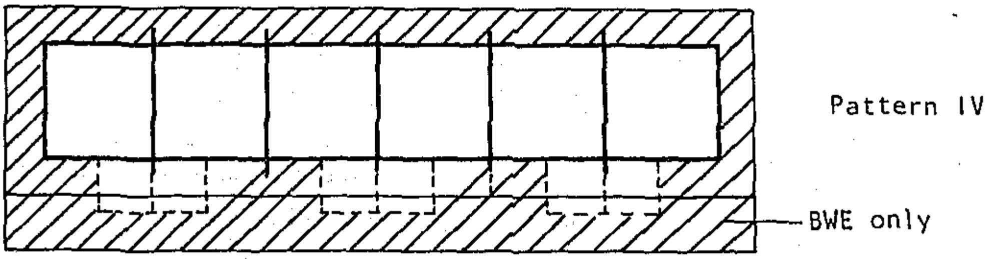
b) DM- Type

Half of the floor area of D-Type is put on the 2 floor.

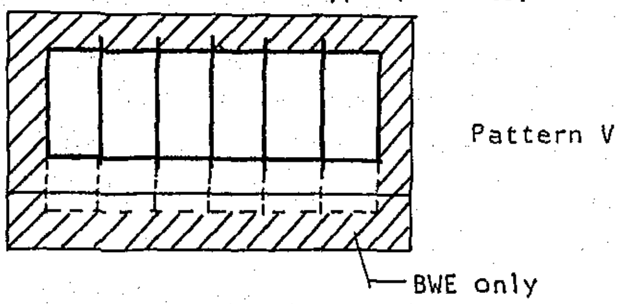


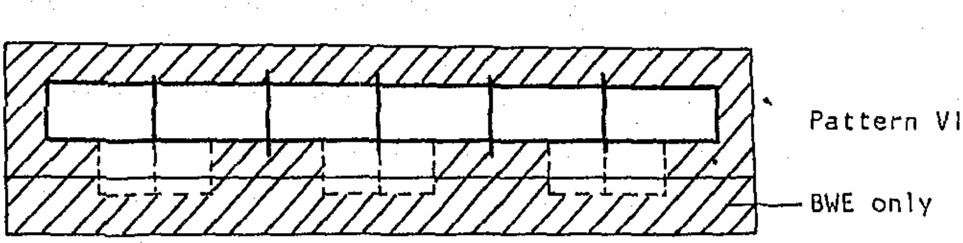


c) R-Type Row House of $6^{m} \times 6^{m} = 36^{m^2}$ (6 Units)



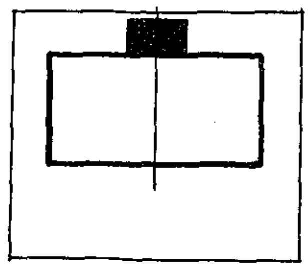
d) RM-Type Row House of DM Type (6 Units)





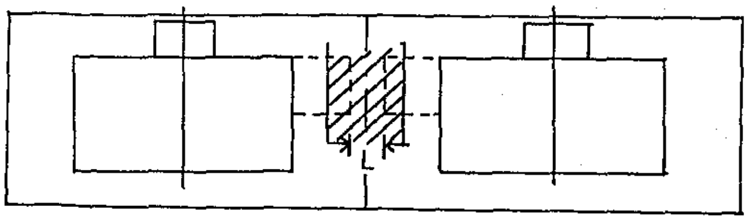
o Other proposals for effective use of lot

i) Site border line arrangement of WC/M.



WC/M is a block structure and the least possible fire hazard. Therefore, it can be put outside the house and by arranging it on the lot border line or its nearest place, the effective use of the site is obtainable.

ii) Arrangement of frontage ward extension (FWE) in duplex



The following arrangements of the frontage ward extension in duplex are considered for efficient site use.

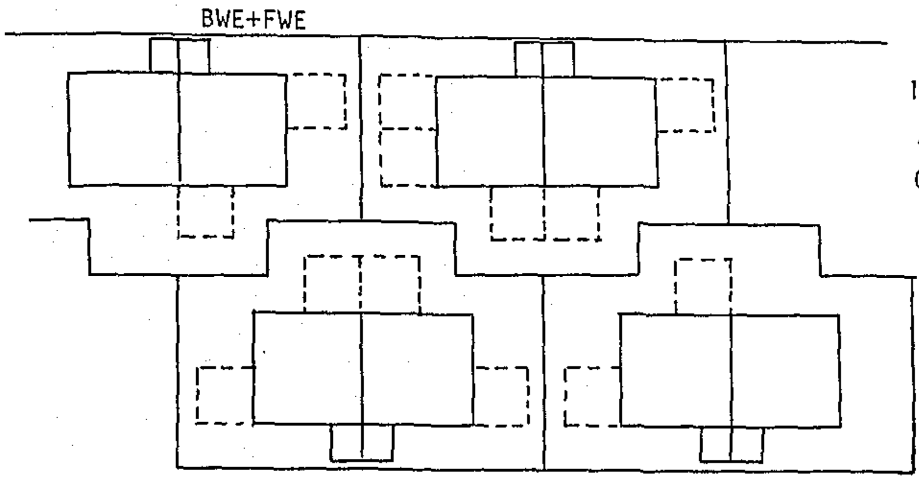
. Length, L, can be less than 4 m; The outside walls and back of eaves of extended parts within 2 m from the lot border must be of fire proof construction and the roof within the 2 m must be of non flamable material and no window or door is allowed in the extended walls facing each other. Above mentioned items must be observed through contract, supervision or guidance.

. Length, L, is zero; In this case new unit walls will be constructed in advance of materials with respective performance level and supervision or guidance has to be done to ensure that the each part of newly extended building must not exceed 30 cm - 50 cm (in both horizontal and vertical directions) from the edge of unit wall.

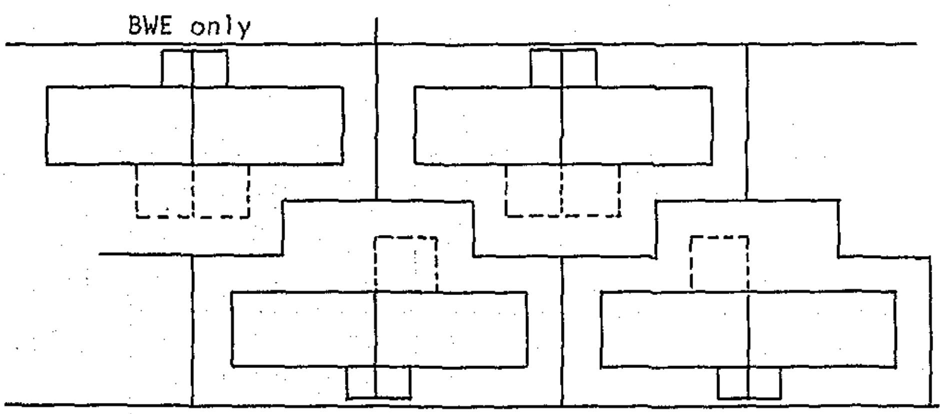
In the case of 30 cm - on each border line. unit walls needed.

In the case of 50 cm - every six units. unit walls needed.

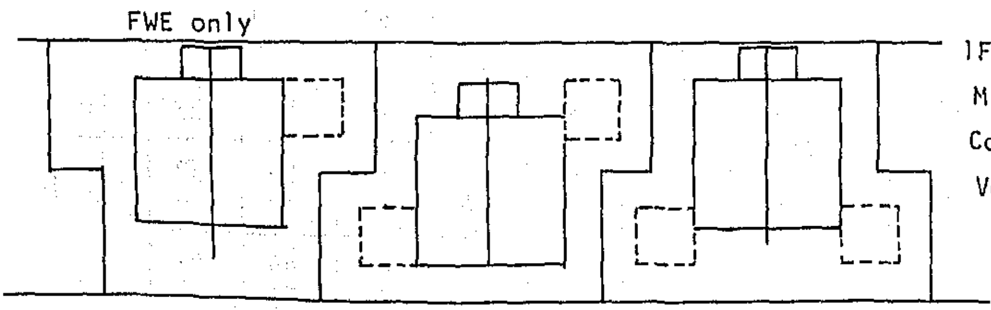
iii) Effective use of the site by arrangement of special lot form.



1F floor area 56.3m²
Min. Lot area 115m²
Covering Ratio 49%
Volum Ratio 49%



1F floor area 43.3m²
Min. Lot area 95m²
Covering Ratio 46%
Volum Ratio 46%



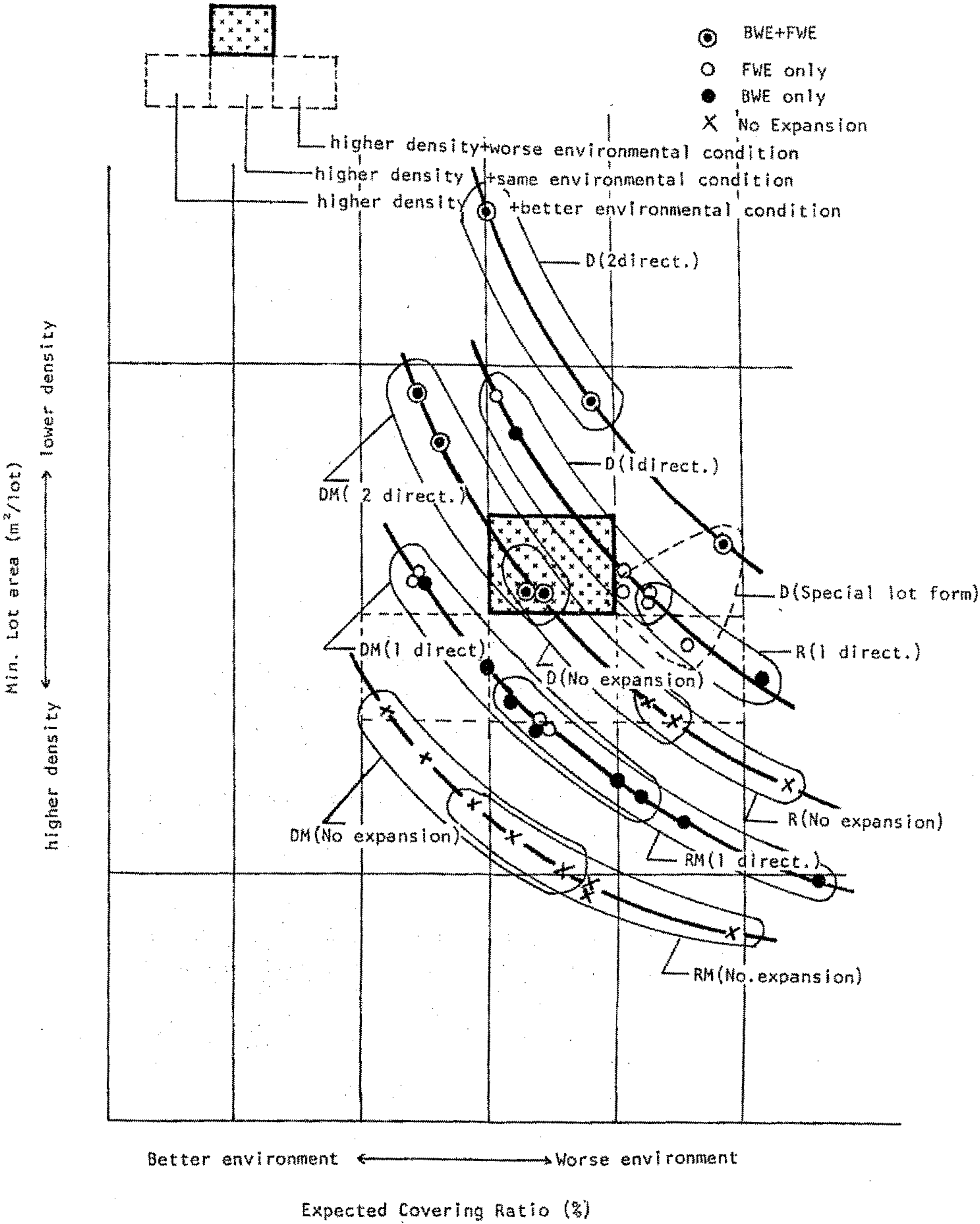
1F floor area 43.3m²
Min. Lot area 105m²
Covering Ratio 41%
Volum Ratio 41%

Floor Area, Lot Area, Coverage Ratio and Volume Ratio

UNIT TYPE	Building line	Pattern type	Dot Number	Expansion Possibility	(A) (M)	(B) (M)	(C) (M)	(D) (M)	(E) (M)	(F) =(A)/(E) (%)	(G) =(B)/(E) (%)	(H) =(C)/(E) (%)	(I) =(D)/(E) (%)
D	3	I	1	no.	36	36	=(A)	=(B)	108	33	33	33	33
			2	BWE only	45	54			135	33	40	33	40
			3	FWE only	45	54			144	31	38	31	38
			4	BWE+FWE	54	81			180	30	45	30	45
	2	I	5	no	36	36	=(A)	=(B)	80	45	45	45	45
			6	BWE only	45	54			104	43	52	43	52
			7	FWE only	45	54			110	41	49	41	49
			8	BWE+FWE	54	81			143	38	57	38	57
DM	3	II	9	no	18	18	36	36	72	25	25	50	50
			10	BWE only	27	27	45	45	90	30	30	50	50
			11	FWE only	27	36	45	54	108	25	33	42	50
			12	BWE+FWE	36	54	54	72	135	27	40	40	53
	3	III	13	no	18	18	36	36	81	22	22	44	44
			14	BWE only	27	27	45	45	108	25	25	42	42
			15	FWE only	27	36	45	54	108	25	33	42	50
			16	BWE+FWE	36	54	54	72	144	25	38	38	50
	2	II	17	no	18	18	36	36	50	36	36	72	72
			18	BWE only	27	27	45	54	65	42	55	69	83
			19	FWE only	27	36	45	45	80	34	34	56	56
			20	BWE+FWE	36	54	54	72	104	35	52	52	69
	2	III	21	no	18	18	36	36	56	32	32	64	64
			22	BWE only	27	36	45	54	80	34	45	56	68
			23	FWE only	27	27	45	45	77	35	35	59	59
			24	BWE+FWE	36	54	54	72	110	33	49	49	65
R	3	IV	25	no	36	36	=(A)	=(B)	84	43	43	=(F)	=(G)
			26	BWE only	45	54			105	43	51		
	2	IV	27	no	36	36	36	=(B)	67	54	54	=(F)	=(G)
			28	BWE only	45	54	45		87	52	62		
RM	3	V	29	no	18	18	36	36	48	38	38	75	75
			30	BWE only	27	36	45	54	60	45	60	75	90
	3	VI	31	no	18	18	36	36	63	29	29	57	57
			32	BWE only	27	36	45	54	84	32	43	54	64
	2	V	33	no	18	18	36	36	37	49	49	97	97
			34	BWE only	27	36	45	54	48	56	75	94	113
	2	VI	35	no	18	18	36	36	47	38	38	77	77
			36	BWE only	27	36	45	54	67	40	54	67	81
	3	VII	37	BWE+FWE	56.3	65.3	=(A)	=(B)	115	49	57	=(F)	=(G)
		VII	38	BWE only	43.3	43.3	=(A)	=(B)	95	46	46	=(F)	=(G)
		IX	39	FWE only	43.3	51.3	=(A)	=(B)	105	41	49	=(F)	=(G)

A: Expected 1F. Floor area
B: Expected Max. 1F Floor area
C: Expected Total Floor area
D: Expected Max Total Floor area

E: Min. Lot Size
F: Expected Coefficiency A/E
G: Expected Max. Coeff. B/E
H: Expected Coeff. C/E
I: Expected Max. Coeff D/E



Relations Between HousingTypes, Housing Lot and Covering Ratio.

With reference to the trends shown in the figures, the following proposals are given:

- When higher density and worse environmental conditions are acceptable; (coverage ratio 40 - 50 % and 80 - 100 m^2/lot).

  D Type : No extension; or elaborately planned lot form (no. 38)

  R Type : One direction extension with building line about 2.5 m; or no extension (no. 5).

  DM Type : none

  RM Type : none

- When higher density and unchanged environmental conditions are acceptable; (coverage ratio 30 - 40 % and 80 - 100 m^2/lot).

  D Type : No extension

  R Type : none

  DM Type : One direction extension (no. 10).

  RM Type : One direction extension (no. 32).

- When higher density and improved environmental conditions are acceptable; (coverage ratio 20 - 30 % and 80 - 100 m^2/lot).

  D Type : none

  R Type : none

  DM Type : One direction extension; or no extension (no. 13).

  RM Type : none

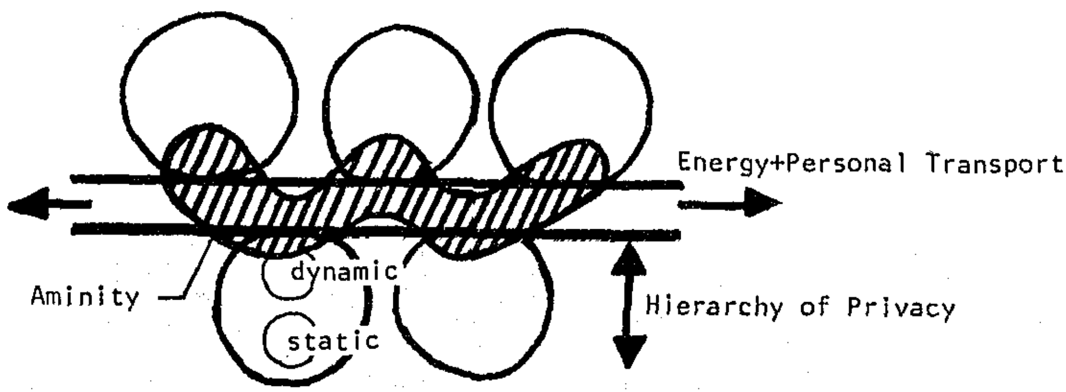
C. Extension of 20 m^2 type housing

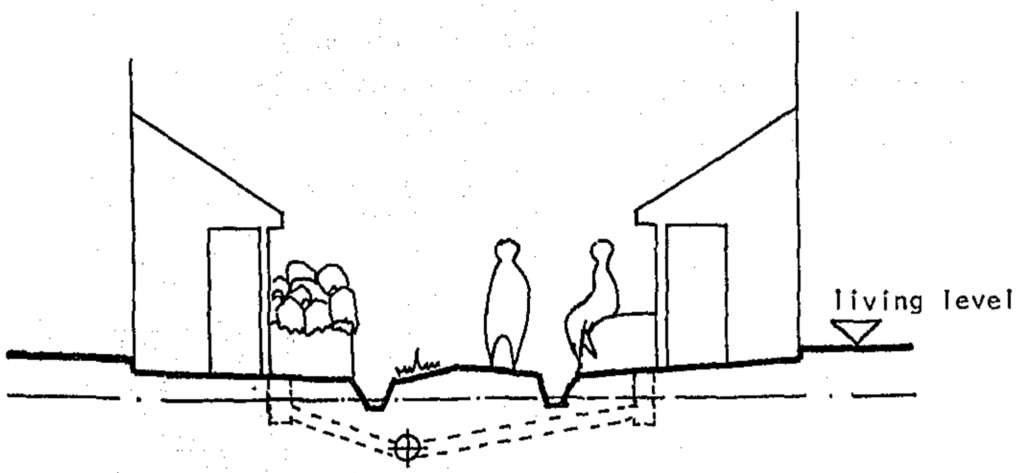
For extension of 20 m^2 type FWE and BWE, i.e. two directions of extension possibility is recommendable to get final floor area about 45 m^2

3-3-4 Access System and Surroundings of Houses

Access to buildings, especially positioning of footpath.

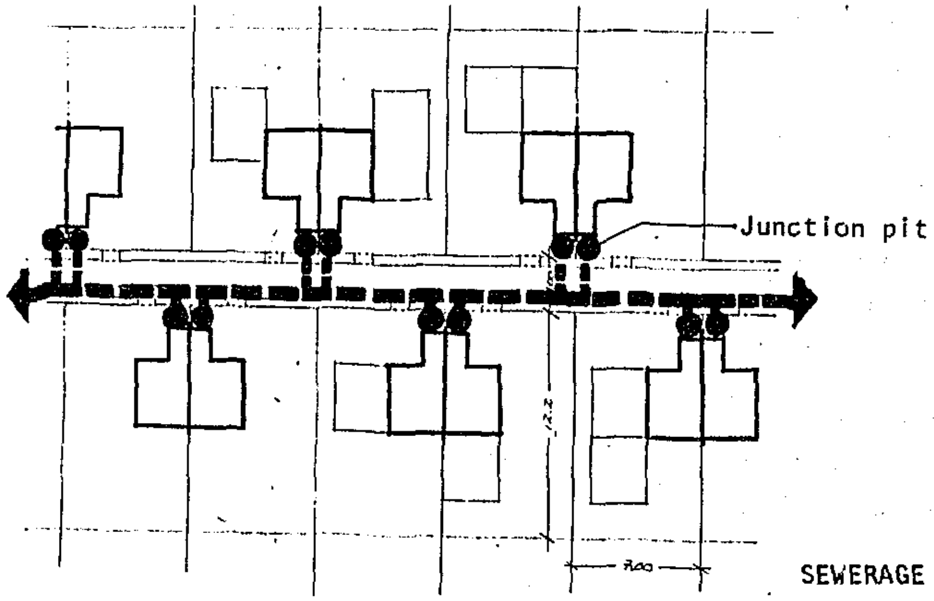
- Put footpaths high enough to avoid inundation, as these are daily life access route.
- Combine the drain pipes and water supply pipes etc., to access.
- Space arrangement to produce living amenities.
  - Not too wide, and so as to allow easy communication between neighbours.
- Make the footpath width 3 m, and include 50 cm gutters on both sides. Pavement to be 1.40 m, and plant grass in the remaining 0.6 m with water supply and drainage pipes underneath.





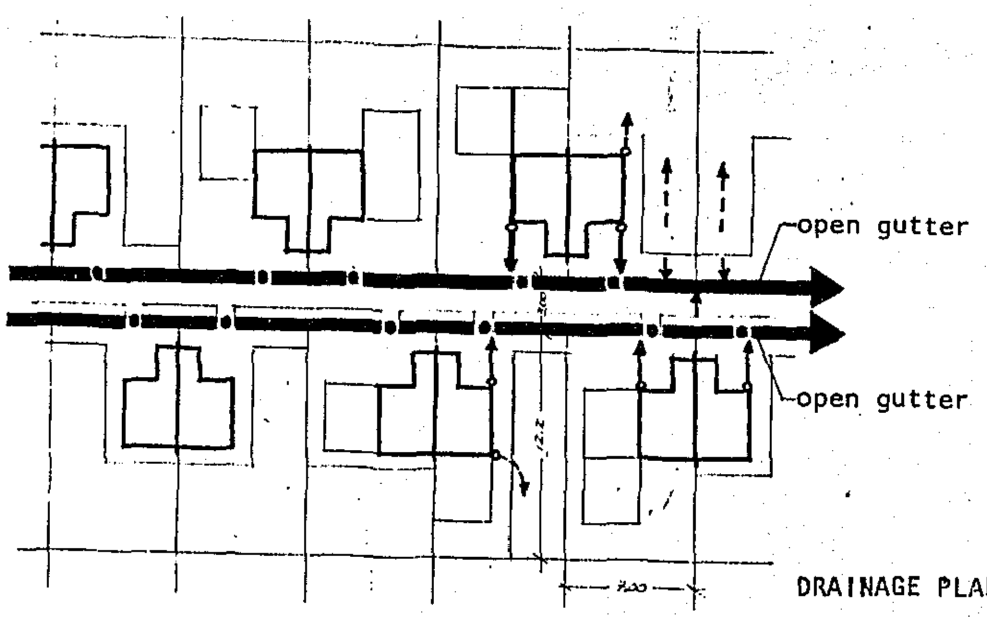
Section of Footpath

EXAMPLE OF BLOCK PLAN FOR DM-24 TYPE UNIT.

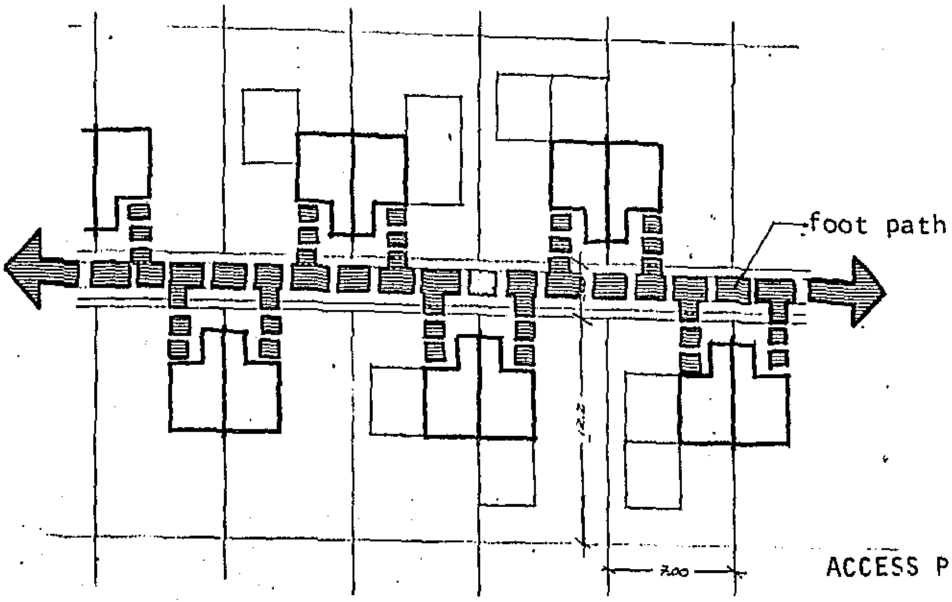


SEWERAGE PLAN

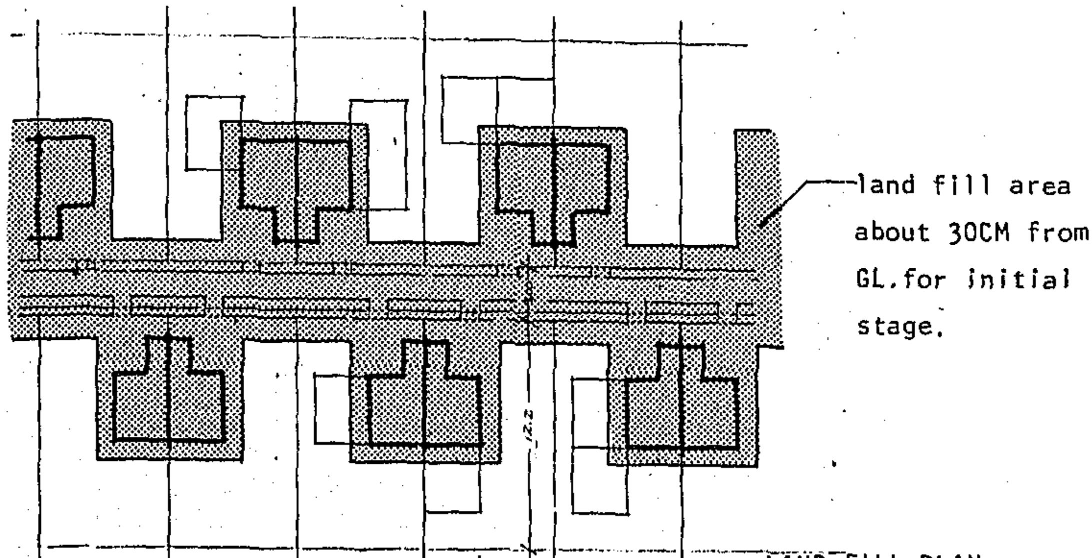
*Water Supply route is also as illustrated above.



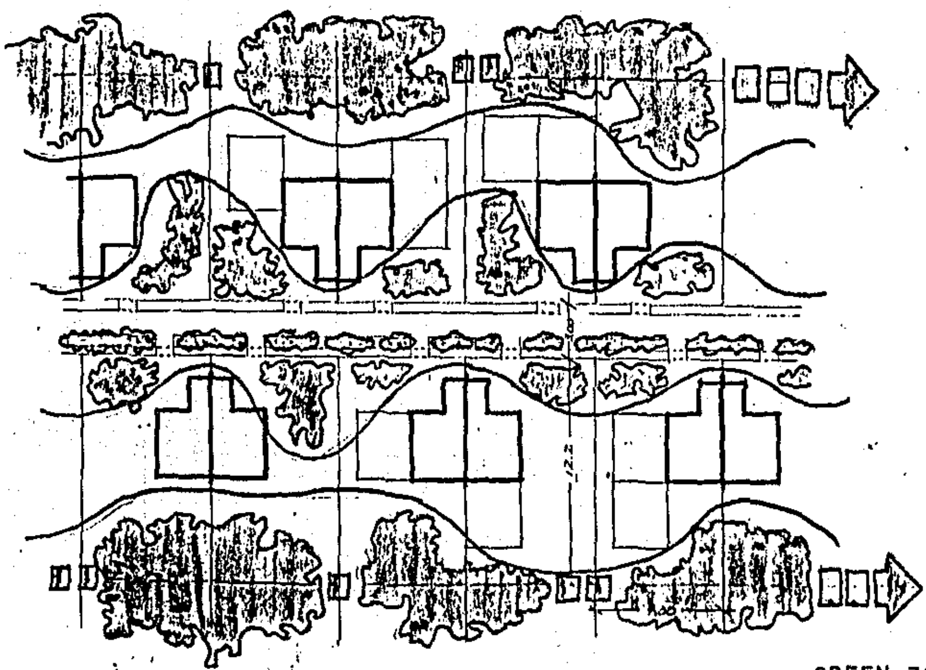
DRAINAGE PLAN



ACCESS PLAN



LAND FILL PLAN



GREEN ZONE PLAN

LIST OF HOUSING TYPES SELECTED IN PHASE I

			Type	No of Story	Floor Area (M^2): Net floor Area (A): Living Area	Veranda	Total	Common Floor Area	Gross (B) Floor Area	(A)/(B) %	Cost ($\times 10^3$ R): Total Cost (C)/Unit	(C)/(B)	(C)/(A)
Duplex	Improved Existing Type	O	D-20	1	24	-	24	-	24	100	710.4	29.6	29.6
			D-36	1	36	-	36	-	36	100	900.0	25.0	25.0
			D-45	1	45	-	45	-	45	100	1125.0	(25.0)	(25.0)
			D-54	1	54	-	54	-	54	100	1350.0	(25.0)	(25.0)
			D-70	1	72	-	72	-	72	100	1800.0	(25.0)	(25.0)
Duplex Massonette	New Type	O	DM-24	2	23.9	-	23.9	-	23.9	100	862.8	36.1	36.1
		O	DM-36	2	34.6	-	34.6	-	34.6	100	1117.6	32.3	32.3
Massonette	Improved Existing Type		M-45	2	45	-	45	-	45	100	1406.3	(31.3)	(31.3)
			M-70	2	72	-	72	-	72	100	2250.0	(31.3)	(31.3)
	New Type	O	M-45A	2	47.7	-	47.7	-	47.7	100	1478.7	31.0	31.0
Flat	Gallery Access Type		FG-36	4	37.4	4.7	42.1	11.8	53.9	78	3524.8	65.4	83.7
			FG-45	4	45.0	7.1	52.1	11.8	63.9	82	4117.2	64.4	79.0
			FG-45R	5	43.1	10.0	53.1	10.8	63.9	83	3747.9	58.7	70.6
	Stair Case Access Type		FS-36	4	37.7	5.2	42.9	5.3	48.2	89	3197.1	66.3	74.5
			FS-45	4	47.7	5.2	52.9	4.1	57.0	93	3707.8	65.0	70.1
		O	FS-45R	5	47.7	5.2	52.9	4.1	57.0	93	3337.0	58.5	63.1
	Massonatte Type		FM-45	4	42.8	5.4	48.2	9.3	57.5	84	3744.4	65.1	77.8

FG-R : Attic used Type Flats.
O : Sellected Type for the rough project cost estimate.

4. SUBJECTS AND PROPOSAL

4-1 Flat Housing Study

- As a construction model, C Type, i.e. eclectic type of wall-rahmen and rahmen is recommendable.
- There is no advantage in this stage in light-weighting because it increases the total cost. The reason is that there is no wall material to compete with BATAKO and concrete block.
- Two alternatives of floor area of 36 m^2 and 45 m^2.
- Consideration on possibility of extension in 36 m^2 type is required.
- For flats building type, FS type, i.e. staircase access type is advantageous.
- In FS type, the type with staircases inside the building is advantageous (FS' type)
- Connection of access and veranda is proposed.
- With regard to the number of stories, five storied flats is the most economical in all flats building types, but there are a lot of disadvantages. In case of adopting the five storied flats, five storied by attic spaced with used is recommendable for its cost reduction.
- The number of units per floor is, from the point of view of escaping distance and construction, FS' Type - 8 units, FG Type - 6 units, FM Type - 12 units/ 2 F is recommendable.

4-2 Low Rise Housing Study

- For soil improvement, it can be divided into pile method and dry-up method.
- For pile method, a study of the total cost including the site planning and infrastructure etc. is needed.

- For dry-up method, a method should be considered not only by dry-up, but also unified by soil filling or soil replacement.

- For foundation system, considering the differential settlement, the upper part of RC and the lower part BATUKALI system will be realistic.

- Soil test of 1 - 2 m from the ground surface on the CENGKARENG site is absolutely necessary.

- For a floor construction system, a slab on grade system is advantageous, however, considering the strong possibility of expansive soil, study of its countermeasure is necessary. At least, a segregated floor in living area, and aggregate floor in WC/M area is recommended.

- Under the present assumed conditions (expected bearing capacity of soil etc.)
  - In the case of single storied house, BATACO wall construction is economical.
  - In the case of two storied house, both BATACO wall construction and wooden wall are neary the same in cost.

- As for housing type, the following four types are considered:
  - Single storied Duplex Type : D Type
  - Two storied Duplex Type : DM Type
  - Single storied Rowhouse Type : R Type
  - Two storied Rowhouse Type : RM Type

  New type, DM Type (DM-24, DM-36) and wooden wall RM type (M-45A) are proposed in this stage.

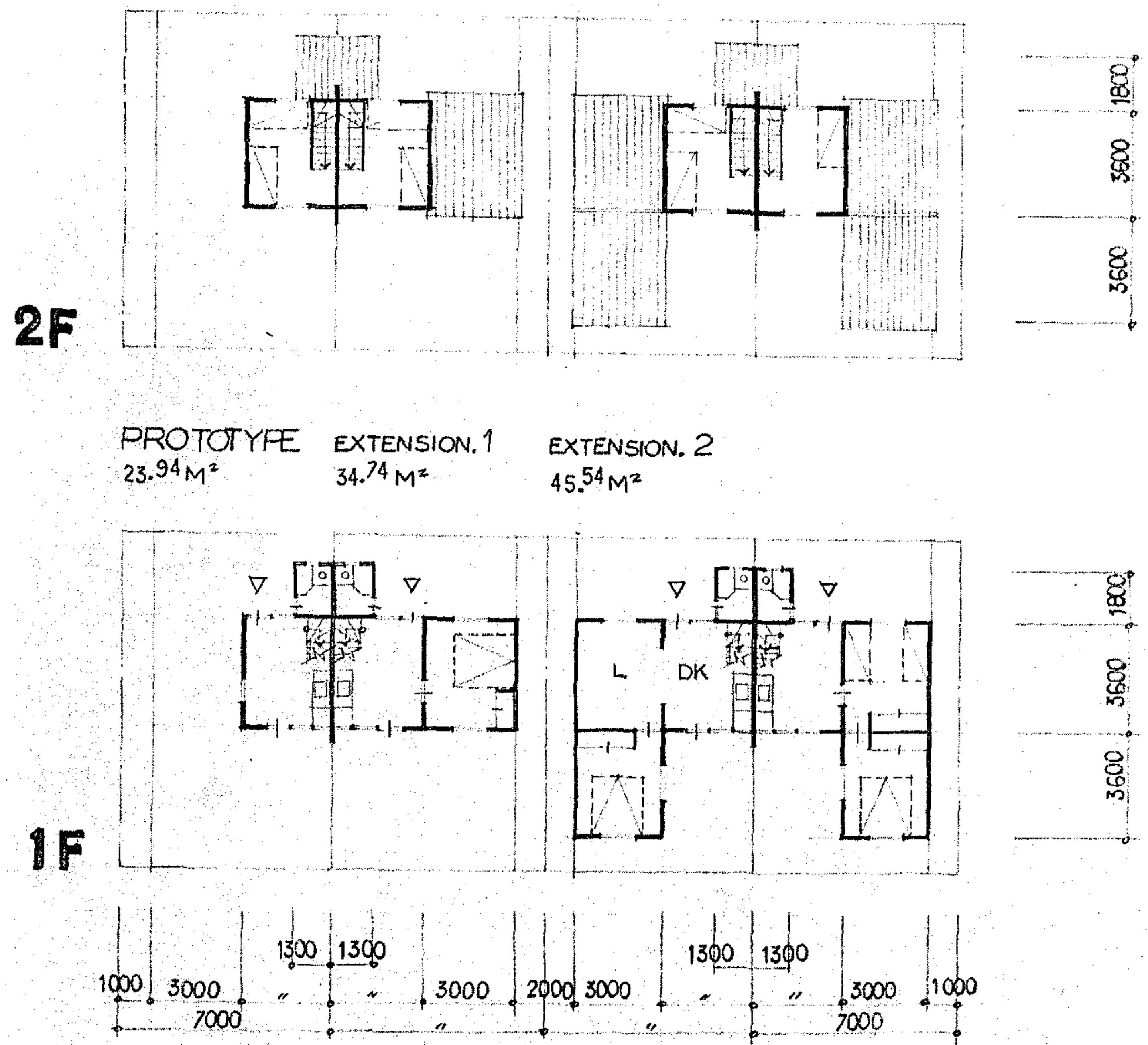
- For R Type, no study has been made at the present stage, however, in the next stage, it will be carried out if required relating to the density requirement.

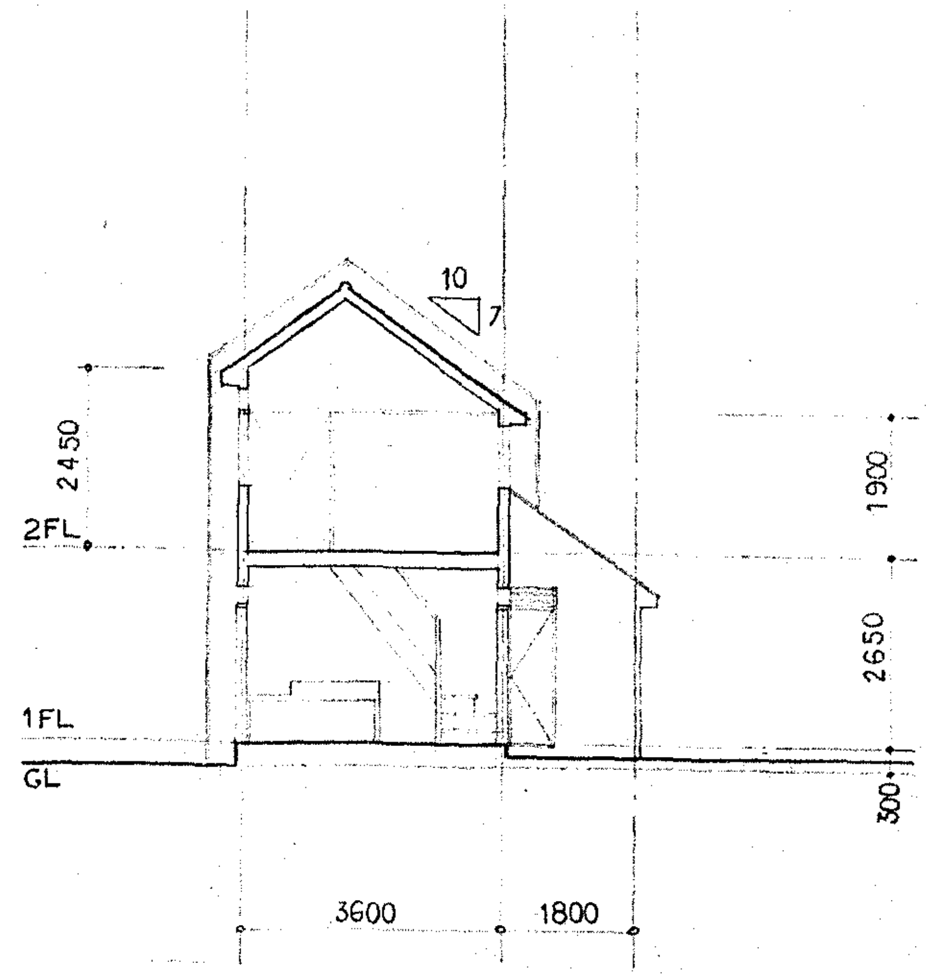
- For 24 m^2 Type houses, two direction of extension possibility will be considered.

- For 36 m^2 Type houses, one direction of extension possibility or no extension will be considered.

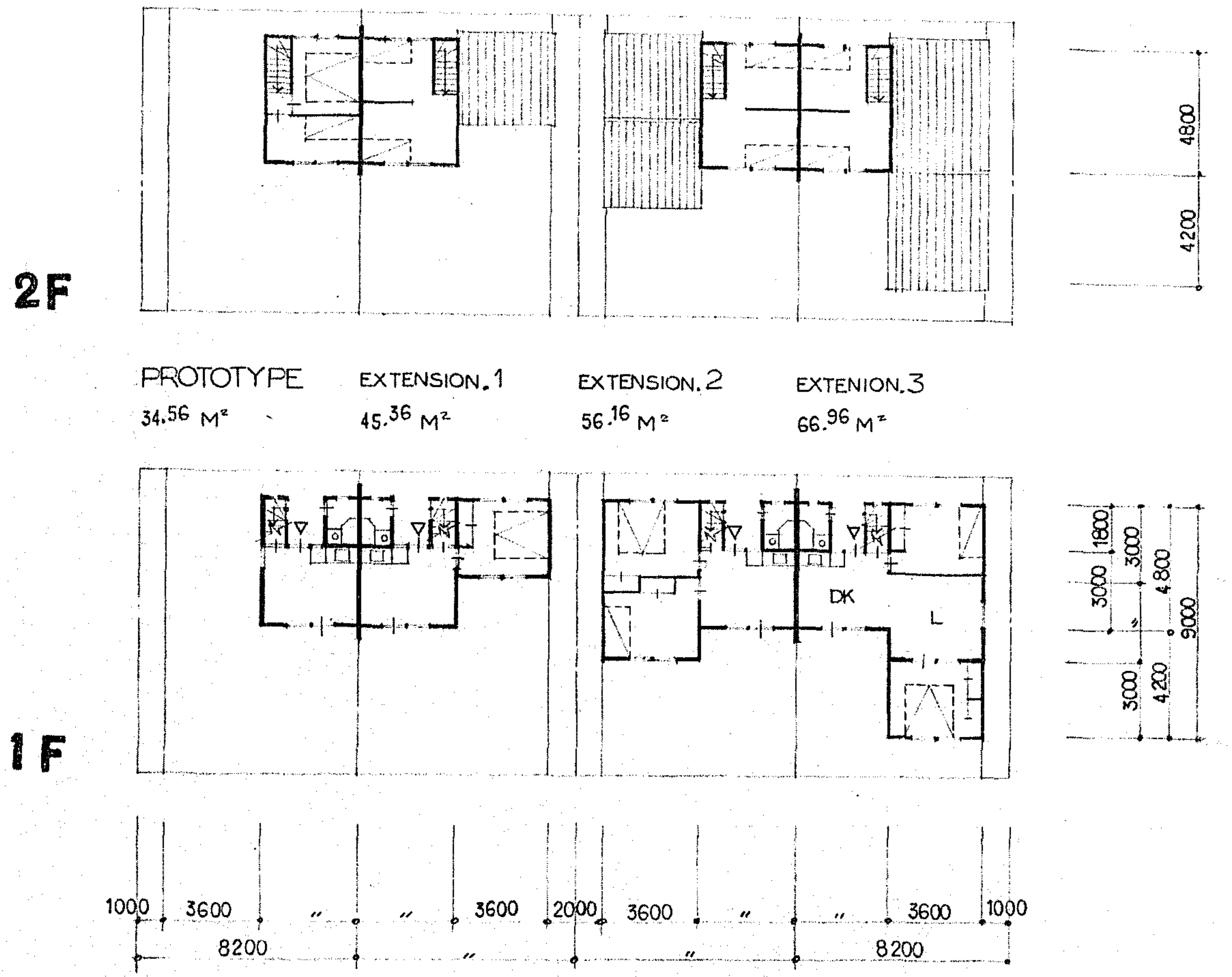
- For over 45 m^2 Type houses, no extension possibility will be considered.

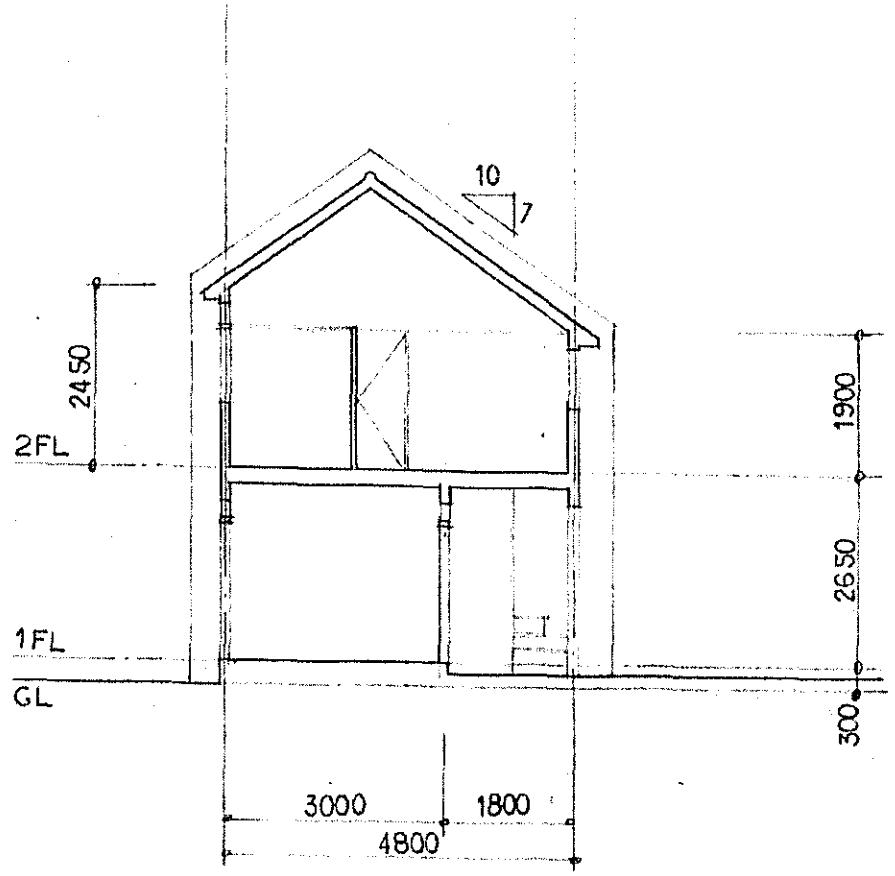
- Footpath, which is a daily access to houses is recommended to set high enough not to be inundated.



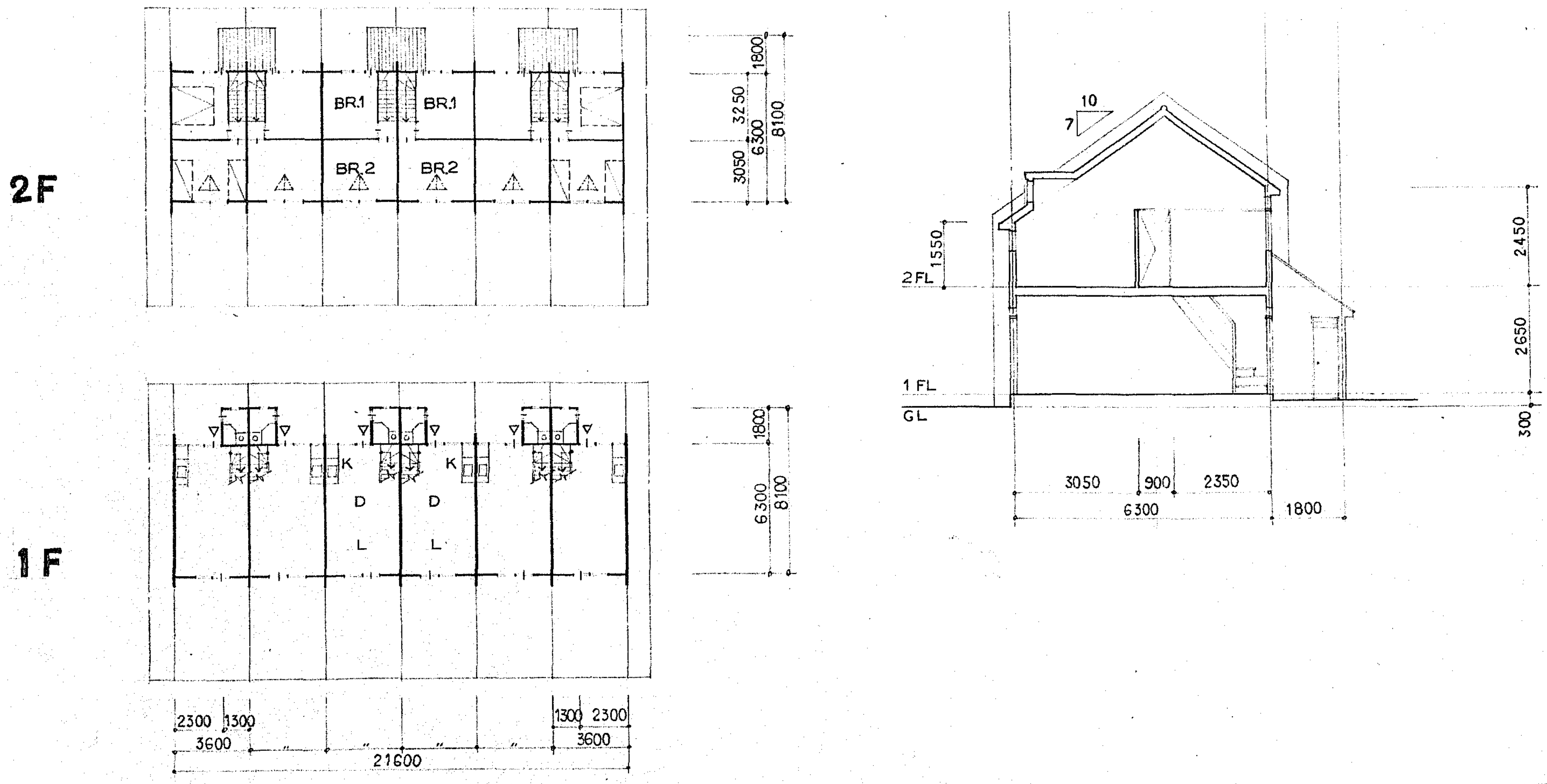


Specification	Roof	Unglazed roof tile	Floor Area	Net Floor Area M²/Unit	Living Floor Area	23.94	DM-24 DUPLEX MAISONETTE TYPE	No.
	Outerwall	Cement fiber board t=15 plastering t=10			Veranda	—		
	Floor	1F;Concrete slab on grade t=50 2F; Particle board wood floor.			Sub Total	23.94.		
	Wall between Houses	Cement fiber board t= 25 both side mortar t=7.5x2		Common Floor Area		—		
	Inside Wall	Wooden structure exposed; Bamboo mat		Gross Floor Area		23.94		
	Structure	Wood- frame costruction	Scale	1/200 1/100			THE STUDY OF LOW COST HOUSING PROJECT (KTA-20) PHASE I	
	Foundation	Continuous footing						





Specification	Roof	Unglazed roof tile	Floor Area	Net Floor Area M²/Unit	Living Floor Area	34.56	No.
	Outerwall	Cement fiber board t= 25 both side mortar t=7.5x2			Veranda		
	Floor	1F;Concrete slab on grade t=50 2F; Particle board wood floor.			Sub Total	34.56	DM-36 DUPLEX MAISONETTE TYPE
	Wall between Houses	Cement fiber board t=25, both side mortar t=7.5x2		Common Floor Area			
	Inside Wall	Wooden structure exposed; Bamboo mat		Gross Floor Area		34.56	
	Structure	Wood- frame costruction	Scale	1/200		1/100	THE STUDY OF LOW COST HOUSING PROJECT (KTA-20) PHASE I
	Foundation	Continuous footing					



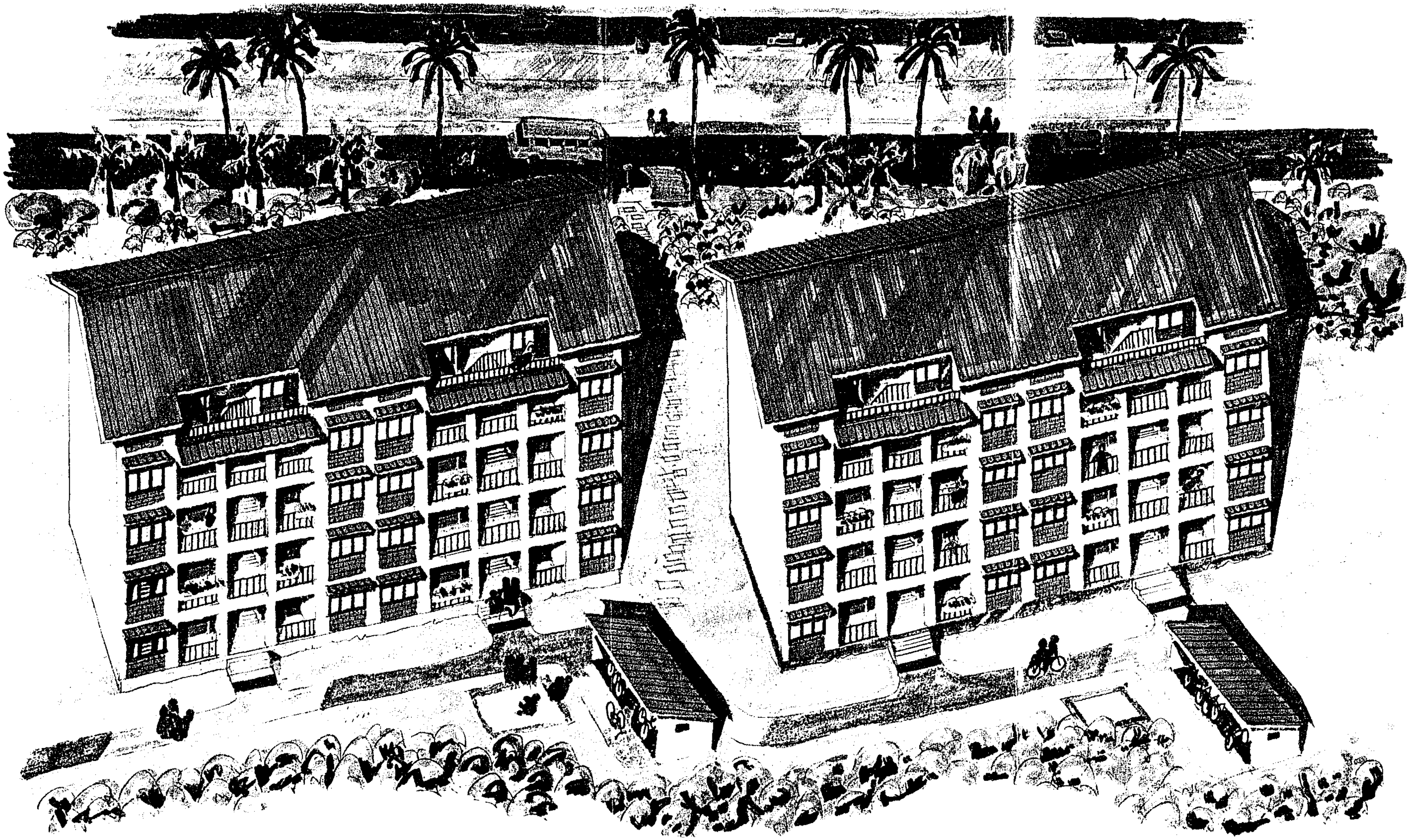
Specification	Roof	Unglazed roof tile	Floor Area	Net Floor Area M^2/Unit	Living Floor Area	47,70
	Outerwall	Asbesto board siding t=5			Veranda	
	Floor	1F; Concrete slab on grade t=50 2F; Particle board wood floor			Sub Total	47,70
	Wall between Houses	Cement fiber board t=25, both side mortar t=7.5x2		Common Floor Area		
	Inside Wall	Wooden structure exposed; Bamboo mat		Gross Floor Area		47,70
	Structure	Wood- frame costruction	Scale	1/200 1/100		
	Foundation	Continuous footing				

M－45A

MAISONETTE TYPE

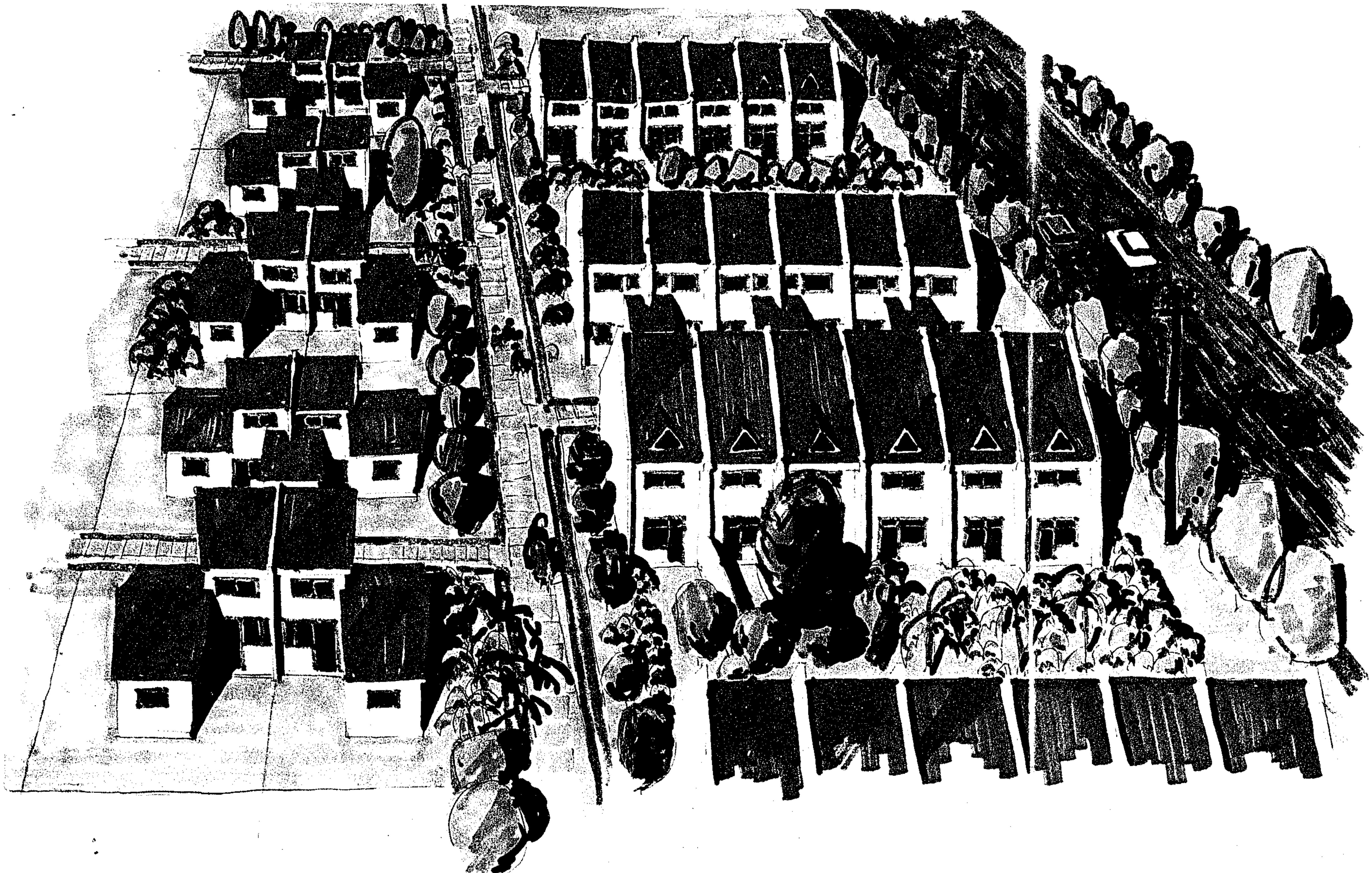
No.

THE STUDY OF LOW COST HOUSING PROJECT (KTA-20) PHASE I



LOW COST HOUSING PROJECT IN CENGKARENG

BIRD'S-EYE VIEW (FS'-45R)



LOW COST HOUSING PROJECT IN CENGKARENG

BIRD'S-EYE VIEW (DM-24 & M-45A)

PART III

PROSPECTS FOR THE NEXT PHASE

PART III PROSPECTS FOR THE NEXT PHASE

1. OBJECTIVES OF PART III

This study consists of two phase; PHASE I-Pre-Feasibility Study, and PHASE II - Feasibility Study.

In PHASE I, basic surveys for housing supplies and specific conditions of Cengkareng site, like as a swampy condition, were carried out. Then, on the basis of above studies, various types of site plannings and houses were prepared.

In PHASE II, socio-economic surveys like as site development policys, finance and fund conditions and housing economy conditions as well as technical surveys will be carried out. Then the Feasibility Study will be formulated.

Therefore, the final conclusion should be defined at the end of PHASE II.

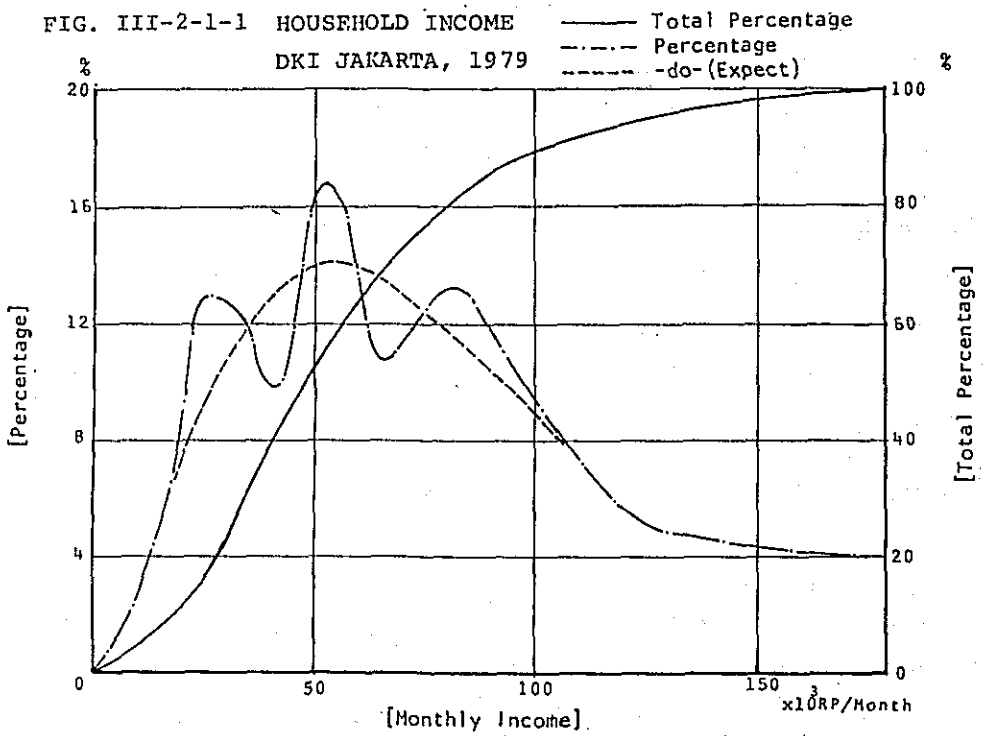
But, the formulation of the results of studies and surveys carried out untill now and prospect for the next phase may be effective for the coming next phase study. In PART III, on the basis of the study in PART I and II, we try to calculate the total project cost and selling price, even though some of them are tentatively settled, and to prospect the next phase.

2. TARGET GROUP AND AFFORDABILITY

2-1 Household Income Distribution

Fig. III-2-1-1 shows the income distribution of the households in DKI Jakarta in 1979. The peak of the distribution corresponds to about 55,000Rp.

FIG. III-2-1-1 HOUSEHOLD INCOME DKI JAKARTA, 1979



2-2 Affordability

2-2-1 Terms of Loan

The Indonesian Government considers the following terms of Loan.

	Selling Price	
	less than 2.5 million Rp	more than 2.5 million Rp
Initial Payment	5%	10%
Terms of Repayment	20years (unredeemable for 1year)	15years (unredeemable for 1year)
Interest	5%	9%

2-2-2 Percentage of Expenditure for House

The following are the percentages of house expenditure for total living cost at DKI Jakarta in 1976.

1.	Food expense	51.6%
2.	Dwelling light and fuel expense	25.20%
3.	Clothes expense	4.65%
4.	Furniture expense	2.75%
5.	Ceremonial expense	1.71%
6.	Tax and insurance	1.11%
7.	Others	12.98%

* Average income is 55,400 Rp/month
* Source : National socio-economic survey Round V Jan-Apr.,1976

The percentage of dwelling, light and fuel expense in total living cost is 25.2% as mentioned above. Generally, the percentage of dwelling expense trends proportionate to the value of income. We estimate it at 20% on the average.

2-2-3 Target Group

Housing improvement methods for each income group are as follows,

Lowest:	0~ 20%	0~30,000 RP/Month	:	Kampung Improvement Project (KIP)
Lower :	20~ 70%	~65,000	:	Site and Service Project (S&S)
Low :	70~ 90%	~110,000	:	Low Cost Housing Project
Medium:	90~ 98%	~180,000	:	Medium Cost Housing
High :	98~100%	180,000~	:	High Cost Housing

Among them, up to now, PERUMNAS has undertaken S&S and Low Cost Housing Project. But recently, the size of houses shows a tendency to be small, as small as house as of S&S, due to the rising cost of lots. On the other hand, higher income part of Low Cost Houses tends to be sold as an empty lot for the subject of the cross subsidy.

Consequently, a revision of target group for Low Cost Housing will be necessary.

High potentiality of Cengkareng site requires expensive lot price, which is too much for the lowest part of lower income group.

By reasons of mentioned above, the target group of this project may be a little lower than the former group.

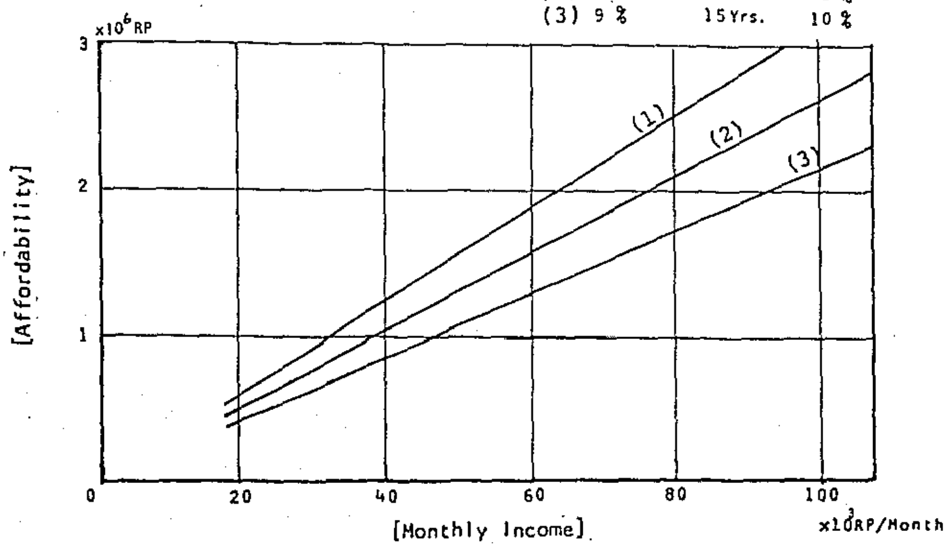
Income frequency of 60% or 60,000 RP/month is considered as the average target group.

2-2-4 Affordability

Fig. III-2-2-1 shows the affordability estimated on the basis of the above-mentioned conditions. Those of the households of 60,000Rp/month corresponds to about 1.9 million Rp in case, initial payment is 5%, terms of repayment are 20 years, and interest is 5%.

FIG. III-2-2-1 AFFORDABILITY

	Interest	Terms of Payment	Initial Payment
(1)	5 %	20 Yrs.	5 %
(2)	5 %	15 Yrs.	5 %
(3)	9 %	15 Yrs.	10 %



3. CASE STUDY OF TOTAL PROJECT COST AND SELLING PRICE

From among these unit density matrix of net lot area per unit and housing type distribution which are shown in PART I, following typical 3 cases are further studied on total project cost and selling price.

	CASE	Housing Area Ratio	Unit Density	No. of Total Housing Unit	
				Alternative I	Alternative II
Min. Density	CASE-AX (40)	40 %	34 unit/ha	8,700 units	5,400 units
Medium Density	CASE-BY (50)	50 %	52.5 unit/ha	13,400 units	8,400 units
Max. Density	CASE-CZ (60)	60 %	87 unit/ha	22,300 units	13,900 units

Note: Project area in Alternative I 260 ha

Alternative II 160 ha

Calculation is made excluding empty lots for commercial building.

3-1 Land Acquisition Cost

Present raw land price of Cengkareng area is 3,000 RP/M^2 and land acquisition cost is calculated by adding interest.

	Alternative I (260 ha)	Alternative II (160 ha)	Note
① Raw Land Price	7,800 mil RP	4,800 mil RP	3,000 RP/M^2
② Interest	2,110 mil RP	1,300 mil RP	① x 13.5% x 2 years
Land Acquisition Cost	9,910 mil RP	6,100 mil RP	

3-2 Implementing Cost of Site Improvement

From the construction costs calculated in PART I, implementing cost of site improvement (land development and infrastructure) is calculated as follows.

[Alternative I]

	CASE-AX (40)		CASE-BY (50)		CASE-CZ (60)	
	10^3 RP/unit	mil RP	10^3 RP/unit	mil RP	10^3 RP/unit	mil RP
I. Land Development	119	1,035	113	1,514	107	2,386
II. Infrastructure						
. Road Bridge	205	1,783	145	1,943	99	2,208
. Drainage	58	505	41	549	28	624
. Water Supply	121	1,053	84	1,125	72	1,606
. Sewerage	243	2,114	180	2,412	159	3,546
. Garbage	4	35	4	54	4	89
. Electricity	44	383	44	590	44	981
Sub Total	675	5,873	498	6,673	406	9,054
III. Total (Site Improvement)	794	6,908	611	8,187	513	11,440
IV. Implementing Cost (III x 1.4)	9,671 mil RP		11,462 mil RP		16,016 mil RP	

[Alternative II]

	CASE-AX (40)		CASE-BY (50)		CASE-CZ (60)	
	10^3 RP/unit	mil RP	10^3 RP/unit	mil RP	10^3 RP/unit	mil RP
I. Land Development	148	799	141	1,184	134	1,863
II. Infrastructure						
. Road Bridge	205	1,107	145	1,218	99	1,376
. Drainage	58	313	41	344	28	389
. Water Suplly	127	686	88	739	75	1,042
. Sewerage	252	1,361	186	1,562	161	2,238
. Garbage	4	22	4	34	4	56
. Electricity	44	237	44	370	44	612
Sub Total	690	3,726	508	4,267	411	5,713
III. Total (Site Improvement)	838	4,525	649	5,451	545	7,576
IV. Implementing Cost (III x 1.4)	6,335 mil RP		7,631 mil RP		10,606 mil RP	

Note 1. Following items are included in implementing cost

① Survey + Planning .... III x 3 %

② Overhead + Adm. Cost .... (III + ①) x 5 %

③ Interest .... (III + ① + ②) x 13.5% x 2 years

Compensation cost of all kinds and building removal cost are excluded.

Note 2. Following infrastructure systems are adopted

. Water supply -- PAM-Central distribution system

. Sewerage -- Central - lagoon system (with aerator)

3-3 Hosuing Construction Cost

[Alternative I]

	Type	Const. Cost/unit (x 10^3 RP)	CASE-AX (40)		CASE-BY (50)		CASE-CZ (60)	
			units	mil.RP	units	mil.Rp	units	mil.RP
1 storied	D-20	852	3,480	2,965	2,680	2,283	0	0
2 storied	DM-36	1,341	4,350	5,833	8,040	10,782	15,610	20,933
Flat	FS'-45R	4,004	0	0	1,340	5,365	4,460	17,858
Empty lot	-	-	870	-	1,340	-	2,230	-
Total			8,700	8,798	13,400	18,430	22,300	38,791

[Alternative II]

	Type	Const. Cost/unit (x 10^3 RP)	CASE-AX (40)		CASE-BY (50)		CASE-CZ (60)	
			units	mil.RP	units	mil.RP	units	mil.RP
1 storied	D-20	852	2,160	1,840	1,680	1,431	0	0
2 storied	DM-36	1,341	2,700	3,621	5,040	6,759	9,730	13,048
Flat	FS'-45R	4,004	0	0	840	3,363	2,780	11,131
Empty lot	-	-	540	-	840	-	1,390	-
Total	-	-	5,400	5,461	8,400	11,553	13,900	24,179

Note: Construction cost/unit = (Net construction cost) x 1.2 and including following items.

1 Planning + design fee ... 3 %

2 Public facility improvement cost ... 1,000 RP/M^2 x 20 %

3 Overhead + Adm. Cost .... 5 %

4 Interest .... 13.5 % x 2 years

3-4 Total Project Cost

Case studies of total project cost are as follows.
Results show that total project cost/unit are nearly same in Alternative I and II, although land development cost and infrastructure cost are cheaper in Alternative I. But in this calculation compensation costs are excluded and if these costs are taken into consideration Alternative I is expected to have higher total project cost.

[Alternative I]

(mil RP)

		CASE-AX (40)	CASE-BY (50)	CASE-CZ (60)
I	Land Acquisition Cost	9,910	9,910	9,910
II	Site Improvement Cost	9,671	11,462	16,016
III	Housing Cost. Cost	8,798	18,430	38,791
IV	Total Project Cost	28,379 (3.3 mil RP/unit)	39,802 (3.0 mil RP/unit)	64,717 (2.9 mil RP/unit)

[Alternative II]

		CASE-AX (40)	CASE-BY (50)	CASE-CZ (60)
I	Land Acquisition Cost	6,100	6,100	6,100
II	Site Improvement Cost	6,335	7,631	10,606
III	Housing Const. Cost	5,461	11,553	24,179
IV	Total Project Cost	17,896 (3.3 mil RP/unit)	25,284 (3.0 mil RP/unit)	40,885 (2.9 mil RP/unit)

3-5 Selling Price

Selling price of each housing type are shown as follows. Land relating cost (land acquisition cost + site improvement cost) are calculated as follows.

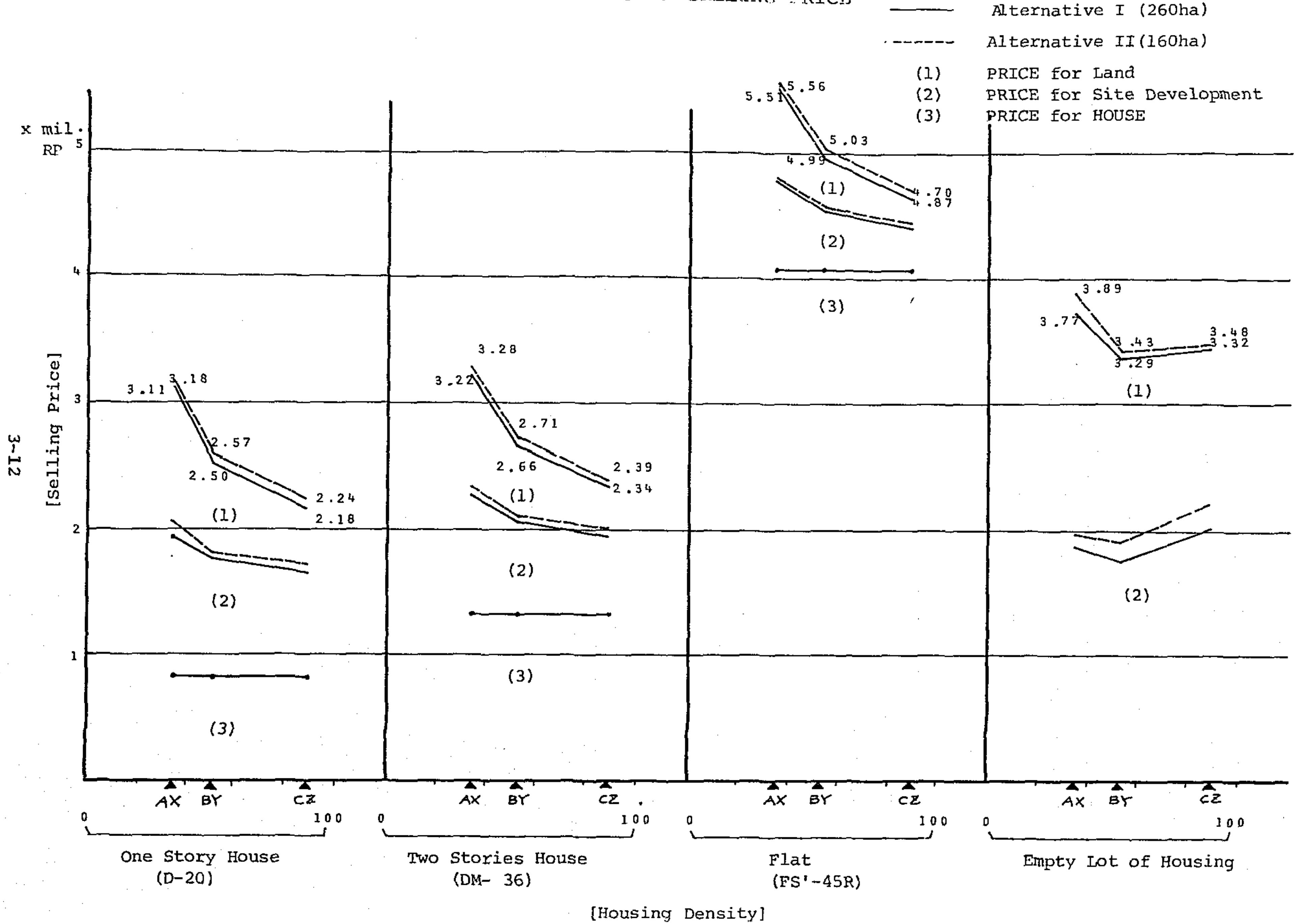
(Total project cost/housing area (m^2)) x (lot area (m^2))

Results show that in all cases selling price is more than 1.9 mil.RP which is expected as average affordability

Row rise houses	2.1 ∿ 3.2 mil.RP
Flats	4.7 ∿ 5.5 mil.RP

If this 1.9 mil.RP is fixed level of affordability, study in next phase shall be targeted not only to technical aspects but also to strategical aspects to reduce these selling prices.

CASE STUDY OF SELLING PRICE



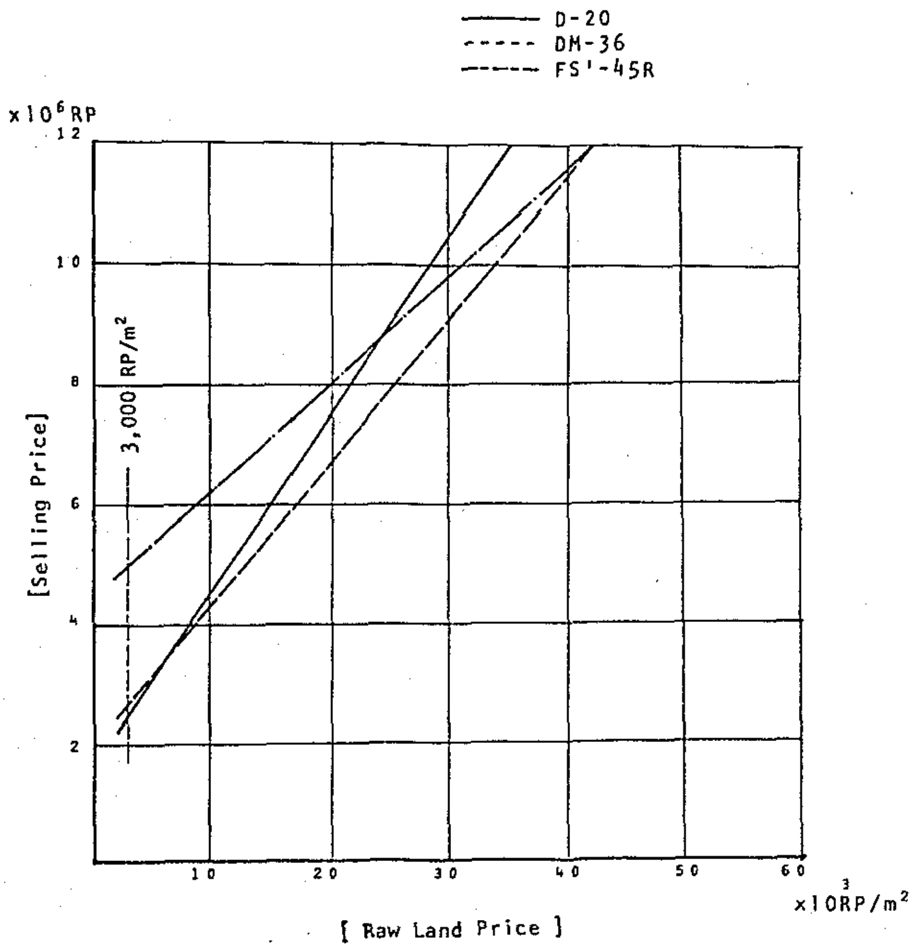
4. SELLING PRICE AND RAW LAND PRICE

According to the case studies of selling price, the price of flats is considerably higher than that of low rise houses. The raw land price, which will increase rapidly every year is an important element of the price difference between flats and low rise houses.

Therefore, relations between the selling price and the raw land price are studied here. As there is only a few difference between Alternative I and II, the result of CASE-BY (50) is shown next.

SELLING PRICE BY THE RAW LAND PRICE

CASE-BY (50)



If the raw land price is more than 25,000 RP/m^2, the selling price of flats is cheaper than one story houses, and more than 42,000 RP/m^2, cheaper than two stories houses.

For two stories houses, it is cheaper than one story houses at more than 6,000 RP/m^2.
At present, the raw land price at Tanah Aban in the center of Jakarta is about 40,000 RP/m^2. Near future the raw land price at Cengkareng will increase, then, the two stories houses will be feasible.
But, at the point where flats are cheaper than other types, the selling price itself is considerably high. Further study is necessary to be constructed as one of the low cost housing types.

5. CASE STUDY OF CROSS SUBSIDIZED SELLING PRICE

The development plan of this site is made on the premise of MIXED-COMMUNITY concept and includes empty lots for commercial and business buildings and also empty lots for houses of higher income group.

These lots can be used for the purpose of cross subsidy. Concretely the empty lots for commercial and business buildings are distributed along the main roads of DKI MASTER PLAN.

Considering the rapid development of Western Jakarta Area in near future and the start of new international airport, the site will have a very high potentiality in future.

On the other hand the empty lots for houses are distributed in rather higher part of the site and have smaller possibility of damages from inundation and subsidence of ground and also have better environment situating near green belt and facing to the road accessible by car. Thus these lots have high additional value as housing lots.

In this case study, CASE-BY (50) is adopted as an example case with following assumptive conditions;

- Empty lot for commercial building is 40 ha
- Land acquisition cost, land development cost and infrastructure cost increases in proportion to the increase of project area (+ 15 %).

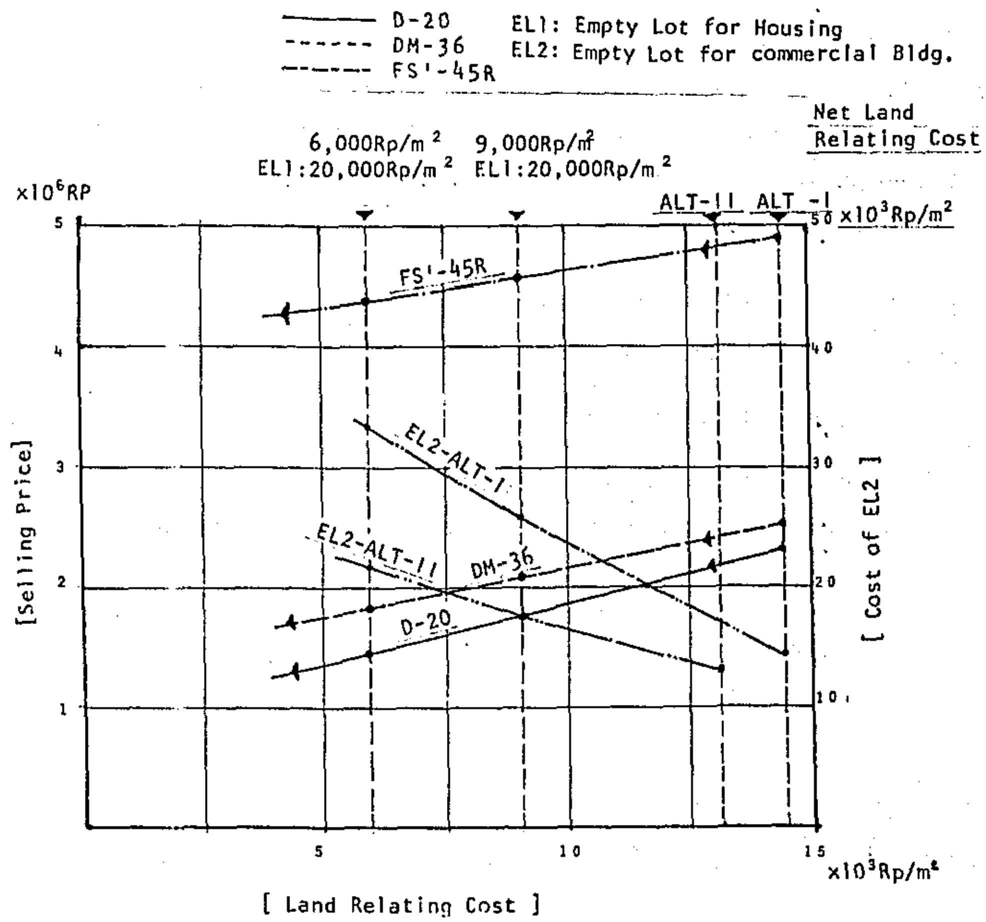
[Land Use]

	Housing Area	Empty Lot for Housing	Empty Lot for Commercial Bldg.	Others	Total
Alternative I	103.2 ha (12,060)	26.8 ha (1,340)	40 ha	130 ha	300 ha
Alternative II	63.2 (7,560)	16.8 (840)	40	80	200

In this study only the selling price of lots are cross-subsidized and empty lots for commercial and business buildings and houses are plus subsidized.

First the price of lots for low cost houses are assessed 9,000 RP/m^2 or 6,000 RP/m^2. And the price of empty lots for houses are assessed in both cases 20,000 RP/m^2.
And finally the subsidy charge of empty lots for commercial and business buildings is calculated so that the total land relating cost will coincides.

SELLING PRICE BY CROSS SUBSIDY
CASE-BY (50)



The results of calculation of selling prices show that if the selling price of land is cross subsidized to about 10,000 RP/m^2, average income group will afford to buy 1 storied types of houses.

And if the selling price of land is further cross subsidized to about 7,000 RP/m^2, 2 storied type is also within the affordable range, but in this case the price of empty lots for commercial and business buildings will rise up to about 2.3 times (33,000 RP/m^2) in Alternative I, and 1.5 times (20,000 RP/m^2) in Alternative II compared to the cost without cross subsidy.

Needless to say, the selling price of those empty lots for commercial and business buildings and houses shall be reviewed later with the balance of market price in Cengkareng area.

6. PROSPECTS FOR THE NEXT PHASE

An analysis shall be made on the studies performed up to this moment and by itemizing problems, future problems shall be arranged in good order for the implementation of this project.

6-1 Site Planning

(Object of Implementation)

- o The area of 300 ha covering this project area features various characteristics depending on condition of land acquisition and utilization of land and gives important influence on the easiness and difficulty and scale of the implementation. However, at this moment, future prospect of land acquisition, combination of existing villages into the implementation program, etc. are not yet finally settled. Accordingly, in the future, these points should thoroughly be studied and the object of implementation, namely, project area, implementing scale, etc. should be determined.

(Facility Demand)

- o In this plan a proposal is made to acquire positively a commercial lot of 30 ha for meeting requirements of these needs when the development of this district make a good progress. Upon completion of the new international air port and preparation of the outer ring road, in tune with the national economical progress, demands for facilities for commercial business and offices will invariably increase. A realistic forecast of these demands shall necessarily be made. Another some 10 ha is allocated for service facilities within this district. It is necessary that the tendency of needs of inhabitants in future shall be assumed and the volum for them shall be reviewed.

  Additionally, in the future, a considerable rise of rate of matriculation and utilization of automobile can be expected and thoughtful consideration should also be given to parking facilities and other traffic facilities.

(Neighbourhood Unit Composition)

- o In this plan, 4,000 inhabitants compose a neighbourhood unit with allocation of a primary school. This figure has been determined by estimation of future facility level, scales, fluctuation of primary school attendants, etc. However, as present planning standard shows 4,000 inhabitant - 1 neighbourhood unit and 3,000 inhabitant - 1 preliminary school unit an adjustment shall be made in the future accordingly. Regardless of consolidation of the existing village into the implementation or not, for a balanced neighbourhood composition of Cengkareng development, socio-economical conditions of the existing village should be studied.

(Implementing Body and Implementing Program)

Upon starting the housing development of Cengkareng a variety of implementing bodies will participate in it. Accordingly, implementing body, implementing items and implementing program of each body concern shall be clarified.

(Planned Density and Raw Land Price)

- o The land price of the district will be spirallingly increased. An alternative plan is made on supply of 10% of walk-up flat. Walk-up flat can easily meet the requirement for higher density and can cope with high land price. Therefore it is necessary to estimate in the implementing program planed density along with the change of land price, the method and optimum time of introduction of walk-up flat. Further, the development of low rise houses, for example court house type houses, which can meet the higher density requirement shall be studied.

IMPLEMENTING ITEMS AND IMPLEMENTING BODIES

		PERUMNAS	CIPTA KARYA	DKI	Others
a-1	Drainage	o			o main pipe DPV
a-2	Water Supply	o			o Untill Intake PAM
a-3	Sewerage	o			
a-4	Road	o		o	
a-5	Electricity	o			Execution by PLN
b-1	Kindergarden				o
b-2	Primary School	o lot only		o	
b-3	Middle School	o lot only		o	
b-4	High School	o lot only		o	
b-5	Shopping Facility				o
b-6	Public Hall Mosque etc.	o lot only			o
b-7	Administrative Facilities				
b-8	Medical Facilities				
b-9					
b-10					

(Land Development Method)

- The topographical survey was completed in February, 1980.
  Based upon these survey drawings, studies are to be made with respect to the land development from the quantive aspect.
  The problems in connection with the above shall be pointed out in the following:
  As this District is located on the low land some 3 m above the sea level, as land development method, land filling, drying-up, polder system etc. are considered. Upon completion of the main drainage the dry-up operation can be conducted easily. However, concerning the existing surface layer soil it is expected that its load bearing capacity is low and is not applicable to housing construction and surface soil surveys should be made for sellecting the alternatives of soil replacement, filling-up or using of soil stabilizers.
  As for the land filling application of sea sand or laterite can be considered. Analysis should be made on their property, strength, difficulty of procurement of materials, costs, etc. with due attention paid to the filling-up quantity. As to polder system, its cost is expected very high and accordingly, study shall be done between the aforesaid two methods.

(Relating Projects)

At this moment, the development of surrounding roads is scheduled by the authorities of DKI Jakarta. This development plan involves in some part expansions of the existing roads, however, a majority of parts will be new construction. Therefore the prospect of implementing program shall be grasped clearly.
Mass housing construction before the completion of this development plan will cause not only the disturbance of traffic service but also the difficulty of infrastructure improvement, obstacles to the housing development plan itself and bad influence on the existing housing area. Additionally, it is also necessary to prepare second best resolution against this.

For instance, widening of access parts of the existing roads to the Jakarta-Tanggerang highway, repair of the Cengkareng-Teluk Naga road, construction of access ways to the new international air port should be also studied.

- o Concerning the drainage system, this construction plan is made based on the assumption that, the housing development will be started after the completion of drainage plan which will be executed by PBJR. For example, if the housing development plan will be executed without improvement of existing drainage, the large scale of filling-up of soil will be necessary, leading in consequence to deterioration of flow-out coefficient, infiltration of contaminated water to cultivated land, and further to over-flowing of the existing drainage routes, damaging on rice cultivation, inundation, flood, etc. As to the development of drainage system, the next best measures shall, under some limitations be studied. For instance, construction of a tentative reservoir pond, repair of K. Kapuk Muara, construction of tentative drainage route up to the fish ponds and housing site improvement by polder system shall be considered as alternative plans.

6-2 Flat Housing Study

When looking back to the result of the studies performed up to now, it is clear that construction cost of the flat housing ranges RP 70,000 - 80,000/m^2 (net), and is considerably unfavorably compared to it of low rise houses, RP 25,000 - RP 32,000/m^2. In spite of this background, a possibility of adding the flat housing into the menu of the low cost housings shall be examined as the principal subject in the secondary stage of study. At the same time, another approach will be necessary for examining possibility of cost reduction by developing further the flats model type and housing unit type. The study items in the secondary stage are itemized in the following:

- o Relationship between the rise of land price in future, density and selling price;

Study shall be done on the possibility of adding the flat housing into the menu of low cost houses by examining how much land price increase including the construction costs of infrastructure etc. will be needed, or how high density requirement will be needed.

o Study of conversion of flat type model related to possibility of cost reduction and higher density requirement.
  Study shall be done on the possibility of new flat model type or composite flat model type apart from the hitherto studied flat model types, FG FS and FM types.

o Possibility study of cost reduction by introduction of new construction method or materials.
  Study shall be done apart from the conventional material or structural method like cost-in-situ RC structure & maisonry construction, searching for the possibility of new method which will enable the cost reduction or for the feasibility of importing a part of construction materials or construction method from abroad.

o Study of the flat housing from the site planning point of view.
  Studies will be conducted on the flat housing from the stand points of a mass arrangement, landscaping, hazard prevention (fire, flood, etc.) and effective use of external space and also about the possibility of point house type flats.

o Study of clarification of flats in the housing policy and of possibility of implementing thereby.
  After the studies of the cost reduction and density requirement etc. it can be said that the building cost itself of flat have small possibility of coming down to the competitive level to those of the low rise house, the clarification in the housing policy will be the higgest problem for introducing the flat house into the menu of the low-cost houses. In this case, following possibilities can be considered;

- Positioning of flat as a high-level oriented house.
  When the flat house is positioned as one to be plus cross subsidized with bigger floor area and living levels, is there realistical feasibility?

- Positioning of flat as an experimental house for unflammable housing stock with higher density.
  For preparation for the future flat house era, and by positioning as an experimental house with special purpose for instance, living house of the Government employee or official clerk by thinking of the Government subsidiary and by reducing the number of houses to be built, the possibility of implementation of these houses will be studied.

6-3 Low Rise Housing Study

Studies related to the low rise housing on this occasion involve

1. Study of the low rise housing applicable to a low and swampy area "Cengkareng"
2. Study of the living house type capable of meeting higher density requirement.

For the items "1" and "2", studies have been made standing on each respective view point, however, they can not be regarded as sufficient.
Accordingly, in the phase II also, it is necessary to conduct a further detailed study with same study policy.
Concerning "1", specific study of land development by the topographical maps was not conducted and the soil improvement method remains unsettled because of shortage of data on the characteristics of the surface layer soil, and accordingly, a continuous study is required for clarifying the cost effect inflicted on the cost of the row rise house. Further, it is necessary to perform a little more detailed study, especially the study on the cost characteristics and on the availability of materials in order that final selection of the wall and roof materials will be made. On the other hand, concerning "2", a study is necessary for the low rise housing as a mass, especially for 20-24 m^2 type or 36 m^2 typehouses with expansion, with proper consideration on environmental aspects and hazard protection aspects.

For instance, a study will be made how to arrange building line, form of lot, scale of lots and expansion method and environment subsequent after expansion..

Further, a study will be required on the possibility of living house of a new series (R-series type, RM small-scale type).

6-4 Construction Cost

With respect to the construction material and labour costs, study covers the necessary range for phase I, however, for the Phase II further many-sided studies will remain to be conducted. Especially, an accumulation of cost data will become necessary for the accurate calculation of road, land development administration and management costs which is tentatively calculated in this report.

On the other hand, in the case study of calculation of the total project cost, many assumptions are adopted and some condition is excluded, thus those volues should be checked later. They are listed as follows:

- Building removal compensation cost
- Compensation cost for agricultural products and resettlement.
- Cost for removing buildings, etc.
- Construction cost of public facilities.
- Loan interest and repayment term.

6-5 Strategy for Implementation

According to a case study calculation of selling price in this report, when the cross-subsidy and capital subsidy are not available, the sales price exceeds the affordability.

Thus, in the phase in which development of public housing is performed a strategy is often required not only for solving technical problems but also for solving soft problems. A great majority of these problems include the government housing policies and so, solutions of them are only possible by the clear decission by government or by relating public agents.

The strategy items for the implementation can be pointed out as follows:

1) Setting of target groups

In Part III, an average target group was estimated from the income distribution per household, however, considering special conditions in Cengkareng District and housing policy judgement in relating aspects of PERUMNAS, it is necessary to study on the range of the target groups and their distribution of them.

Recent trends indicate that target group is lowered down to the lower income class, however considering the potentiality of the Cengkareng District, some difficulty will be seen in lowering the target group excessively.

2) Setting of Affordability

From the loan conditions and household expense rate the affordability is estimated but this shall be reviewed in accordance with the target groupe mentioned at 1).

a. Loan Condition

The ratio of down payment depends upon the saving capacity, etc., of the target group, however, on the other hand, such increase of ratio of down payment which does not let the target group feel a deep embarassment in their household should also be investigated

For example, if the term between contract and occupation is one year and if during this time the same amount as monthly repayment will be deposited, the ratio of down payment will increase up to 7-8% within one year.

The longer the loan period, more advantageous will be the repayment, however, this depends upon the period of depreciation of the building concerned. As far as the concrete houses are concerned this period can be made long, however, for wooden houses, this will be shortened to 20 years.

Lower the interest rate, easier the repayment, but in public housing political decision is needed.

b. Housing Expense capacity in Household.

It is necessary to analyse income and expenditure structure of household more accurately with respect to the target group. However, as no reliable data is available, study will meet difficulty to graspe the real condition.

3) Method of procurement of capital of operation

a. Loan interest

As a result of calculations of the total project costs, payment for interest for loan was discovered to be approx. 15%, slowing considerable effect of the interest ratio.
Accordingly, investigations are being done for possibility of getting a loan of low interest ratio, however, this requires political judgement.

b. Government Subsidy

In the Republic of Indonesia, there is no systems of affording the Government Subsidy to the construction of public houses, this item is not considered in this calculation. As other countries are now providing Government Subsidies, as this particu particular subsidy is necessary for promoting construction of the public houses, special action should be taken to the Government in the future.

c. Payment by other related public projects

In this present report, such payments from the operating agent are excluded, as the construction cost of peripheral roads, new proposed drainage system, water distribution piping to the area and rearrangement costs of the existing villages in the Alternative-II.
On the other hand, site improvement costs for the public installations such as schools, community establishments, parks and roads shall be borne by the operating agent.
However, for such a large scale development project as we are now studying as the peripherial areas will be apt to receive these services, it should be considered that a portion of the site improvement cost required for the public installations be borne by the source outside.

d. Utilization of credit agency

As the interest ratios adapted by various credit agencies are less than 13.5% as is the case with our trial calculation and the length of years of credit is longer, it is profitable to apply to these agencies.

The possible subjects to credit are in many cases not the houses themselves, but some related public facilities associated with the public establishment.

Therefore the portion of the cost by credit agency is considered rather small.

The related public facilities are as follows:

- Construction machines
- Some construction materials
- Sewer treatment facilities
- Facilities of water source and water supply system

4) Cross-Subsidy

In this report, a calculation was made utilizing empty lot as a case study for the CROSS-SUBSIDY.

According to the result of this calculation, it was found that house of 36 m^2 type can be included in the range of average target group and this method itself turns out to be considerably effective.

The flat house cost in this case study amounts to above RP 4 million, too expensive for the low cost house, however, by utilizing house itself for the CROSS-SUBSIDY, the selling cost can be lowered.

For planning the CROSS-SUBSIDY, it is necessary to study the market prices of land in the peripheral area.

5) Sales house and rent house

Generally, in case of rent house, the monthly payment amount is lower than that of sales house.

This is due to the fact that for the rent house, a subsidiary money is generally available and also to a longer depreciation period.

Accordingly, an advantage of the rent house will more be found in the concrete construction as is the case with flat houses than the case of the wooden houses.

APPENDIXES

1. SCOPE OF WORK
2. MINUTES

SCOPE OF WORK

FOR

THE STUDY OF LOW COST HOUSING PROJECT

(KTA 20)

Agreed

Between

JAPAN INTERNATIONAL COOPERATION AGENCY

And

CIPTA KARYA

Dated :

Takao Hirota

(Mr. Takao Hirota)
Director of
Social Development Cooperation
Department, Japan International
Cooperation Agency.

Ir. Radinal Moochtar
Director General of Cipta Karya
Department of Public Works.

I. INTRODUCTION

In response to a request of the Government of the Republic of Indone. the Government of Japan has decided to conduct a feasibility study fc the low cost housing project. The Japan International Cooperation Agency (hereinafter referred to as " JICA ") the official agency responsible for implementation of technical cooperation programs of the Government of Japan, will carry out the study in close cooperation with the Government of the Republic of Indonesia and its authorities concerned.

II. BACKGROUND OF THE STUDY.

Housing Policies in Indonesia has been developed since PELITA II (1974/75 - 1978/79).
Low cost housing, one of the main housing program of the government in PELITA II, were mainly supplied with low rise housing development. But in PELITA III (1979/80 - 1984/85) some changes in the policy are going to be implemented which will include the development of four storied housing or so called " walk-up-flats ", with the objective of optimizing the use of land especially in the large and density populated urban areas.

According to the housing program in PELITA III, 50.000 units of four storied housing are planned to be constructed by PERUM PERUMNAS as part of the 120.000 units houses to be built by PERUM PERUMNAS in the coming five years period. In this framework, the development of four storied housing is considered of high priority by the Indonesian Government.

It is widely known, that many parts of the northern coast of Java consist of low level and swampy lands presently left undeveloped.
Many of these lands are situated close to the city center. Therefore if it can be proven that such undeveloped land can be successfully changed into a good housing estate, such experience can be applied more widely in other areas in Indonesia.

III. OBJECTIVES.

The study aims at two targets :

One is to conduct feasibility study and preliminary engineering design for housing development project in the site of Cengkareng. The coverage of the engineering design will be subject to further decision by both parties. Secondly is to develop standardized designs for pilot Walk-up flat for public housing, with possible development in Cengkareng Site.

IV. THE SCOPE OF THE STUDY.

4.1. <u>The feasibility study of housing development project in the site of Cengkareng</u>.

4.1.1. In order to achieve the said objectives, the study will cover :

1. Survey and analysis of general conditions, with particular attention to social, drainage, sewerage and other civil engineering aspects.
2. Assessment of socio-economic development potentials of the site, including preliminary estimate of development cost.
3. Conducting basic designs of site planning in some parts of the site.

4.1.2. The Implementation programme for the feasibility study in Cengkareng site will be decided taking in to consideration the feasibility of the development of standardized designs of pilot walk-up flat.

4.1.3. The size of the site will be decided based on criteria such as the target group, population density, mixed community, etc. The tentative site area is considered within the range of 30 Ha to 50 Ha.

4.2. <u>The development study for the pilot walk-up flat</u>.

4.2.1. In order to achieve the previously mentioned objectives, the study will consider the following :

1. Feasibility of utilizing local materials with due consideration to its socio-economic and employment effects.

2. Conformity between the affordability of the target group and cost of house which will be provided.

3. The minimum building standard and regulation, and other provision as appropriate.

4. Rationalization of construction works in order to shorten the term of works and to simplify the construction works.

4.2.2 The results of studies that will be prepared and submitted are the formulation of standardized designs of the pilot walk-up flat , the identification of structural calculation and the estimation of construction cost.

4.2.3. The implementation program of study is as follows :

<u>(The first stage).</u>

The following preliminary study will be implemented by the Japanese team dispatched to Indonesia under the cooperation with the Indonesian counterpart team.

1. Inventory and analysis of the data and the following fields covered :
   - The characteristics of housing demands.
   - The present situation of housing industries and housing supply system.
   - Construction cost , land price , building materials available and the others.

2. Setting up the pre-condition for tentative design.
   - The floor size of a dwelling unit.
   - The dimentions of each part of building
   - The size of building and the number of storey.
   - The housing equipment performance level
   - The dwelling performance level.
   - The estimation construction cost.
   - The building materials by each part of building.

<u>(The second stage).</u>

According to the pre-condition for tentative design,draft designs will be formulated either in Indonesia or in Japan. In the latter case , possibilities will be explored for the provision of funds for counterpart personnel to participate in drafting the design in Japan.

(The third stage).

The draft designs prepared on the second stage will be reassessed fully and orientation of modification is considered in detail by the joint team of Japan and Indonesia.

(The fourth stage).

In accordance with the result of reassessment on the third stage, modification of the draft designs will be implemented and the final standardized designs of pilot walk-up flat will be completed in Indonesia or in Japan.

V. STAFFING.

The study will be undertaken by a team of professionals covering the following fields :

1. Project management.
2. Architecture designs
3. Building structure engineering
4. Building equipment engineering
5. Civil engineering

It is understood , that city planning and financial / economic analysis necessary for the project is already covered in the above mentioned fields.

VI. CONTRIBUTION OF THE GOVERNMENT OF INDONESIA.

For the purpose of the study , the Government of Indonesia through PERUM PERUMNAS will cooperate to the extent possible by :

1. Providing the team with the data and information concerned with its use in connection with the study.
2. Carrying out works of soil test.
3. Facilitate for obtaining exemption from taxes and duties for machinery equipment and materials necessary for the study.
4. Assigning counterpart personnel (officials/engineers) to the team during the study period.
5. Providing the team with suitable office space and office equipment necessary for the study.
6. Providing vehicles with drivers.

7. Providing any other available facilities that may be required for the execution of the study as it will be agreed upon between both parties.

VII. CONTRIBUTION OF JICA.

For the purpose of the study , the Government of Japan will assist to the extent possible :

1. Sending the Japanese expert team to conduct the study.
2. Transferring the knowledge to the Indonesian counterpart experts during the period of the study.
3. Arranging the equipment necessary for the efficient conduct of the study.

MINUTES OF THE DISCUSSIONS ON THE
INCEPTION REPORT FOR THE LOW COST
HOUSING PROJECT (KTA-20)

(Phase I)

The discussion on the Inception Report were held on the 12th, 16th and 17th of October in 1979 at PERUM PERUMNAS (see ATTACHMENT I) and the contents of the Inception Report were fundamentally agreed upon by both parties after recognizing the following items :

1 - a) The objective of this study is to make pre-feasibility study for Housing Development Project on the site of PERUM PERUM - NAS in Cengkareng considering the combination of types of housing.

b) It will be studied whether a walk up flat is suitable or not to the site of Cengkareng as one of the housing types mentioned above.

2 The organization of the study and the members of each part of the organization is shown in ATTACHMENT II.
The complete members for the steering committee and the counterpart will be nominated in December 1979.

3 Indonesian side requested that the transfer of technology shall be considered more.
Japanese side replied that they would try their best for the effective transfer of technology such as adjustment of working schedule and the way of working.

October 23, 1979.

Ir. Suyono, M.Sc.
Director of Planning
PERUM PERUMNAS

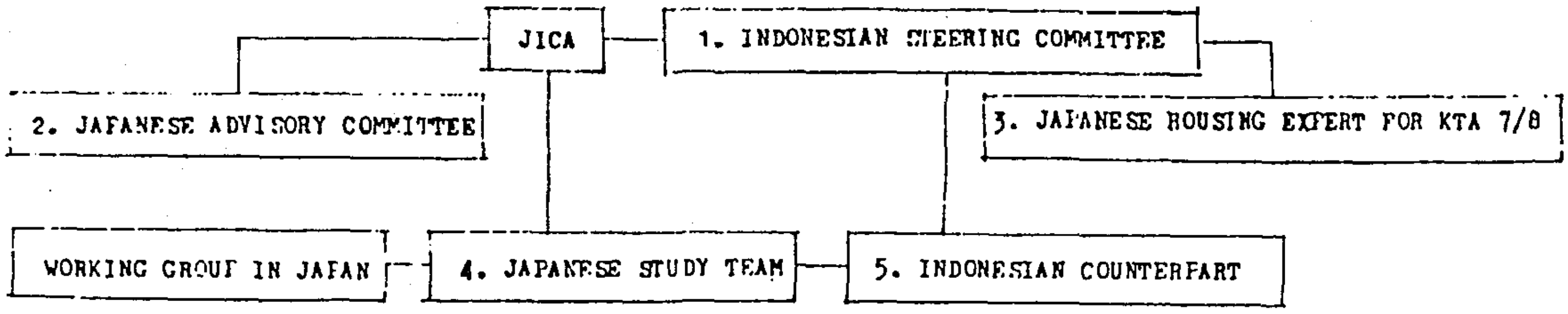
Jiro SUZUKI
Team Leader of Japanese
Study Team

ATTACHMENT I.

ATTENDANTS' LIST OF MEETINGS

	1st	2nd	3rd	
Date	Oct. 12, 1979	Oct. 16, 1979.	Oct. 17. 1979	
Place	PERUM PERUMNAS	PERUM PERUMNAS	PERUM PERUMNAS	
ATTENDANTS	INDONESIAN SIDE PERUM PERUMNAS Ir. Soenarjono Danoedjo Ir. Suyono, M.Sc. Mr. Soelistijo Tjitrohamidjojo Ir. Duddy Soegoto Ir. Aziz Dahlan Ir. Yos Sidharta JAPANESE SIDE ADVISORY COMMITTEE Mr. Nobuaki Ohkubo Mr. Toshio Ishiguro Mr. Tetsuo Numaoi STUDY TEAM Mr. Jiro Suzuki Mr. Hajime Sabo Mr. Shunji Kawada Mr. Shunran Takahashi Mr. Yutaka Saito Mr. Yashushi Miyazaki Mr. Ryoichi Kawasaki JICA Mr. Takeshi Shinoura EMBASSY Mr. Takeo Yamazaki EXPERT FOR KTA 7/8 Mr. Shinsaku Kanetaki Mr. Toshio Uetama Mr. Hajime Obata	INDONESIAN SIDE PERUM PERUMNAS Ir. Duddy Soegoto Ir. Aziz Dahlan JAPANESE SIDE ADVISORY COMMITTEE Mr. Nobuaki Ohkubo Mr. Toshio Ishiguro Mr. Tetsuo Numaoi STUDY TEAM Mr. Jiro Suzuki Mr. Hajime Sabo Mr. Shunji Kawada Mr. Yutaka Saito	INDONESIAN SIDE PERUM PERUMNAS Ir. Suyono, M.Sc. Ir. Duddy Soegoto Ir. Aziz Dahlan JAPANESE SIDE ADVISORY COMMITTEE Mr. Nobuaki Ohkubo Mr. Toshio Ishiguro Mr. Tetsuo Numaoi STUDY TEAM Mr. Jiro Suzuki Mr. Hajime Sabo Mr. Shunji Kawada Mr. Shunran Takahashi Mr. Yutaka Saito Mr. Yashushi Miyazaki Mr. Ryoichi Kawasaki JICA Mr. Takeshi Shinoura EMBASSY Mr. Takeo Yamazaki EXPERT FOR KTA 7/8 Mr. Shinsaku Kanetaki Mr. Toshio Uetama Mr. Hajime Obata	

ATTACHMENT II Work Organization



1. INDONESIAN STEERING COMMITTEE

Director General Of CIPTA KARYA
IR. RADINAL MOOCHTAR

Director of Housing of CIPTA KARYA

Director of Sanitation Technic of CIPTA KARYA

President Director of PERUM PERUMNAS

Director of Planning of PERUM PERUMNAS

Director of ~~Estate Management~~ Construction of PERUM PERUMNAS

The head of institutions of DKI Jakarta

2. JAPANESE ADVISORY COMMITTEE

SOICHIRO MATSUTANI Chairman
Director of Housing Construction Division, Housing Bureau, Ministry of Construction (MOC)

NOBUAKI OHKUBO Adviser to the Team
Deputy Head of Urban Building Division, Housing Bureau, MOC

TOSHIO ISHIGURO Adviser to the Team
Deputy Head of Land Development Planning Project Division, Tsukuba Academic New Town, Development Bureau, Japan Housing Corpolation

YASUNORI YAMANAKA Adviser to the Team
Deputy Head of Housing Construction Division, Housing Bureau, MOC

YUJI ISHIYAMA Adviser to the Team
Head of the First Earthquake Engineering Division, International Institute of Seismology and Earthquake Engineering, Building Research Institute, MOC

TETSUO NUMAOI Adviser to the Team
Overseas Cooperation Officer, International Division, Planning Bureau, MOC

3. JAPANESE HOUSING EXPERT for KTA 7/8

SHINSAKU KANETAKI

TOSHIO UETAMA

HAJIME OBATA

HAJIME YOKOBORI

4. JAPANESE STUDY TEAM

JIRO SUZUKI Leader
Nihon Architects, Engineers & Consultants, Inc. (NAEC)

HAJIME SABO Town Planner
NAEC

SHUNJI KAWADA Architect
NAEC

SHUNRAN TAKAHASHI Structural Engineer
NAEC

YUTAKA SAITO Mechnical Engineer
NAEC

YASUSHI MIYAZAKI Irrigation Engineer
NAEC

RYOICHI KAWASAKI Engineering Geologist
NAEC

HIROYA YOSHIKAWA Environmental Scientist
NAEC

5. INDONESIAN COUNTERPART

IR. DUDDY SOEGOTO Coordinater
PERUM PERUMNAS

IR. AZIZ DAHLAN Planner
PERUM PERUMNAS

IR. HERRY PURNOMO Architect
PERUM PERUMNAS

IR. PARYATNO PARNO Civil Engineer
PERUM PERUMNAS

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*
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MINUTES OF THE DISCUSSIONS
ON THE INTERIM REPORT FOR LOW COST HOUSING PROJECT
IN CENGKARENG, JAKARTA (KTA-20) PHASE I.

The Interim Report (see ATTACHMENT 1) was submitted and explained by the Japanese Study Team and discussed by the participants (see ATTACHMENT 2) at the Joint Meeting on the 18th of January in 1980 in Jakarta.

The Interim Report which orientates the frame of the Final Report (draft) was fundamentally agreed upon by both parties after recognizing the following items :

1) The Final Report of Phase I (draft) shall be formulated on the basis of the Interim Report with the accomplishment of the purpose of Phase I explained at the Joint Meeting.

2) The findings and alternatives proposed during Phase I will be evaluated in Phase II after considering additional data, especially socio-economical aspects.

3) The boundary of planning area shall be decided before Phase II.

4) The study on various types of houses shall be developed in Phase II on the basis of the Interim Report.

January 21,1980.

Ir. Suyono, M.Sc.
Director of Planning
PERUM PERUMNAS

Jiro Suzuki
Team Leader of Japanese
Study Team

THE STUDY OF LOW COST HOUSING PROJECT (KTA-20)
PHASE I

INTERIM REPORT

1. INTRODUCTION

2. STUDY OF URBAN DEVELOPMENT
   - 2-1. DEVELOPMENT POLICY
     - A. Site Planning
     - B. Infrastructure
   - 2-2. SITE PLANNING
     - A. Alternative I
     - B. Alternative II
   - 2-3. INFRASTURCTURE

3. STUDY OF VARIOUS TYPES OF HOUSES
   - 3-1. STUDY POLICY
     - A. Architectural Planning
     - B. Structural Planning
   - 3-2. FLAT HOUSING STUDY
     - A. Architectural Planning
     - B. Structural Planning
   - 3-3. LOW RISE HOUSING STUDY
     - A. Architectural Planning
     - B. Structural Planning

4. SUMMARY
   - A. Proposal on Alternatives
   - B. Total Cost Estimate

JAN. 16th, 1980

JAPANESE STUDY TEAM (JICA)

ATTENDANCE LIST
18TH JANUARY 1980

18	19	2.

21	17	16	15	4	13	12	11	10

	9	8	7	6	5	4	3	2

No	NAME	INSTITUTION	SIGNATURE
1	SUYONO	PERUMNAS	
2	[illegible]	[illegible]	
3	Zamzana [illegible]	Directorate of Sanitary Engineering Directorate General of Cipta Karya	
4	IMAN SUNARIO	DKI Jakarta	
5	RAI PRATADAJA	DKI Jakarta	
6	ROSITA D. SAPUTRO	DKI - JKT	
7	Paryalue P.	Perumnas	
8	HERI PURNOMO	PERUMNAS	
9	AZIZ DAHLAN	PERUMNAS	
10	Yuji Ishiyama	IISEE, BRI, Ministry of Construction	Y. Ishiyama
11	Yasunori YAMANAKA	Ministry of Construction	Y. Yamanaka
12	Takeo YAMAZAKI	Embassy of Japan	T. Yamazaki
13.	Tadashi SHINOURA	J. I. C. A.	T. Shinoura
14.	Shinsaku Kanetaki	Cipta Karya Expert	Kanetaki
15	JIRO SUZUKI	JICA TEAM (NIHON ARCHITECTS ENGINEERS & CONSULTANTS ASS INC.)	Jiro Suzuki
16	Hajime SADO	..	Hajime Sado
17	SHUNRAN TAKAHASHI	Jica Team	
18	Hajime Obata	Perumahan Expert	Hajime Obata
19	Hajime YOKOBORI	Perumahan Expert	