9－5　代替案の設定

代替案の設定はチェンカレン地区（Cengkareng）にふさわしい住戸密度を実現すると共に、Ｆ５タイプ住宅率、分譲用地率においても適切な数値を得るような住戸配分パターンを選び出すことにある。事業収支バランスの節でのべたように、住戸配分パターンが住戸密度とＦ５タイプ住宅率を決定する基本的要素である。以下に住戸配分パターンによって上述の諸要素がどのような影響をうけるかの検討をおこなう。

9－5－1　供給住宅群パターン特性

タイプ別住戸数の配分比により住戸密度・Ｆ５住宅率、分譲用地率がどのように変化するかを、供給住宅群パターン毎にみたものがFig－9－6から9－9までの4図である。Fig－9－5はこれを模式的にあらわしたものであり、縦軸にＦ５住宅の戸数比をパーセントであらわし、横軸に住戸密度と分譲用地率をとったグラフを並べて一組の図としている。図中の６本の曲線は２本づつが組になった３組からなり、三つの償還方式に対応している。一組２本の曲線は同じ償還方式でＦ５住宅が累積所得分布の５０パーセンタイルより下位に供給される場合と、上に供給される場合のちがいをあらわしている。また住戸密度をあらわしたグラフと分譲用地率をあらわしたグラフを横軸に平行な直線で結ぶことにより、そのときの住戸密度・分譲用地率・Ｆ５住宅率の数値を知ることができる。たとえば傾斜償還方式の場合、分譲用地率が３０％の点をとると、そのときのＦ５住宅率は１０％（Ａ点）であり住戸密度は７０戸／ha（Ｂ点）であることが図から読みとれる。

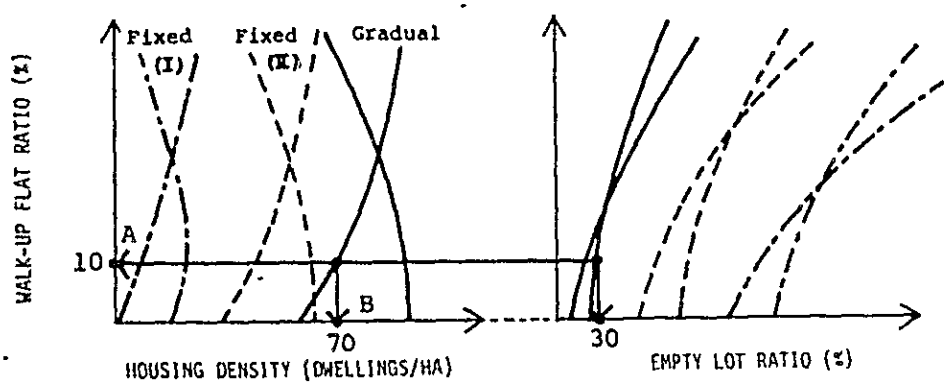


Fig　9－5　償還方式別相関模式図
（密度－Ｆ５タイプ住宅率－分譲用地率）

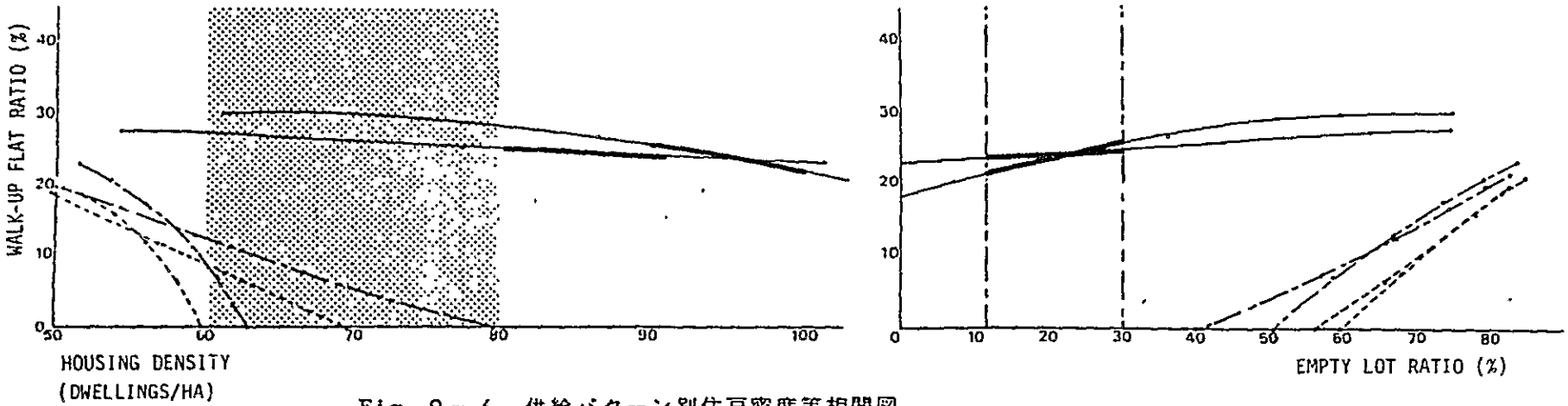


Fig 9－6 供給パターン別住戸密度等相関図
－高密完成型

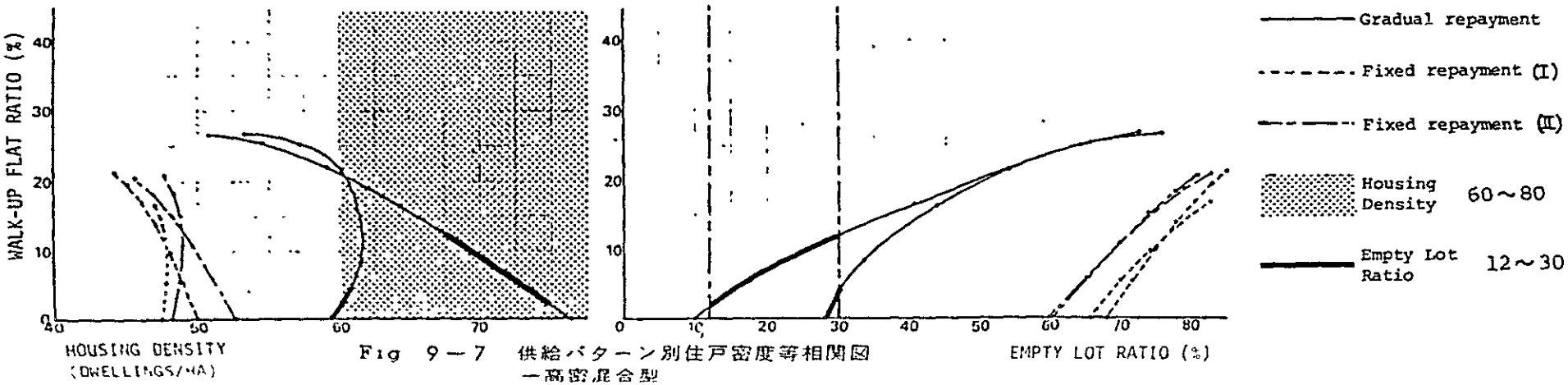


Fig 9－7 供給パターン別住戸密度等相関図
－高密混合型

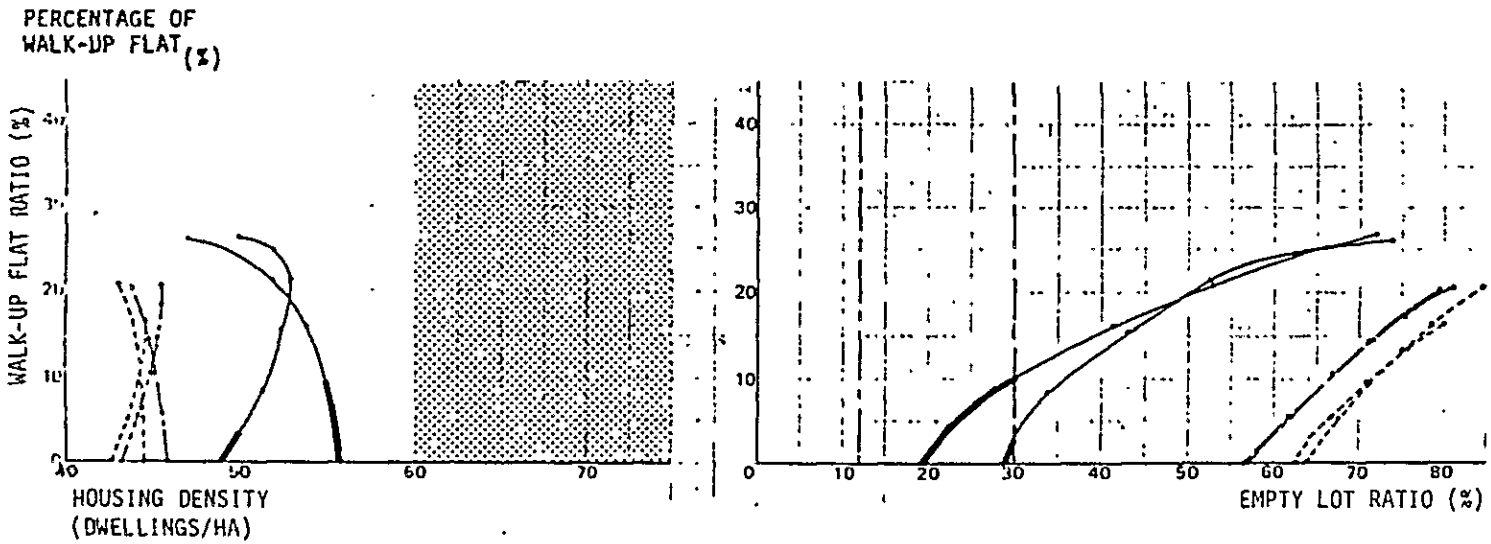


Fig 9－8 供給パターン別住戸密度等相関図
－中密増築型

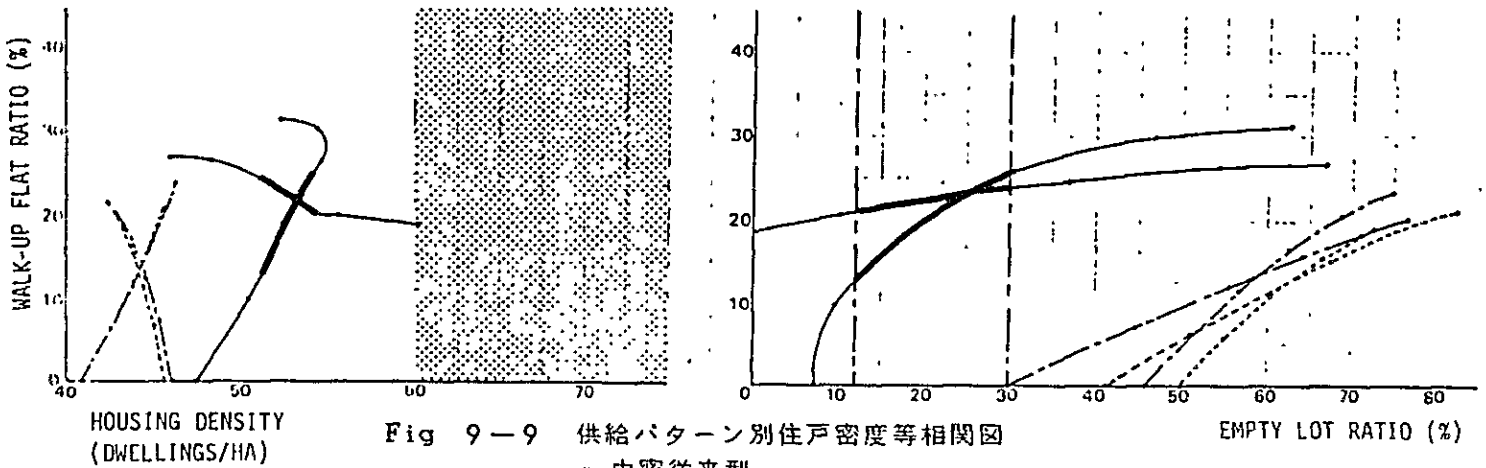


Fig 9－9 供給パターン別住戸密度等相関図
－中密従来型

四つの供給住宅群を比較すると、高密完成型住宅群は住戸密度100戸／haをこえる住戸配分が可能であるのに対して高密混合型・中密増築型においては70戸／ha 前後が最大の住戸密度である。また中密従来型では60戸／ha未満である。これは各住宅群の平均戸当り宅地面積を素直に反映しているとみることができる。Ｆ５住宅率をみると、傾斜償還の場合で３０％、定額償還の場合で２０％がおおよその上限である。この傾向は供給住宅群のちがいによって大きく異なるということはない。しかもどの場合においても、Ｆ５住宅率が上限に近づいたときの分譲用地率は６０％から８０％というような大きな割合になる。これはＦ５住宅のコストが高いために、その割合が大きくなればサブシディのための分譲用地率も高くなることを示している。

ひとつの供給住宅群に着目した場合には、当然のことながら傾斜償還による場合が最も住戸密度が高く、定額償還（３０～７０パーセンタイル）定額償還（２０～７０パーセンタイル）の順に密度が低くなる。ただし定額償還の二つの場合の差はそれほど大きくはない。

9－5－2　代替案の設定

代替案の設定は前項のグラフを参考にして以下の枠組の中から選択する。

I）計画目標密度の範囲である60戸／ha～80戸／haを実現できること。

II）低所得者層を対象としていない分譲用地の比率は30％をこえないこと。

ただし住宅地に必要な商業用地のために76,000㎡の分譲用地は最低確保する。これは用地全体の約12％にあたる。

これらの条件に合ったグラフ上の線分をFig－9－10、11に示す。太線部は分譲用地率が12％から30％の範囲である。

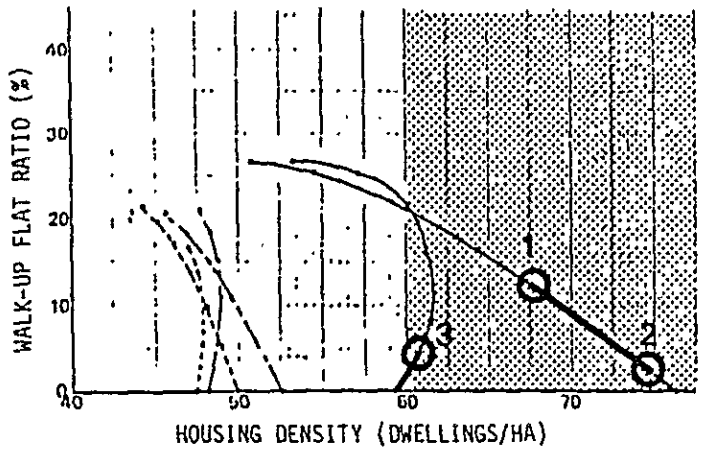


Fig　9－10　最終代替案の抽出－高密混合型

以上の検討により三つの供給パターンが代替案に該当することがわかる。各供給パターンの中で住戸密度およびF5タイプ住宅率の最も高い点を選び、その点の住戸配分を示したものがTable－9－8である。これらを最終的な代替案に設定する。

Table 9－8 最終代替案の諸元

	Type of Housing Group for Supply	Repayment Method	Lower ← Housing Supply Allocation → Upper					Total Housing Units	Housing Density	Walk-up Flat Ratio	Empty Lo Ratio
1.	High Density Combination	Gradual	F5-36	F2-36	M-36	R-36N	E.L.	7550	69	12	30
			880	2510	1890	1500	770				
2.	High Density Combination	Gradual	F5-36	F2-36	M-36	R-36N	E.L.	8340	76	2	12
			170	4000	2340	1830	0				
3.	High Density Combination	Gradual	F2-36	M-36	F5-36	R-36-N	E.L.	6670	61	4	30
			1590	1360	240	2710	770				

9－5－3　代替案の総合評価

3つの代替案について定性的、定量的側面からそれぞれの評価を行ない、現時点で最も適切と考えられる代替案を選択する。

まず、*中層住宅の割合をみると、最低2%、170戸から最高12%、880戸までの拡がりがある。本プロジェクトの中で中層住宅の位置づけは、実験的なものというよりは、住宅団地を構成する一つの"コマ"として把えておく。従って、住宅団地の全体構成からみて10%前後の中層住宅供給が妥当と考えられる。　　*F5タイプ。

分譲用地の割合は、12～30%と設定したものの、それが12%の場合は住宅用分譲用地の供給は不可能であり、全て、商業・業務用　地となる。そこで本プロジェクトでは家内工業あるいは、店舗付住宅等の立地により、既存集落の住民の定着化、複合コミュニティの形成等を一つの計画目標に掲げているため、住宅用分譲用地の確保は不可欠である。そのため全供給戸数の10%前後の分譲用地が一つの適切な供給量と考えておく。

住宅の戸数密度はCENGKARENG　の立地特性からより高い方が望ましい。これら三つの代替案はいずれも60戸／haを確保しており、従来の住宅団地よりは20%以上も高密な住宅地を形成しているが、可能であれば70戸／ha以上を確保することが望ましい。

中層住宅および2階建フラットをより低い所得階層に供給し、増築可能な住宅タイプをより高い所得階層に供給することが住宅地の環境水準をより高く維持するための一つの手法と考えられる。かつ所得の高い階層は増築可能な接地型住宅を求める意識が強く、これまでの住宅団地をみると、それらの階層は比較的良質な増築を行って来ている。従って代替案(3)のような供給パターンは余り望ましくない。

供給すべき住宅タイプの配分は、あるタイプが極端に多く、他は極端に少ないというよりは、需要の多様性、住宅地の変化ある構成等から配分にバランスを

持つ必要がある。そこで代替案(2)の場合は全体の半数が２階建フラット、中層は２％、分譲用地は０ということで全体にバランスを欠いていると云える。一方代替案(1)は全体に各タイプとも１０％以上の配分を示しており、バランスのとれた住宅タイプの配分と云える。

クロスサブシディは、所得の高い階層から低い階層へ、さらにより低い階層がより多いサブシディを受けることが最も自然な形である。そこで代替案(3)の場合はより高い階層の住宅がより低い階層の住宅よりはより多いサブシディを受けていることになり不自然な形となっている。

以上のような代替案の評価から総合的な判断として代替案(1)が最も現時点で適切な代替案と考えられる。
そこで以下の作業はこの代替案(1)を基礎に地区の総合計画、建設計画、財務分析、経済分析を展開する。

9－5－4　高地価地区を想定した住戸密度等の補足検討

(1) 従来PERUM PERUMNAS が開発してきた住宅地にくらべるとCeng－kareng の土地価格は高い方に属する。しかしJakarta市の中心部にくらべるとまだまだ低価格である。前項までの検討において、住宅建設費のなかにしめる土地整備費のコストは約⅙であることがわかっている。したがって、住戸密度をあげることによって戸当りコストを低くする効果はそれほど大きくはない。しかし更に地価の高い地区ならば、住戸密度をあげることによって戸当りコストを低くする効果は十分大きくなるであろう。将来、地価の上昇率が建築費の上昇率を上まわるような時にも同じ考え方を適用できるであろう。そしてこのような想定は人口集中のすすむ大都市近郊地では十分現実的である。

以上のような観点から、他の条件は同じで土地価格だけを上昇させた場合の検討を以下に試みる。地価は現況の２倍、５倍、１０倍の三つの場合を想定する。検討内容は住戸密度とＦ５タイプ住宅率・分譲用地率の相関である。

(2) 検討のケースは、三つの土地価格設定に対して住宅供給群パターンの四つの場合をかけあわせた１２ケースである(Table ９－１０。)償還方式は傾斜方式（２０～８０パーセンタイル対象）のみとする。

Table ９－９　検討ケース

土地価格の設定(1980年)	開発土地原価＊	住宅供給群	償還方式
6,000RP/m²(２倍)＊＊	36,700RP/m²(1.3倍)＊＊	F2-26 F5 F2-36 M	20 50 80 (傾斜償還)
15,000RP/m²(５倍)	55,900RP/m²(2.4倍)	F5 F2-36 M R-36N	
		F5 M R-36N R-36	
30,000RP/m²(10倍)	92,300RP/m²(4.1倍)	F5 D-15 D-21 D-36	

＊　１９８３年１２月価格

＊＊　いずれもCengkareng の価格に対する比。
Cengkareng の設定買収地価は、3,０００RP/m²。（８－４説明参照）。

これらの検討ケースにCengkareng の場合を加えてグラフにあらわしたものがFig９－１１～１４である。

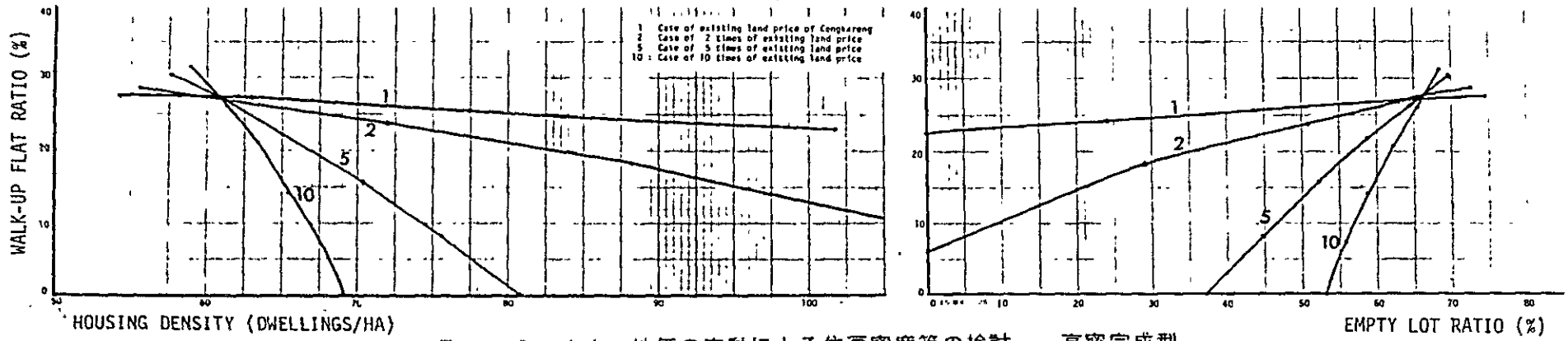


Fig 9－11 地価の変動による住戸密度等の検討 －高密完成型

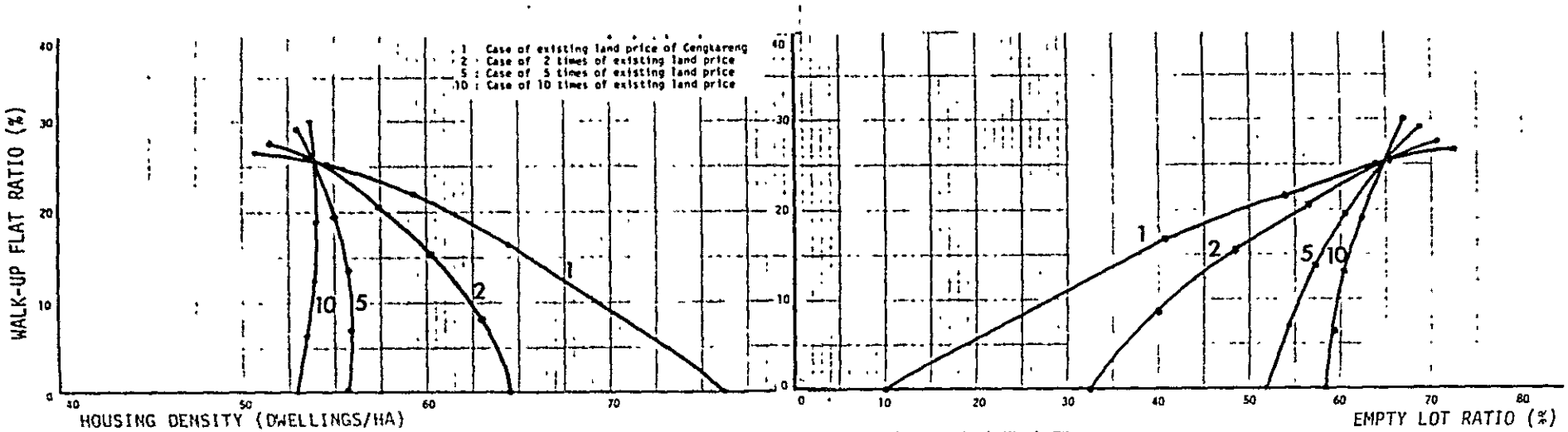


Fig 9－12 地価の変動による住戸密度等の検討 －高密混合型

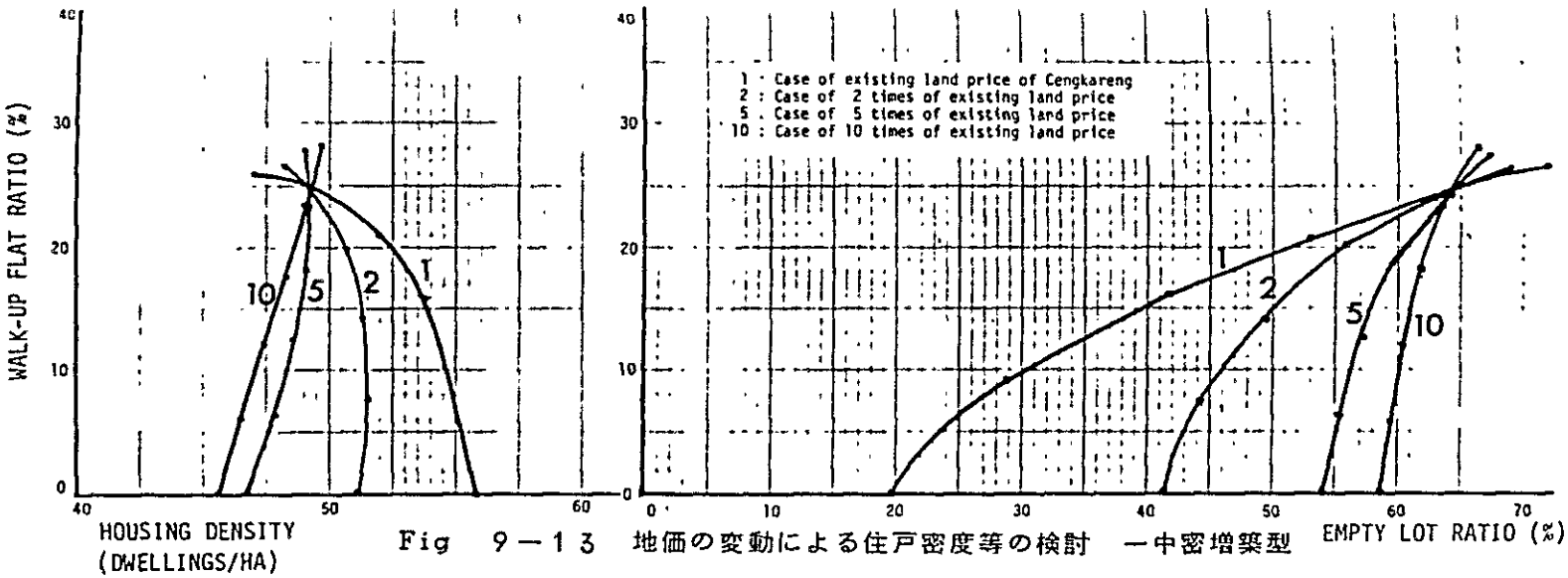


Fig 9－13 地価の変動による住戸密度等の検討 －中密増築型

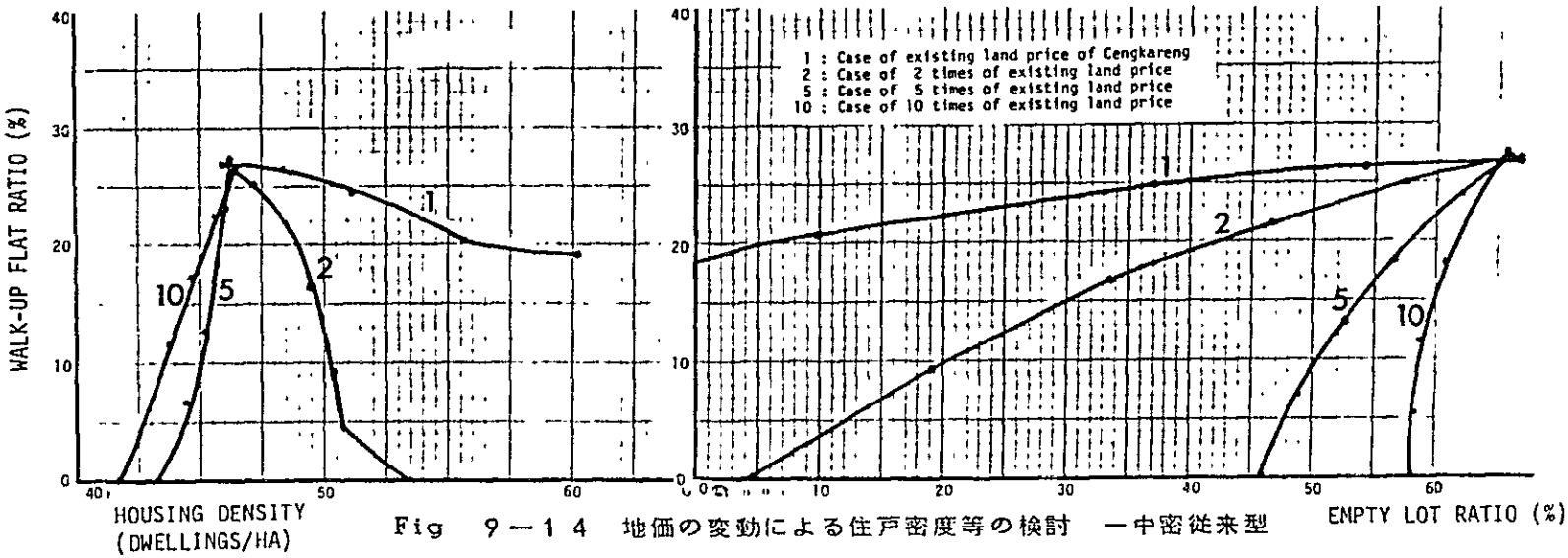


Fig 9－14 地価の変動による住戸密度等の検討 －中密従来型

これらのグラフによれば

i) 地価が高くなるにつれて住戸密度がさがり、分譲用地率が上る。

ii) 分譲用地率が６５パーセント近くの値のとき、地価の影響をうけないような住戸密度とＦ５タイプ住宅率がどの住宅供給群にも存在する。このときのＦ５タイプ住宅率は２０～３０パーセント、住戸密度は４５～６０戸／*ha*である。

iii) 地価が５倍以上になると、Ｆ２－２６タイプの住宅をふくまない三つの住宅供給群において、住戸密度とＦ５タイプ住宅率が正比例の関係になる。

の三つが特徴点である。特に第３点目は、Ｆ５タイプ住宅を増すことによって住戸密度をあげるためには、Cengkareng の５倍の地価の場所であること、または建築費にくらべて地価上昇率が５倍に達するような時期であることのどちらかが必要なことを示している。このような条件を満してはじめて、Ｆ５タイプ住宅が住戸密度を高める手段として有効となる。

第10章　財務分析

第10章　財　務　分　析

１０－１　概　要

PERUMNAS の事業は中央政府等からの出資金、民間ローンの５０％近い１３.５％／年という低金利の資金を政府関連金融機関から借入れ、それと自己資金とを組み合せ、事業単位ごとに収支をバランスさせることを原則としている。従って本プロジェクトもその原則に基づき、キャッシュフローを作成して財務分析評価を行った結果、最終的には４１,１４３百万円Rpの投資額（事業費総支出額）に対して４３,０１２百万Rpの収入を得て、収支がほぼバランスを保っている。

一方 PERUMNAS の REPELITA Ⅲで１２万戸の住宅建設を予定した場合の総事業規模は３５０,０００百万Rp以上である。その中で本プロジェクトの総投資額は約４０,０００百万Rpであるところから、総事業規模に占める本プロジェクトの割合は約１１％になる。一方本プロジェクトの総住宅建設戸数は7,５００戸であり、１２万戸の６％に当たり、本プロジェクトの投資額は戸数比に対しては大きい。しかしこれは本プロジェクトがインドネシア国全体でみた場合、最も高地価の都市近郊地に立地していることと、低地開発のための基盤整備費の高コストに起因するものである。他のプロジェクトはより低地価で開発の容易なところに立地しており、戸数当りの投資額は相対的に低くなる。従って、本プロジェクトが PERUMNAS 全体の事業のバランスをくずすことはないと言える。

本プロジェクトでは総建設戸数の１０％以上に当る８８０戸の中層住宅を供給している。現時点でこの中層住宅は先駆的住宅タイプでそれに対する国民の嗜好性も明確ではなく、確実に有効需要を引き出すには若干の不安がある。

しかし本プロジェクトは最も低い所得層に中層住宅を供給しており、建設コストが他と比較して２倍以上であるものの、最も低く販売価格を設定している。そのため若干の売れ残りが生じたとしても本プロジェクトの財務フレームに影響を与える度合は少なく、財務上安全な供給方式と言える。

１０－２　キャッシュ・フロー

a）本プロジェクトは政府関連の金融機関であるＢＴＮからの融資とPERUM PERUMNASの自己資金とを組み合わせて遂行される。

開発にあたってPERUM PERUMNASの自己資本は、まず

Land acquisition Cost

Planning Cost

に充当される。さらにそれは

Interest

Overhead

Investment for Allocation

Insurance

をまかなう、

一方ＢＴＮからの融資（建設資金）は

Infrastructure Cost

Housing Construction Cost

（Physical Contingency と Price Contingencyを含む

という事業　の中心部にむけて充当される。

この建設資金融資の金利は１３.５％／年（３.３７５％／３ケ月）である。

b）事業期間におけるインフレーションは年々１５％と見込まれる。

c）建設終了後直ちに、住宅および住宅地はＢＴＮに売却される。※

この売上代金の一部は金融機関からの建設融資への返済に当てられ、他の部分はPERUM PERUMNASの自己資本に移転されて、次の事業のために持越される

d）キャッシュ・フローをTable １０－１に、期毎の融資及びその利子と返済のフローをTable １０－２に示す。

※注　入居者はＢＴＮからの融資を受けて住宅あるいは住宅地を購入し、２０年間でＢＴＮに返済する。そのため資産の受け渡しはPERUM PERUMNAS →ＢＴＮ（入居者）となり、資金の回収はＢＴＮ→PERUM PERUMNASとなる。

Table 10－1 キャッシュフロー

	Year / Item	～1981	1982 Jan-Mar	1982 Apr-Jun	1982 Jul-Sep	1982 Oct-Dec	1983 Jan-Mar	1983 Apr-Jun	1983 Jul-Sep	1983 Oct-Dec	1984 Jan-Mar
Source of Funds	Balance									12,356,484	7,009,963
	Capital of PERUMNAS	3,815,163	5,063	10,893	193,208	277,984	649,369	1,048,081			
	Loan from Government Bank		44,027	81,797	1,248,892	1,605,538	3,698,361	5,704,813			
	Selling of Empty Lots								4,355,166		4,355,166
	Selling of Houses								17,150,967		17,150,967
	Total	3,815,863	49,090	92,690	1,442,100	1,883,522	4,347,730	6,752,894	21,506,133	12,356,484	28,516,096
Use of Funds	Land Acquisition	3,430,900									
	Planning	345,258									
	Infrastructure		35,222	65,437	92,361	345,435	489,195	1,231,375	1,983,072	952,900	1,572,323
	Housing Construction				906,753	938,996	2,469,494	3,332,474	4,013,675	2,493,836	2,582,512
	Physical Contingency		3,522	6,544	99,911	128,443	295,869	456,386	541,220	344,673	353,913
	Price Contingency		5,283	9,816	149,667	192,664	443,803	684,578	811,831	517,010	530,869
	Overhead	34,526	4,403	8,180	124,889	160,554	369,836	570,482	734,979	430,842	503,964
	Interest of the Loan			1,486	4,247	46,397	100,584	225,403	417,941	417,941	417,941
	Investment for Allocation	5,179	660	1,227	18,734	24,083	55,475	85,572	110,747	64,627	75,594
	Insurance				45,138	46,950	123,474	166,624	200,684	124,692	127,125
	Cost for the Right to Build								136,000		136,000
	Loan Repayment										12,383,428
	Total	3,815,863	49,090	92,690	1,442,100	1,883,522	4,347,730	6,752,874	9,149,649	5,346,521	18,685,659
									(12,356,484)	(7,009,963)	(9,830,437)

Table 10－2 融資と利子及び返償のフロー

Year		Loan from BTN	Loan Repayment	Balance	Interest
'82	Jan-Mar	44,027		44,027	0
	Apr-Jun	81,797		125,824	1,486
	Jul-Sep	1,248,892		1,374,716	4,247
	Oct-Dec	1,605,538		2,980,254	46,397
''83	Jan-Mar	3,698,361		6,678,615	100,584
	Apr-Jun	5,704,813		12,383,428	225,403
	Jul-Sep			12,383,428	417,941
	Oct-Dec			12,383,428	417,941
'84	Jan-Mar		12,383,428	0	417,941

10－3 事業収支

上に示したキャッシュ・フローにもとづく期毎の収入と支出を集計（Sum up）したところで収支計算表を作成すると次のとおり。

1. Revenue (Sales)	
FS'5－36	3,067,483
FS'2－36	10,139,478
M－36	10,338,725
R－36N	10,756,247
Empty Lots	4,238,311
Commercial Lots	2,935,627
Irregular Lots	1,536,393
Total	43,012,264
2. Expenses	
Land Acquisition	3,430,900
Planning	345,258
Infrastructure	6,767,320
Housing Construction	16,737,740
Physical Contingency	2,230,481
Price Contingency	3,345,721
Overhead	2,942,655
Interest	1,631,940
Investment for Allocation	441,398
Insurance	836,887
Cost for the Right to Build	272,000
Land Price Increase	2,161,466
Total	41,143,766
3. Profit	1,868,498

第11章　経済分析

第１１章　経　済　分　析

11－1　Cangkareng 地区住宅開発の社会・経済的意義

１１－１－１　住宅開発の基本的性格・目標

Cengkareng Project の基本性格は、発展途上国に共通な都市過密化問題に対応できる総合的な社会開発計画の実施というところにある。

都市に流入・増大する人口は、都市内の部落部（カンポン）や市街地の各所で質の低い住宅に住みつき、また不法居住をくりかえしている。多数は借家依存の生活を営んでいる。

一方、流入人口の多くは都市における雇用機会の不足や不安定に悩んでいる。これに対応するためには、流入・増大した人口を都市外周部に分散させること、未利用地を活用し、市街地に残る限られた空間を有効利用することによって住宅建設をすすめること、村落部における農業活動を維持するとともに、市街部での商工業建設活動を振興して雇用機会の増大を図ることである。

Cengkareng Project はこの対応策の一環として

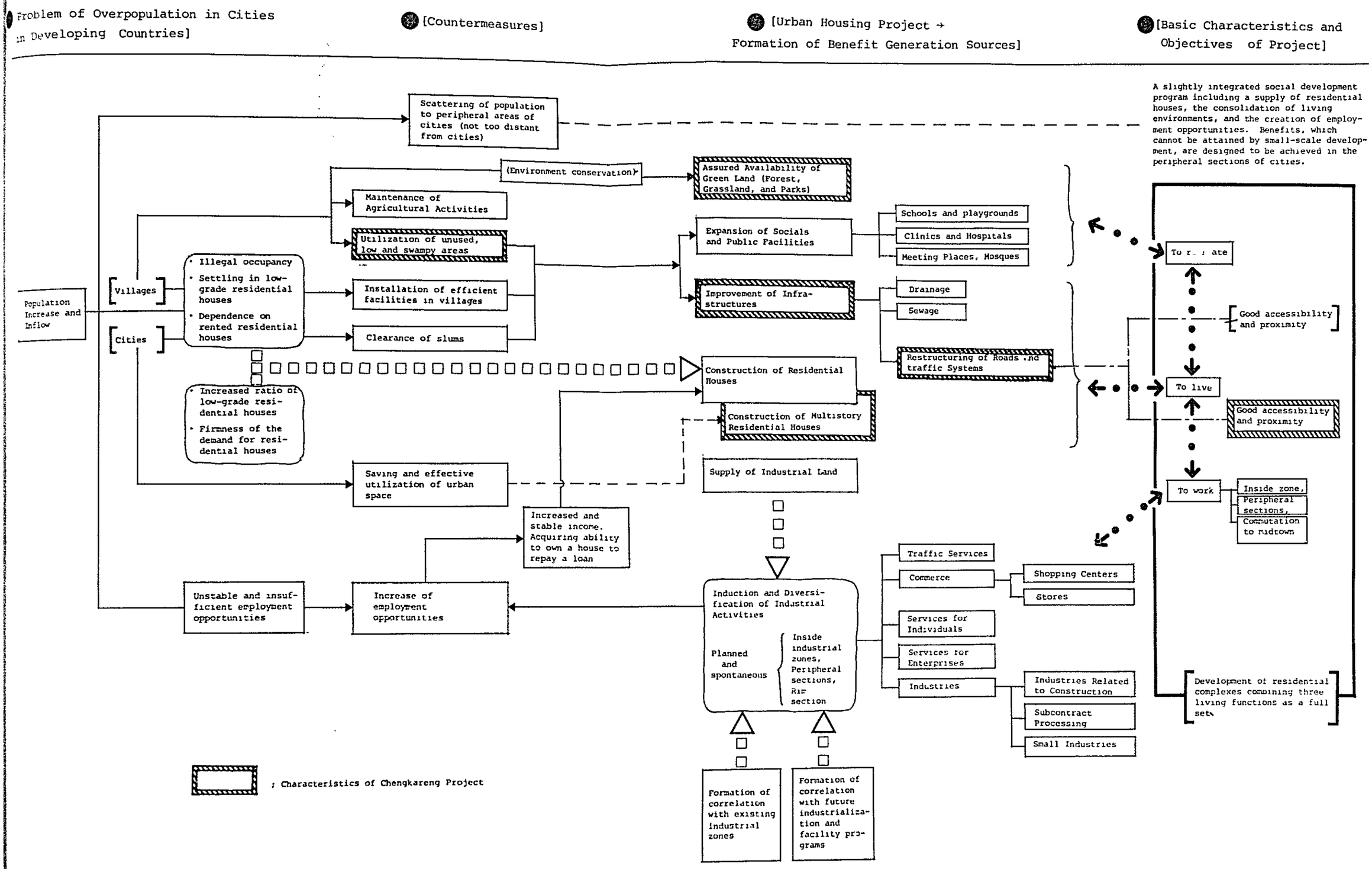
- 都市に近い低湿地・未利用地帯を活用し、
- 緑地の確保に努めながら社会公共施設やインフラストラクチュアの整備を行い、
- Jakrta-Tanggerang 街路沿いの道路交通体系を再編成しつつ、
- 中層住宅を含む都市型高密度住宅建設を行う。
- また産業用地の提供を行って、現存の商工業活動の一部を地区内にとり入れ、また将来の産業化計画との連関を深めることによって雇用機会増大を図る。

そのための都市・住宅開発計画である。

こうして小規模開発では達成しにくい「住む、レクリエートする、就業する」という三つの生活機能を多少とも自足的に営めるような、したがって社会・経済的便益性の高い住宅団地を建設することをめざしているのである。

Fig 11－1 は以上を Cengkareng Project の社会・経済的便益の系譜図としてまとめたものである。

Fig 11－1 社会・経済的便益の系譜図



１１－１－２　Cengkareng地区の社会公共的環境

現時点においては、Cengkareng地区の社会的条件、住環境、水道・電気施設の状況は他地域に比して概してよくない。都心から１０km以内の地点にあり、しかも将来周辺のJakarta- Tangerang地域にむけて商工業、幹線道路、空港等の活発な展開が計画されているという意味ではきわめてポテンシャルの高い地域でありながら、今一つ地域イメージが低いのは、この社会公共的環境の悪さに負っていると言ってよい。

他方学校、運動場、娯楽機関等の施設は、人口数との割合でみれば比較的良く整っているとみることができる。

"Statistik Wilayah DKI Jakarta"※の１９７９年版における資料によれば、次の諸点を指摘できる。

i）まず低湿地帯であることによる洪水の発生、火災や犯罪の発生といった自然的・社会的安全性の指標からみると、Cengkarengは問題地区である。１９７９年において洪水の発生件数は他の洪水多発地区なみの６件であるが、被害者数は人口の割には多く、また被害額はCengkarengが全Kecamatan中最大となっている。それは３３,５００千RpでＤＫＩJakarta全体の被害額７８,０４７千Ppの４３％をも占めている。

ii）火災による被害者数はCengkarengが３０kecamatan中の３位、被害額は８位となっている。

iii）泥棒や掠奪の犯罪件数も多い方に属しているし、被害額も３０地区のうち５位である。

iv）７９年のCengkarengにおいて水道の敷設されている村数（kelurahan）は１、敷設されていない村は９、水道の水の利用割合は２.２４％、井戸水の利用割合は６４.１３％である。これは１０村中１つも水道の敷かれていないPasar Minggu（ South Jakarta ）地区に次ぐ悪条件である。

v）電気のきている村が７９年のCengkarengにおいては半数の５つを占める。電気利用のウェートは１８.３７％、石油ランプのウエートは５８.１２％である。これはKel.Seribu地区（North Jakarta）、Pasar Rebo、Cakung地区（ East Jakarta ）等とともに悪条件の代表例である。

３０kecamatan中電気のきている村をもっているのは９地区であり、そ

※Statistic Data of DKI Jakarta

のうち５地区は１つか２つの村に電気がきているだけである。残りの２１地区においては電気利用のウエートはおおむね５０％をこえ、高いところは80％前後に達している。

vi) 学校（幼稚園、小学校、中学校、高校）数は、人口の割には多く　また運動施設ではサッカー、テニス、バドミントンその他の運動場が、娯楽施設では映画館が比較的数多く整っている。

１１－１－３　便益の内容

以上みてきたように現Cengkarengの社会･公共的環境が相対的に良くないだけに、新住宅団地開発のもたらす経済的便益は一層大きいものとなることが期待できる。

先にかかげた「住む、レクリエートする、就業する」の３つの生活機能に関連する諸々の施設・設備、住宅、行政機関、交通手段そして商・工業活動（これらは便益の発生源とみることができる）は、健康性、快適性、安全性、利便性、高効率性（時間節約性）、所得創出性等の指標を通して家計に様々な便益を与えることになろう。

新たな土地・住宅を購入することを通して、住民は結局のところ

- 家計消費支出の節減
- 所得増大
- 提供される社会・経済的便益を享受しうる機会の増大

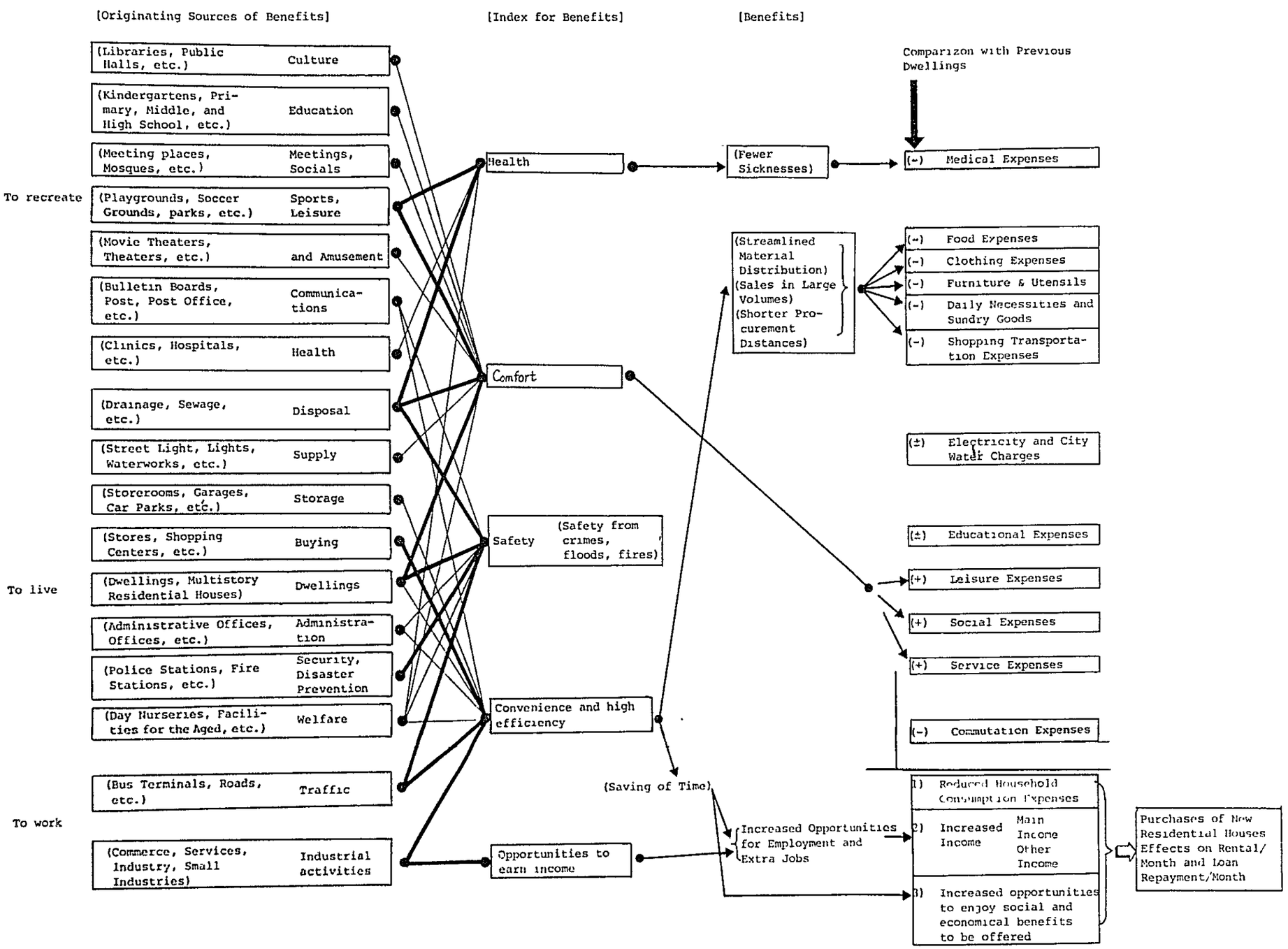
という成果を手に入れることができるのである。

Table11−1は現プロジェクトがもたらす社会・経済的便益を、直接的便益と間接的便益にわけてリストアップし、それらの相互関係を示したものである。また１１－２は住民が享受する直接的な便益の内容を、その発生源からたどりつつ示したものである。

Table 11－1　プロジェクトの社会・経済的便益

Contents of the Project			[DIRECT BENEFITS] Benefits related to Household expenditure (Saving in expenditure)	(Income increase)	Benefits in social and public activities (Saving in expenditure)	Employment employment expansion Project (Construction period	(After construction)	▲Others Negative effects	[Indirect Benefits] <Benefits brought indirectly from the present project Effects into economic and industrial activities	Welfare improvements for personal residents	The orderly growth of "Cities"	<Effects by projects of higher level>
Land Preparation Infrastructure	Drainage					◎				Decline of flood		
	Sewage Treatment		(Desease control →) Saving in medical expenses							Decline of flood occurrence, diseases, improved health		
	Roads							▲ Negative Traffic Aspects				[illegible]
	Water		Water Saving							Increase of the piped water ratio		
	Electricity		Electricity							Improvement in level of power supply		
	Others											
Housing					Supply of low cost housing compared with the private sector	◎	◯	▲ Disturbance to the kumpung residents				
Expansion				Increase of Employment opportunities								
Social Facilities (Community Service)	School			Increase of Employment opportunities	Merit as to lower cost in building rather than existing urban redeveloping projects	◯	◯			Increase of educational opportunities		
	Medical Facilities									Improvements in medical care		
	Recreation & Sports Facilities									Increasing opportunities to promote recreational and sporting events		
	Others											
Relating Industries	Industries					◯			Increase of production + and its inter-industrial effects			Creation of industrial extension comprised by opening of new airport
	Small Scale Industries			Increase of Employment opportunities								
	Markets		Saving in transportation expense for shopping				◎		Street peddling + Booth + Store			
	Small Shops											
	Others											
Project (Well-Designed Site Planning) TOTAL	KIP → Land Price increase	SES → LCH → Rental/ Purchase	Improvement of living environment for a specific proportion of the whole population, whole households Meeting the Demand for housing Formation of new households Latent demands (including renewing)			Employment expansion in the construction materials industry and related industries during construction periods		▲ Cost of relating People ▲ Compensating them for their lost of property	Effects of public investments Improvement of managerial foundations for construction related industries and firms		Opportunity to initiate long term direction for the growth of cities Form a great center for urban activities in Jakarta Barat	Labour supply for new Airport related business
			Improvement of Access to working places, city center.						Construction related Contiguous industry General improvements in labor productivity			
			Improvements in supply capability of relatively highly skilled workers									

Fig 11－2 便益の内容（直接的便益）



11－2　経済性の分析（Economic Feasibility）

チェンカレン地区の住宅開発計画に投じられた土地、資本、労働力等の基本的な生産要素は、どれだけの社会経済的厚生（Welfare）を生みだすのか。それを明らかにするために１１－１に示された当Project の様々な社会・経済的効果を、可能なものについて定量化し、それを開発に要した投資額との関係で評価することが必要となる。同時に社会・経済的効果のうち定量化できない部分についても適切に留意し、評価を与えておかねばならない。つまりここでは次の２つの作業を行なう。

1）当Projectの提供する土地・住宅が、居住者に与える直接的な便益を推計し、それを総建設コストとの関係で評価して実質的意味での収益（Return）を明らかにする。

2）１１－１に示した当Projectの様々な直接・間接の社会・経済的便益のうち、とくに次の効果を適切に評価する。

a）建設期間中、および期間後における雇用拡大効果

b）建材産業を中心とする生産性向上効果

c）周辺工業地帯への安定的な労働力供給効果

１１－２－１　直接的便益の評価と内部収益率（ＩＲＲ）

a）このProjectの供給する住宅が居住者にもたらす直接的な便益は、次の手順で考えることができる。

i）生産活動や開発行為によって形成される物財や資産の価値は、その供給と需要との関係によって規定されるという原理に則して、まず供給の側から考える。

ここで供給とは、この国の土地　資本・労働力という基本的生産要素（資源）の一定部分を割りあてることによって、土地の造成、インフラの整備、住宅の建設を行うことである。この投資活動の結果、形成された社会的ストック、資産（Property）はそのコストにみ合うある価値を体化している。それは土地の地価（Land Price）であり、設備・建造物費用という固定資産価値である。それらの固定資産が年々の使用に供せられるとき、地代、設備機械損料、家賃・住居費（Household expenditure）といった一種の賃貸料（Rental Value）を生み出す。

チェンカレン地区の開発行為によって供給されるインフラのよく整備された土地と住宅は、一定の資産価値をもつとともに、このRental Valueを年々新たに生み出していく源となるのである。

ii) 次に土地・住宅を需要する居住者の側からみよう。

居住者が享受する直接的な便益は１１－１のFig11－2に示してある。

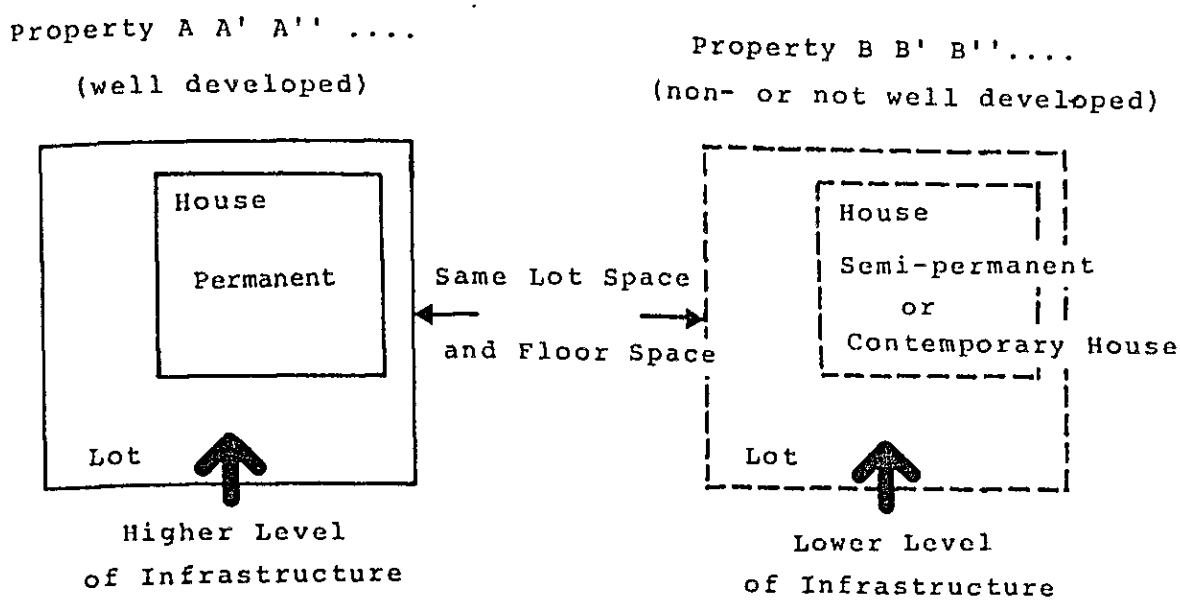
図にみるように居住者は以前に住んでいた所と比較してより一層の

- 家計支出（食費、医療費、日用品費、交通費等）における様々な節約効果
- 時間節約効果
- 就業機会や副収入を得る機会
- 提供される社会公共施設（病院、教育施設、モスク、運動場等）を利用できる機会

を享受できる。つまり総合的にみて一層良好な住環境を期待できるから、チェンカレン地区の土地・住宅を需要するのである。そして家計収入の中から一定割合の対価支払いに同意するのである。一般的にその対価とは期毎の家賃であり、またローンで住宅を購入する場合はその期毎の返済額である。また自己資金で一括購入する場合には、その将来価値の年々の価値への割引計算が行われる。

具体的にこのチェンカレンProjectにおいては、住宅については ローン購入とその期毎の返済が前提とされている。また、土地（Empty Lot と Commercial Lot）については一括払購入が前提とされている。

iii）以上の供給要因と需要要因は原理的には市場メカニズムの中で作用し、価格決定をもたらす。すなわち、次図のような異種の土地・住宅市場における需給関係が便益測定の基礎となる価格（一種のRental Value）を決定する。つまりA、A'、A''……、B、B'、B''……という各系列の土地・建物の消費者による選択行動と、一方それらの様々な経済的コストによる供給行動とが相互に作用しあって価格を決定するのである。



しかしながら現実的にはジャカルタ市内において、土地・住宅に関する有効な市場メカニズムは作用していない。ないし、きわめて部分的にしか作用していない。従って、便益測定の基礎となる価格＝Rental Value は間接的な方法で推定するしかない。

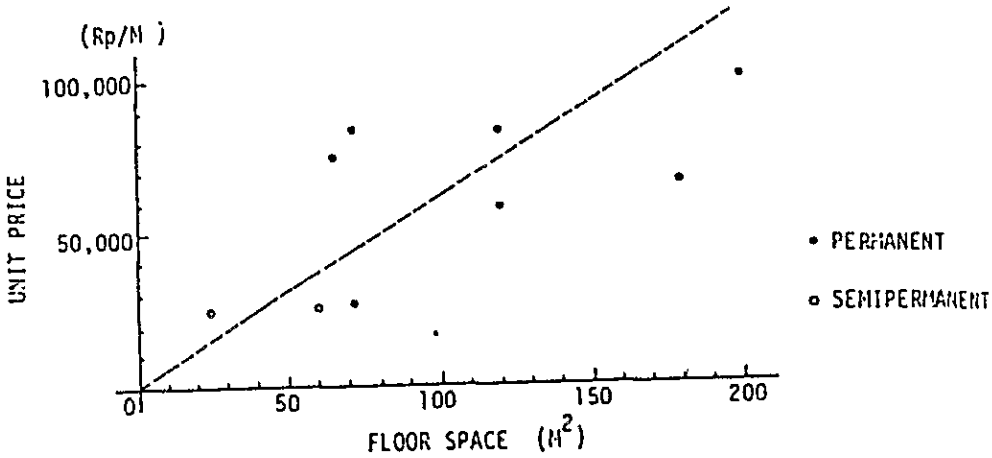
ここでは住宅についてはまず居住者が家計費から期毎のローン返債にあてることを同意できる部分、つまり住宅の　購買可能価格＝販売価格の期毎の償還額を基準として考える。それは現プロジェクトの対象となる所得階層が、８０年時点で得ている平均家計収入（６０,０００Rp／月）の２５％に相当する額である。この金額の中に供給側からみての経済的コスト要因と、需要側からみての社会・経済的便益が体化されているものと仮定するのである。

一方土地については、８０年時点での市場における地価を基準として考える。後述のケース１の内部収益率（ＩＲＲ）計算は、この考え方にもとづいている。

もう一つのケースとして、住宅のもたらす便益を、市場価格を基準として考えることもできる。次の図は極めて限られたサンプル数であるが、ＤＫＩ Jakarta における80年時点でのFloor Space あたり住宅価格（月あたり住居費に換算）を示している。PERUM PERUMNASが政策的に供給しているローコスト住宅より高価となっているのは当然である。平均的にみて、それをケース１の５０％増し（約２２,５００Rp／月）と仮定することが可能

である。

ケース２のＩＲＲ計算はこの考え方に基づいており、ケース１よりも高い値を示す。



b) チェンカレン地区住宅開発事業の経済的コストは、次のものから構成されている。いずれも調査時点である１９８０年価格が基準となっている。

i) Right of Development とTaxを差し引いたLand Acquisition Cost

ii) Planning Cost

iii) Price Contingency とInterestを差し引いたInfrastructure Cost

iv) Price Contingency とInterest及びInsuranceを差し引いたHousing construction cost

v) 労務費のなかから未熟練労働部分について減額を行っている。

vi) 当Projectに使用される建設材料については、後の１１－２－２のb)でも述べるようにスケール・メリットが働く。特に中小規模の伝統的な生産工程における材料生産性の向上も期待される。近代的なSectorにおける技術革新も可能である。従って建設材料費に対して経済コストを適用することができよう。

ケース２のＩＲＲ計算においては、建設材料の経済コストを財務コストより１０％程度低く見積ってある。

c) Project Lifeは入居開始後２０年間である。

d) 内部収益率（ＩＲＲ）

ケース１　　4.８５％（Table１１－２）

ケース２　　１１.４６％（Table１１－３）

Table 11－2 ＩＲＲ（ケース１）　　I = 4.85 %

YEAR	COST	COST PRESENT VALUE	BENEFIT	BENEFIT PRESENT VALUE
1981	3300000.	3147356.	0.	0.
1982	363253.	330425.	0.	0.
1983	1928016.	1672655.	0.	0.
1984	12271726.	10153910.	3042225.	2517207.
1985	2727598.	2152484.	3960225.	3125211.
1986	0.	0.	1224000.	921241.
1987	0.	0.	1224000.	878628.
1988	0.	0.	1224000.	837986.
1989	0.	0.	1224000.	799224.
1990	0.	0.	1224000.	762256.
1991	0.	0.	1224000.	726997.
1992	0.	0.	1224000.	693369.
1993	0.	0.	1224000.	661297.
1994	0.	0.	1224000.	630708.
1995	0.	0.	1224000.	601534.
1996	0.	0.	1224000.	573710.
1997	0.	0.	1224000.	547173.
1998	0.	0.	1224000.	521863.
1999	0.	0.	1224000.	497724.
2000	0.	0.	1224000.	474701.
2001	0.	0.	1224000.	452743.
2002	0.	0.	1224000.	431802.
2003	0.	0.	1224000.	411828.
2004	0.	0.	1224000.	392779.
TOTAL		17456816.		17459952.

B/C = 1.0002

Table 11－3 IRR（ケース2）

I = 11.46 %

YEAR	COST	COST PRESENT VALUE	BENEFIT	BENEFIT PRESENT VALUE
1981	2970000.	2664634.	0.	0.
1982	326928.	263157.	0.	0.
1983	1735214.	1253131.	0.	0.
1984	11044553.	7156047.	3118725.	2020701.
1985	2454838.	1427017.	4495725.	2613401.
1986	0.	0.	1836000.	957547.
1987	0.	0.	1836000.	859096.
1988	0.	0.	1836000.	770767.
1989	0.	0.	1836000.	691519.
1990	0.	0.	1836000.	620420.
1991	0.	0.	1836000.	556630.
1992	0.	0.	1836000.	499400.
1993	0.	0.	1836000.	448053.
1994	0.	0.	1836000.	401986.
1995	0.	0.	1836000.	360655.
1996	0.	0.	1836000.	323574.
1997	0.	0.	1836000.	290305.
1998	0.	0.	1836000.	260457.
1999	0.	0.	1836000.	233678.
2000	0.	0.	1836000.	209652.
2001	0.	0.	1836000.	188096.
2002	0.	0.	1836000.	168757.
2003	0.	0.	1836000.	151406.
2004	0.	0.	1836000.	135839.
TOTAL		12763985.		12761926.

B/C = 0.9998

１１－２－２　その他の社会・経済的便益

a）建設期間中及び建設期間後の雇用拡大効果

当Projectによる社会・経済的便益として、雇用拡大効果をあげることができる。

Fig11－3は建設期間中のInfractructure整備に雇用される延べ労働力数（人・日）を、Fig11－4はHousing Constructionに雇用される延べ労働力数（人・日）を示している。合計1,５４０千人・日の雇用（１日平均約2,１００人の労働者の雇用）が行われることとなっている。

当Projectは建設期間後において各種の社会公共施設の提供を予定している。これがまた雇用拡大効果をもたらす。

Table11－4は各社会公共施設の数と、そこでの職員、従業員数を推計したものである。約６５０名の永続的な雇用が確保されることとなろう。

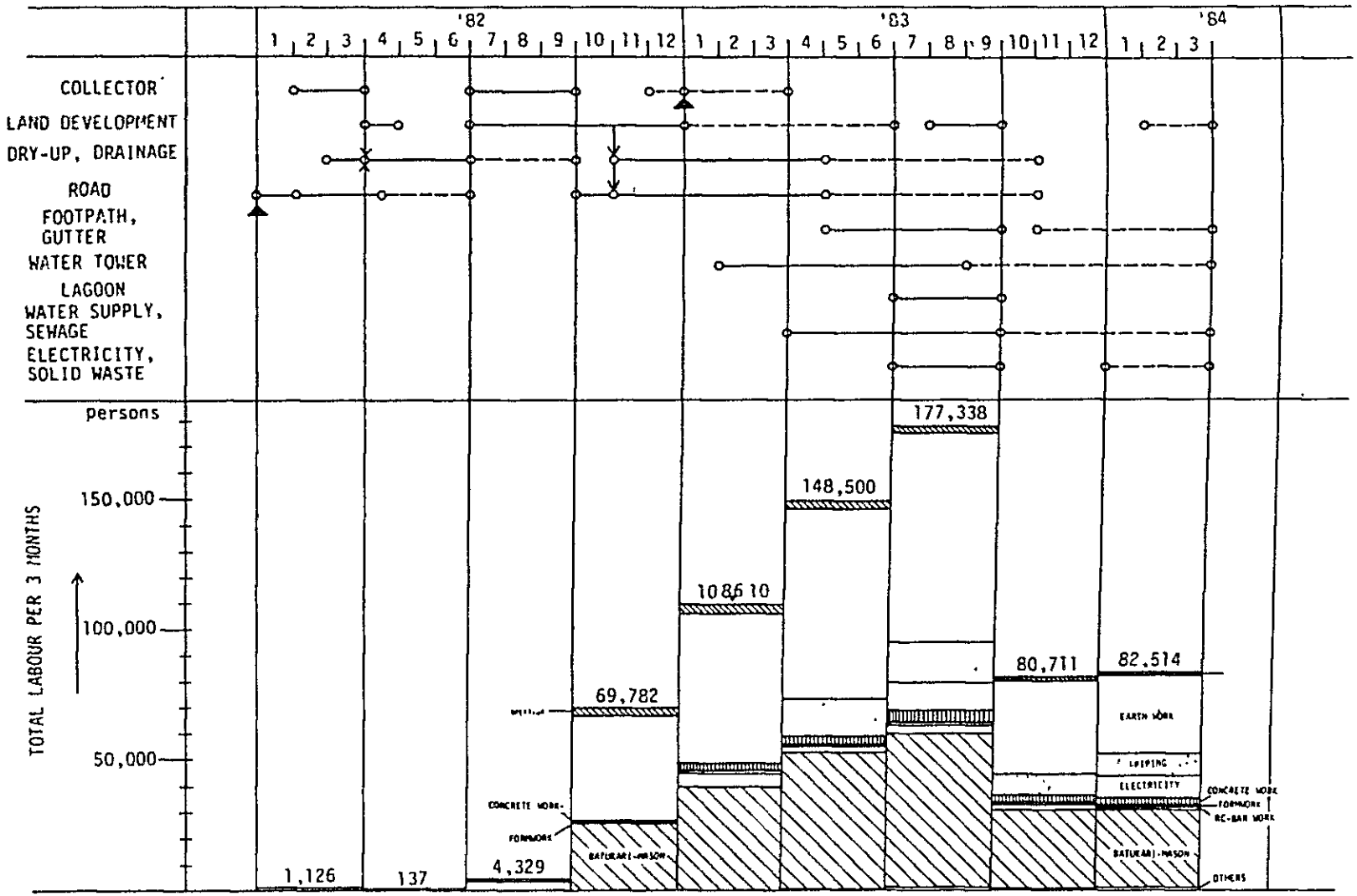


Fig 11－3 インフラストラクチャー工事の労務者数の推計

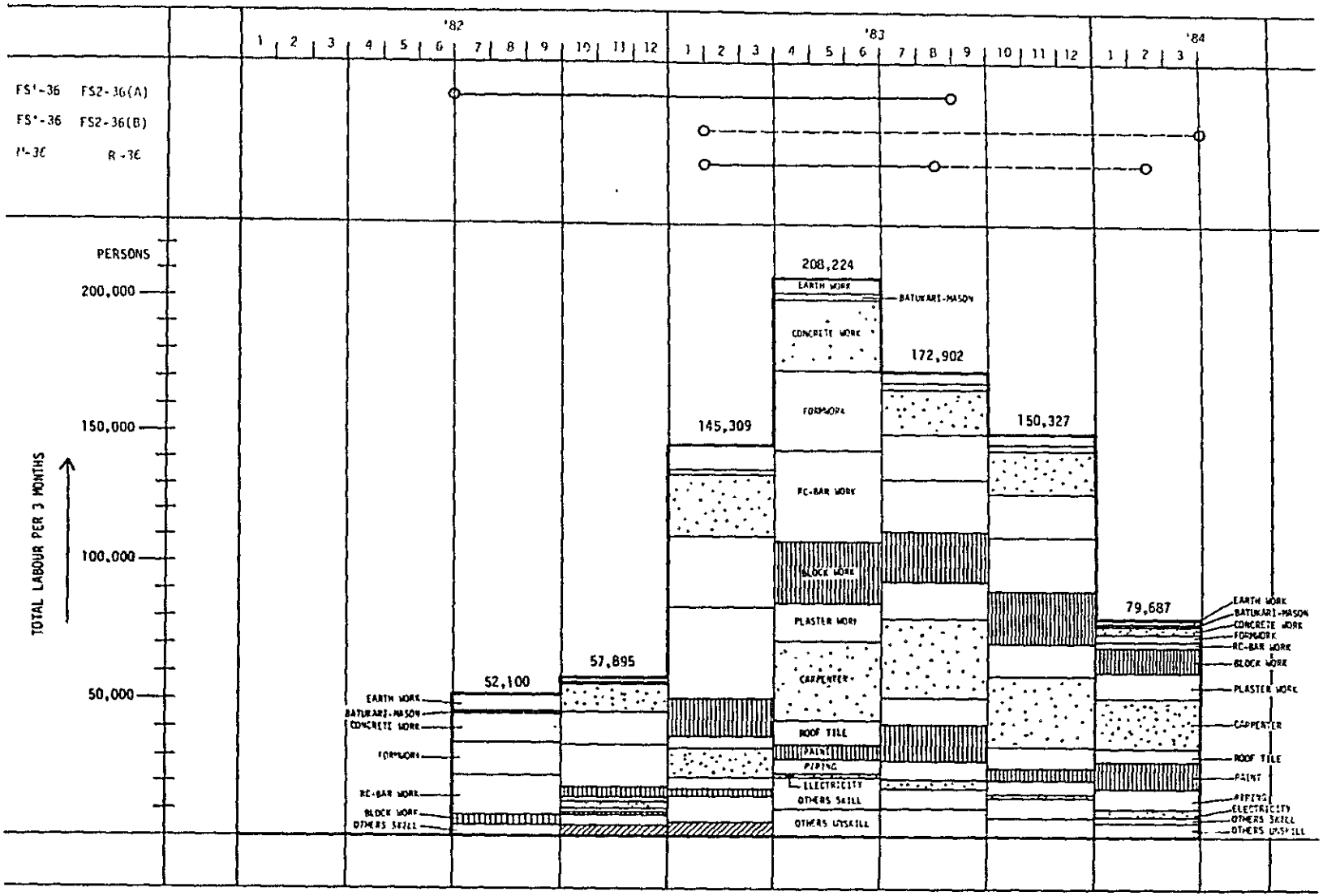


Fig 11－4 住宅工事の労務者数の推計

Table 11－4 社会・公共施設がもたらす雇用効果

Classification of social facilities	Number of facilities	Number of Employees	
Educational			
Kindergarten	(15)	15×5=75 80	365
Elementary school	(28)	8×28=224 → 250	
Junior high school	(2)	20	
Senior high school	(1)	15	
Religious			20
Mosque (Small)	(10)	10	
Mosque	(2)	10	
Medical			35
Hospital	(1)	30	
Health center	(1)	5	
Administrative/Municipal Utility	(5)	30	30
Commercial			200
Sub-center	(10)	100	
Centre Shops Market Cinema Parking	(1)	100	
		Total	650

b）建材産業における生産性向上効果

チェンカレン地区の住宅開発事業の規模は極めて大きいため、これに建設材料を供給する産業はスケール・メリットを享受することができる。

また大量生産を行う過程で、伝統的な生産工程には多くの革新要因がもちこまれ、条件が整えば近代的生産工程に移行することも可能である。

この過程の中で、労働者の熟練度も一定の向上をみることになり、労働生産性の上昇を期待することができる。

Table 11−5は現Projectに使用される建設材料の生産・流通状況を調査団（Study Team）がヒアリング調査によってとりまとめ、それを一覧表にしたものである。表において、中小規模でかつ伝統的生産工程によっている建材、分散的な生産方法をとっている建材、技術革新の余地の大きな建材、流通過程が比較的整備されていない建材については今後生産性向上を期待することができる。

先に示したＩＲＲ算出のケース２における経済的コストには、この要因が含まれている。

Table 11－5 CENGKARENG住宅開発計画に使用される建設材料の生産・流通状況

		Domestic Products or Imported?		Produced in			Production Scale			Manufacturing System		Room to Improvement(increase) of productivity in 5 years				Distributing route system is ····			
		Domestic	Imported	Modern Sector	Semi-modern Sector	Traditional Sector	Large	Medium	Small	Contravited and Systematic	Scattered	Lower possibilities	Higher possibilities	Technically	By another measures	In good order (systematic)	Not systematic	Possibilities of improvement	
																		High	Low
(Housing)																			
Batu-Kali		○				○		○				○					○		○
Sand		○				○		○		○		○					○		○
Portland Cement		○		○			○						○	○		○		○	
Brick		○		○					○		○	○					○	○	
Bataco		○			○			○			○	○					○	○	
Concrete Block		○			○			○			○		○	○			○	○	
Roofing	Tile	○			○				○		○	○					○		○
	Asbesto (colgated)	○		○			○			○			○	○		○			○
Wood (finished)		○		○			○			○			○	○		○			
Ply wood		○		○			○			○			○	○		○			
Particle Board		○		○				○		○			○		○		○	○	
Steel Bar		○		○			○			○			○	○		○			
Steel Pipe (for Handrail)		○			○			○		○			○	○		○			
Wire		○		○			○			○			○	○		○			
Glass		○		○			○			○			○	○		○			
Paint		○		○			○			○			○	○		○			
Lein		○			○			○			○						○		○
(Instructure)																			
Crashed Stone		○			○			○			○					○		○	
Bamboo (for Swampy)		○				○			○		○					○			○
Asphalt		○		○			○			○			○	○		○			
Concrete Pipe		○			○			○			○					○			○
PVC Pipe		○		○			○			○			○	○		○			

c) 計画地区周辺への安定的な労働力供給

現Projectの周辺地域の特徴の1つとして、Jakarta-Tangerang 街道沿いに工業地帯が広がっていることがあげられる(Fig11−5、Fig11−6をみよ)。中小工場はもとより、近代的な大工場の多くがここに立地している。業種としては薬品、ゴム、プラスチック加工などの化学関連工業、ガラス製品、電子・電気関連製品(含むカセットテープ)、食品加工、繊物、包装材料、窯業系の建設資材などである。これらは、典型的な内陸型の加工工業であり、極めて労働集約型(雇用吸収力の高い)の工業である。

従って、この工業地帯に対し、将来とも安定的な労働力を供給することが求められている。

チェンカレンの住宅開発地区には、自分の家を持ち、住居費支出を計画的に行う習慣を身につけ、ある程度の貯蓄にも励むといったタイプの居住者が住むことになる。世帯主の多くは、安定的な勤労意欲に支えられた、比較的質の高い職員層、労働者層であることが期待される。

従来からこの工業地帯に通勤する労働者の多くは、周辺の借家に住んでいた。彼らもチェンカレンの開発住宅に移り住むことによって、より洗練された生活を享受できるようになる。洗練され、かつ規律のある生活は、安定的な勤労意欲につながる。この人々の存在が工業部門の全体としての生産性向上に寄与することになるのである。

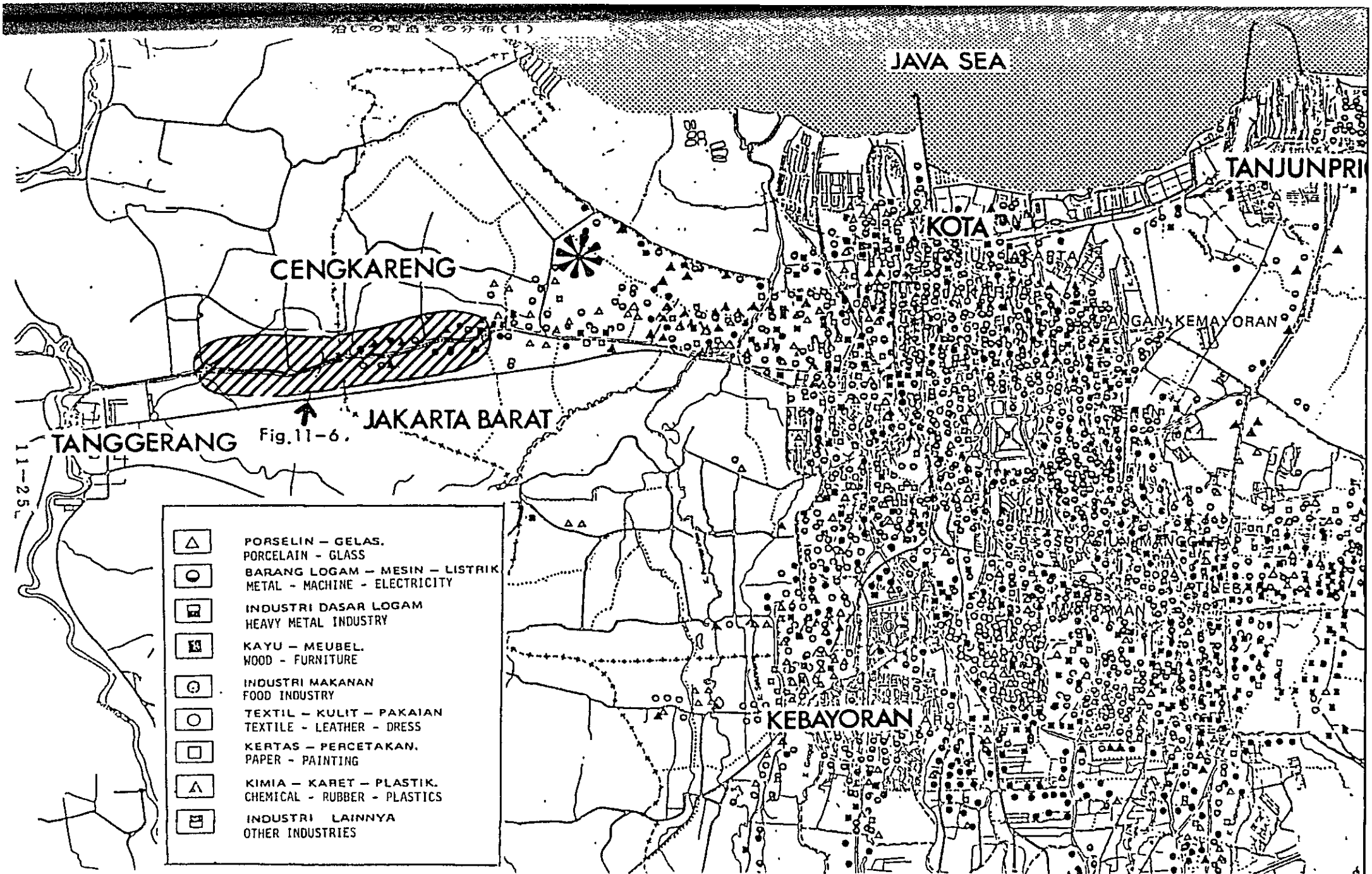
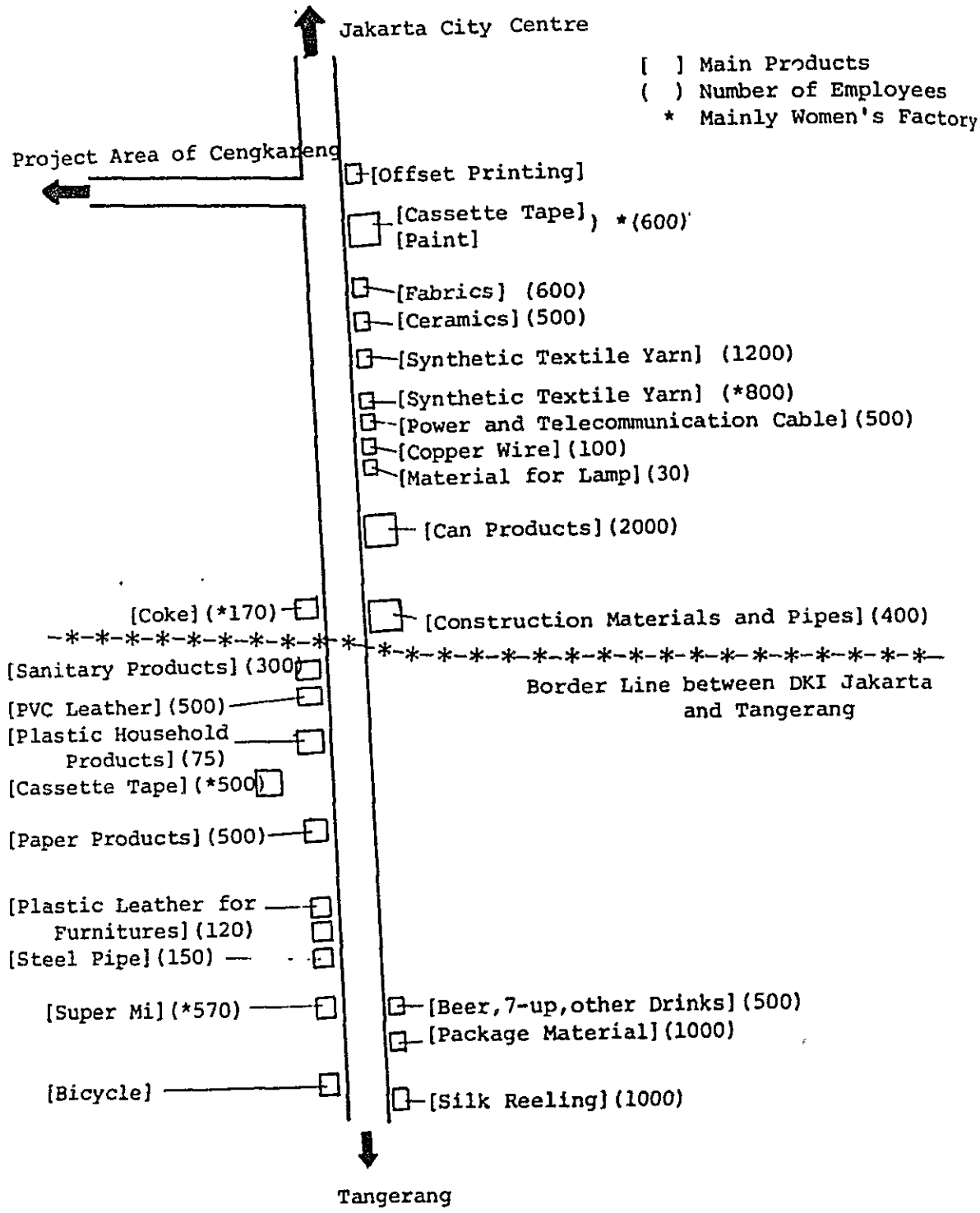

沿いの製造業の分布（1）
JAVA SEA
TANJUNPRI
KOTA
CENGKARENG
JAKARTA BARAT
Fig.11-6.
TANGGERANG
KEBAYORAN
11-25
PORSELIN – GELAS.
PORCELAIN - GLASS
BARANG LOGAM – MESIN – LISTRIK
METAL - MACHINE - ELECTRICITY
INDUSTRI DASAR LOGAM
HEAVY METAL INDUSTRY
KAYU – MEUBEL.
WOOD - FURNITURE
INDUSTRI MAKANAN
FOOD INDUSTRY
TEXTIL – KULIT – PAKAIAN
TEXTILE - LEATHER - DRESS
KERTAS – PERCETAKAN.
PAPER - PAINTING
KIMIA – KARET – PLASTIK.
CHEMICAL - RUBBER - PLASTICS
INDUSTRI LAINNYA
OTHER INDUSTRIES

Fig 11－6 JAKARTA—TANGERANG道路沿いの製造業分布(2)



補足資料

TABLE OF CONTENTS

1-1 LABOR

Item	Unit	Cost (Rp)	Remarks
Mandor	day	1,500	
Foreman		2,400	
Unskilled Labor		1,250	
Carpenter		2,100	
Paitner,Mason,Tinsmith		1,750	
Plumber		1,700	
Operater			see machine cost
Earth wark man		750	

1-2 MATERIALS

Item	Unit	Cost (Rp)	Remarks
River Stone			
Crushed Stone	m^3	6,500	
Round Stone	m^3	6,500	
Koval			
Sand			
Bedding Sand	m^3	4,500	
Mortar Sand	m^3	4,500	
Concrete Sand	m^3	5,000	
Lime	m^3	7,750	
Red Brick Powder	m^3	6,500	
Portland Cement	bag	1,950	40kg/bag
Brick	pc.	19	Tangerang
Brick		82.3	Cetak
Bataco	pc.	85	t=100
Concrete Block	pc.	125	t=100
Concrete Block	pc.	165	t=150
Roofing Tile	pc.	65	Kodok

Item	Unit	Cost (Rp)	Remarks
Wood			
Kamper	m^3	200,000	Class II
Borneo	m^3	102,000	Class II III
Meranti	m^3	100,000	Class IV
Preservated Meranti	m^3	168,570	
Terentang	m^3	45,000	Class IV
Firewood		3,000	
Steel Bar	kg	280	
Steel Pipe	kg	350	for a handrail
Wire	kg	500	
Glass	m^2	7,500	t=5
Glass	m^2	4,400	t=3
Naco Window	step	400	
Bamboo	pc.	200	ϕ6cm/4cm
Asphalt	kg	150	60/70
Rumput	m^2	75	
Plywood	m^2	810	t=4
Plywood	m^2	1,090	t=6
Particle Board	m^2	1,746	t=12
Particle Board	m^2	2,150	t=16
Corrugated Asbestos	pc.	4,330	4t×2,100×1,050
Nok Patent	pc.	1,860	L=1,050
Asbestos Sheet	m^2	1,550	t=4

1-3 UNIT COST

Item	Unit		Cost (Rp)	Remarks
(1) Earth Work (Housing & Small Scale Land Development)				
Excavation	Rp/m^3	Material		
		Labor		
		Total	420	

Item	Unit		Cost (Rp)	Remarks
Compaction	Rp/m^2	Material		
		Labor		
		Total	100	
Back Filling	Rp/m^3	Material		
		Labor		
		Total	100	
Sand Filling	Rp/m^3	Material	5,400	
		Labor	200	
		Total	5,600	
Rumpet	Rp/m^2	Material	75	
		Labor	90	
		Total	165	
(2) Concrete Work				
Concrete 175kg/cm^2	Rp/m^3	Material	24,600	
		Labor	3,000	1:2:3
		Total	27,600	
Concrete 500kg/cm^2	Rp/m^3	Material		
		Labor		
		Total	32,500	
Concrete	Rp/m^3	Material	19,350	1:3:5
		Labor	3,000	
		Total	22,350	
Concrete 225kg/cm^2	Material			
		Labor		
		Total		
Steel Bar	Rp/kg	Material	400	
		Labor	120	
		Total	520	

Item	Unit		Cost (Rp)	Remarks
(3) Form Work				
Foundation	Rp/m^2	Material	1,806	
		Labor	294	
		Total	2,100	
Wall	Rp/m^2	Material	2,580	
		Labor	420	
		Total	3,000	
Column	Rp/m^2	Material	2,838	
		Labor	462	
		Total	3,300	
Beam	Rp/m^2	Material	2,580	
		Labor	420	
		Total	3,000	
Floor	Rp/m^2	Material	3,612	
		Labor	588	
		Total	4,200	
Pile	Rp/m^2	Material	2,580	
		Labor	420	
		Total	3,000	
(4) Masonry Work				
Batu-kari	Rp/m^2	Material	18,050	
		Labor	2,200	1:4
		Total	20,250	
Batu-kali Plaster,Finish	Rp/m^2	Material	410	
		Labor	450	
		Total	860	
Weep Hole	Rp/pc.	Material	36	
		Labor	9	
		Total	45	

Item	Unit		Cost (Rp)	Remarks
Bataco	Rp/m^2	Material	1,570	t=100
		Labor	200	W/Vertical
		Total	1,770(2,520)	Reinforce-ment
				ϕ8 @400
Concrete Block	Rp/m^2	Material	2,070	t=100
		Labor	200	W/Vertical
		Total	2,270(3,020)	Reinforce-ment
				ϕ8 @400
Concrete Block	Rp/m^2	Material	2,730	t=150
		Labor	260	
		Total	2,990	
Brick Exposure (full brick)	Rp/m^2	Material	4,000	
		Labor	600	Tangerang Class II
		Total	4,600	
Brick Exposure (half brick)	Rp/m^2	Material	5,050	
		Labor	400	Cetak
		Total	5,450	
Brick Exposure (half blick)	Rp/m^2	Material	2,000	
		Labor	400	Tangerang Class II
		Total	2,400	

(5) Plaster/Painting Work

Floor Mortar (1:5)	Rp/m^2	Material		
		Labor		t=30
		Total	840	
Exterior Mortar (1:5)	Rp/m^2	Material		
		Labor		t=25
		Total	960	
Water Proof Mortar (1:3)	Rp/m^2	Material	810	
		Labor	420	t=30
		Total	1,230	

Item	Unit		Cost (Rp)	Remarks
Coking	Rp/m	Material		
		Labor		
		Total	700	
Mortar (1:4)		Material		
		Labor		t=15
		Total		
Painting ↓ Concrete	Rp/m^2	Material		
		Labor		
		Total	400	
Painting ↓ wood	Rp/m^2	Material		
		Labor		
		Total	500	
(6) Other Works				
Concrete Pile Driving	Rp/m	Material		
		Labor		
		Total	2,800	
Wooden Work General	Rp/m^3	Material	182,000	Preservated
		Labor	11,790	Meranti
		Total	193,790	
Wooden Work Roof Truss	Rp/m^3	Material	184,500	Preservated
		Labor	15,140	Meranti
		Total	199,640	
Wooden Work Door & Window Frame	Rp/m^3	Material	185,500	Preservated
		Labor	32,800	Meranti
		Total	218,300	
Ground Scaffolding	Rp/m^2	Material		
		Labor		
		Total	600	

Item	Unit		Cost (Rp)	Remarks
Exterior Scaffolding (Bamboo)	Rp/m^2	Material		
		Labor		
		Total	800	
Roof Tile Kodok	Rp/m^2	Material	1,500	
		Labor	200	
		Total	1,700	
Ridge Tile	Rp/m	Material		
		Labor		
		Total	1,800	
Metal Work	Rp/kg	Material		
		Labor		
		Total	750	

1-4 MACHINE COST WITH OPERATOR

Name of Machine	Type	Capacity	Cost (Rp/hr)
Bulldozer		(Operating Weight)	
	D60E.6	15.92 ton	19,530
	D65E.6	16.12 ton	20,400
	D85A.18	18.95 ton	27,780
	D155A.1	32.85 ton	31,250
Swamp Bulldozer	D65P	18.88 ton	21,700
Dozer Shovel		(Bucket Capacity)	
	D57S	$1.6m^3$	16,930
	D75S.2	$2.1m^3$	21,700
Motor Scraper	WS-16	Struck $11.0m^3$	47,310
		Heapen $15.8m^3$	
Wheel loader		(Bucket Capacity)	
	W-90	$2.3m^3$	20,830
	W-170	$3.5m^3$	23,870
Hydraulic	LS2500BJ	Heavy duty $0.35m^3$	15,840
		Loading work $0.5m^3$	

Name of Machine	Type	Capacity	Cost (Rp/hr)
	LS2800AJ	Heavy duty 0.7m^3 Loading work 1.0m^3	20,830
Vibrating Roller	BW212B	8.6 ton	16,930
	BW212SB	9.6 ton	17,790
Road roller		10∿12 ton	4,500
Motor Grader		Blade Width	
	GD37-6H	3.71m	16,930
Clawler Mounted Crane	LS78LS	25 ton	15,840
Dump Truck	TOYOTA	5 ton	4,320

1-5 UNIT COST FOR LARGE SCALE EARTH WORK (Land Development)

Item	Unit	Cost (Rp)	Remarks
Stripping	Rp/m^3	25	Bulldozer D60E 750m^2/hr
Clearing & Grubbing (manual)	Rp/m^2	10	
Clearing & Grubbing & Grading	Rp/m^2	60	Bulldozer D60E Dump Truck (500m) Shovel Loader
Cut	Rp/m^3	130	Bulldozer D60E 150m^3/hr
Fill (dozing)	Rp/m^3	260	Bulldozer D60E (dozing 150m)
Fill (spreading)	Rp/m^3	100	Bulldozer D60E 200m^3/hr
Compaction	Rp/m^3	120	Compactor BW212SP 150m^3/hr
Site Transportation	Rp/m^3	400	Shovel Loader Dump Truck (300∿600m)

Item	Unit	Cost (Rp)	Remarks
Excavation (manual)	Rp/m^3	420	
Excavation & Site Transportation	Rp/m^3	630	Swamp Dozer Back Hoe Dump Truck (1~1.5km)

1-6 COST DATA FOR PLUMBING

(1) PVC-CLASS VP (10 kg/cm^2)

Size	① Pipe material Rp/M	② Accessories Rp/M	③ Sub-total ① + ② Rp/M	④ Excavation & backfilling Rp/M		⑤ Sand bedding Rp/M	⑥ Installation Rp/M	⑦ Sub-total ④ ~ ⑥ Rp/M	⑧ Total ③ + ⑦ Rp/M
				d					
1/2"	305	90	395	0.4	55	270	145	470	865
3/4	365	110	475	"	55	290	145	490	965
1	530	160	690	"	60	295	215	570	1,260
1 1/4	635	190	825	"	60	325	215	600	1,425
1 1/2	930	280	1,210	"	65	335	215	615	1,825
2	1,315	395	1,710	"	70	360	275	705	2,415
2 1/2	1,695	510	2,205	0.6	100	410	275	785	2,990
3	2,585	775	3,360	"	105	440	320	865	4,225
4	4,000	1,200	5,200	"	165	915	470	1,550	6,750
5	5,240	1,570	6,810	0.8	225	1,035	470	1,730	8,540
6	7,880	2,365	10,245	"	240	1,185	635	2,060	12,305
8	11,920	3,575	15,495	1.0	405	2,085	800	3,290	18,785
10	18,160	5,450	23,610	"	460	2,440	965	3,865	27,475

d: Depth (M)

(2) PVC-CLASS VU (5 kg/cm^2, for Sewage)

Size	① Pipe material Rp/M	② Accessories Rp/M	③ Sub-total ① + ② Rp/M	④ Excavation & backfilling Rp/M		⑤ Sand bedding Rp/M	⑥ Installation Rp/M	⑦ Sub-total ④∿⑥ Rp/M	⑧ Total ③ + ⑦ Rp/M
				d					
2"	615	155	770	0.4	65	365	275	705	1,475
3	1,360	340	1,700	0.6	110	435	320	865	2,565
4	2,040	510	2,550	0.6	160	920	470	1,550	4,100
6	4,625	1,155	5,780	0.8	240	1,185	635	2,060	7,840
8	7,720	1,930	9,650	1.0	405	2,085	800	3,290	12,940
10	11,640	2,910	14,550	1.0	460	2,440	965	3,865	18,415
12	16,080	4,020	20,100	1.0	510	2,820	1,130	4,460	24,560

d: Depth (M)

(3) GALVANIZED IRON PIPE (GIP)

Size	① Pipe material Rp/M	② Accessories Rp/M	③ Sub-total ① + ② Rp/M	④ Excavation & backfilling Rp/M d		⑤ Sand bedding Rp/M	⑥ Installation Rp/M	⑦ Sub-total ④ ~ ⑥ Rp/M	⑧ Total ③ + ⑦ Rp/M
1/2"	690	210	900	0.4	55	270	580	905	1,805
3/4	890	265	1,155	"	60	285	580	925	2,080
1	1,380	415	1,795	"	60	295	860	1,215	3,010
1 1/4	1,775	535	2,310	"	60	325	860	1,245	3,555
1 1/2	2,050	615	2,665	"	65	335	860	1,260	3,925
2	2,890	865	3,755	"	65	365	1,100	1,530	5,285
2 1/2	3,720	1,115	4,835	0.6	100	410	1,100	1,610	6,445
3	4,835	1,450	6,285	"	110	435	1,280	1,825	8,110
4	6,945	2,085	9,030	"	160	920	1,880	2,960	11,990
5	9,350	2,805	12,155	0.8	225	1,035	1,880	3,140	15,295
6	11,090	3,327	14,417	"	240	1,185	2,540	3,965	18,382

d: Depth (M)

(4) ASBESTOS CEMENT PIPE (ACP) (20 kg/cm^2, for Drinking Water)

Size	① Pipe material Rp/M	② Accessories Rp/M	③ Sub-total ① + ② Rp/M	④ Excavation & backfilling Rp/M		⑤ Sand bedding Rp/M	⑥ Installation Rp/M	⑦ Sub-total ④ ∿ ⑥ Rp/M	⑧ Total ③ + ⑦ Rp/M
	-	-	-	d					
4"	2,535	760	3,295	0.6	160	920	940	2,020	5,315
6	4,120	1,235	5,355	0.8	240	1,185	1,270	2,695	8,050
8	7,415	2,225	9,640	1.0	405	2,085	1,600	4,090	13,730
10	10,465	3,140	13,605	1.0	460	2,440	1,930	4,830	18,435
12	15,270	4,580	19,850	1.0	510	2,820	2,260	5,590	25,440
14	20,360	6,110	26,470	1.0	560	3,235	2,590	6,385	32,855

d: Depth (M)

(5) DUCTILE CAST IRON PIPE (DCIP)

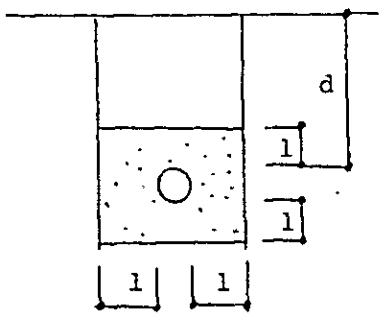
Size	① Pipe material Rp/M	② Accessories Rp/M	③ Sub-total ① + ② Rp/M	④ Excavation & backfilling Rp/M		⑤ Sand bedding Rp/M	⑥ Installation Rp/M	⑦ Sub-total ④ ~ ⑥ Rp/M	⑧ Total ③ + ⑦ Rp/M
				d					
4"	11,200	3,360	14,560	0.6	160	920	1,410	2,490	17,050
6	16,275	4,885	21,160	0.8	240	1,185	1,905	3,330	24,490
8	19,750	5,925	25,675	1.0	405	2,085	2,400	4,890	30,565
10	26,250	7,875	34,125	"	460	2,440	2,895	5,795	39,920
12	42,420	12,725	55,145	"	510	2,820	3,390	6,720	61,865
14	47,450	14,235	61,685	"	560	3,235	3,885	7,680	69,365

d: Depth (M)

1-7 COST DATA FOR WATER SUPPLY AND SEWERAGE

(1) COST OF EXCAVATION, BACKFILLING & SAND BEDDING - WATER SUPPLY

Size	d mm	ℓ mm	Excavation		Back filling		Sand bedding		Total Rp/M	
			M^3	Rp/M	M^3	Rp/M	M^3	Rp/M		
1/2"	400	100	0.114	48	0.066	7	0.048	269	324 →	325
3/4	"	"	0.118	50	0.067	7	0.051	286	343	345
1	"	"	0.122	51	0.069	7	0.053	297	355	355
1 1/4	"	"	0.130	55	0.072	7	0.058	325	387	385
1 1/2	"	"	0.134	56	0.074	7	0.060	336	399	400
2	"	"	0.142	60	0.077	8	0.065	364	432	430
2 1/2	600	"	0.208	87	0.135	14	0.073	409	510	510
3	"	"	0.218	92	0.140	14	0.078	437	543	545
4	"	150	0.346	145	0.182	18	0.164	918	1,081	1,080
5	800	"	0.464	195	0.279	28	0.185	1,036	1,259	1,260
6	"	"	0.503	211	0.291	29	0.212	1,187	1,427	1,425
8	1,000	200	0.850	357	0.478	48	0.372	2,083	2,488	2,490
10	"	"	0.964	405	0.528	53	0.436	2,442	2,900	2,900
12	"	"	1,072	450	0.568	57	0.504	2,822	3,329	3,330
14	"	"	1,186	498	0.608	61	0.578	3,237	3,796	3,795
			420Rp/M^3		100Rp/M^3		5,600Rp/M^3			



(2) WATER METER AND HOUSE CONNECTION

• Meter 1/2"	17,500
• Meter Box	7,500
• Accessories	3,000
• PVC 3/4"×3M	2,895
• GIP 1/2"×1M	1,805
	32,700Rp/unit

(3) PROTECTION FOR ROAD CROSSING PIPE

• Pipe material cost (DCIP) + Installation cost (DCIP) × 0.8

(4) ELEVATED RESERVOIR (400M^3, 25M HEIGHT)

• Structure *	R.S.		62,193.97×10^3Rp
• Excavation	500.35M^3 × 420Rp/M^3	=	210.15
• Slab-on-grade	6.27M^3 × 22,500Rp/M^3	=	141.08
• Sand filling	15.05M^3 × 5,600Rp/M^3	=	84.28
• Back filling	292.55M^3 × 100Rp/M^3	=	29.26
• Pain work	1,752.61M^2 × 400Rp/M^2	=	701.04
• Water proof mortar	297M^2 × 1,230Rp/M^2	=	365.31
• Stairs (Concrete)	R.S.		2,652.07
• Pile driving (concrete)	572M × 2,800Rp/M^2	=	1,601.60
• Pipes and Accessories	R.S.		1,746.50
• Scaffolding and others	R.S.		18,274.74
			88,000×10^3Rp

* Structure

	Concrete			Form work			Steel Bar		
	Volume m^3	Unit price 10^3Rp/M^3	Price 10^3Rp	Volume m^2	Unit price 10^3Rp/M^2	Price 10^3Rp	Volume tons	Unit price 10^3Rp/M^3	Price 10^3Rp
Column	56.94			383.68	3.3	1,266.14	13.30		
Beam	155.75			1,059.97	3.0	3,179.91	30.89		
Slab	29.55	27.50	13,701.33	187.36	4.2	786.91	4.66	520	31,153.2
Wall	18.24			243.20	3.0	729.60	3.87		
Foundation	237.75			184.16	2.1	386.74	2.96		
Pile	35.75	32.50	1,161.88	572.00	3.0	1,716.00	4.23		
Sub-total	533.98		14,863.21	2,630.37		8,065.30	59.91		31,153.2
Total	54,081.71 × 1.15 = 62,193.79 × 10^3Rp								

(5) SEWAGE HOUSE CONNECTION

- PVC 4" × 2M 8,620 (-1.4M Depth)
- Junction box 52,500 = 4 (1 unit/4 households, 70 × 70CM -1.4M Depth)

21,745 → 21,700Rp/unit

(6) SEWAGE COMMERCIAL BLDG. CONNECTION

- PVC 6" × 2M 15,680 (-0.8M Depth)
- Manhole 20,300 (50 × 50CM, -0.6M Depth)
- Junction box 36,300 (50 × 50CM, -1.5M Depth)

72,280 → 72,300Rp/unit

(7) PIPE FOUNDATION

- Bamboo 2.5M × 100Rp/M = 250
- Labor and others = 100

350Rp/M

(8) LAGOON (FOR 60ℓ/d.c, Combined System, 70unit/ha)

• Embankment	$7,300M^3 \times 330Rp/M^3$	$= 2,409 \times 10^3Rp$
• Excavation	$7,300M^3 \times 420Rp/M^3$	$= 3,066$
• Chlorination pit	$40M^3$ (RC)	1,032
• Equipment and installation		75,000
• Electric house		560
• Generator set	46KW	4,400

86,467 → 86.5Mil.Rp

1-8 COST DATA FOR LOW-RISE HOUSES

D-15 (2 Unit/Building)

FLOOR AREA — NET 18.00 M² — GROSS 18.00 M²

Section	Item	Volume	Unit	Unit cost ×10³Rp	Cost ×10³Rp	Sub-total ×10³Rp	Note
Temporary Work	Warehouse	2	Unit	0.90	1.80		
	Temp water	2	Unit	1.20	2.40		
	Grading	-	-	-	-		-See. land development
	Setting & staking out	42.00	M	0.175	7.35		-per wall length (M)
	Scaffolding		Unit	4.50, 9.00		11.55	-only for 2F
Earth Work	Insectisidation	-	M	1.26			-Other cost incl. foundation and floor work
Masonry & Concrete Work	Foundation F_1		M	5.96			
	Foundation F_2		M	3.33			
	Foundation F_3		M	3.07			
	Foundation F_4	38.60	M	2.69	103.83		
	1F. Floor — Slab on grade	36.00	M²	1.79	64.44		
	1F. Floor — Soil floor		M²	0.11			
	Ridge stone F_3		M	0.72			
	Ridge stone F_4	8.70	M	0.47	4.09		
	Concrete block HB-15		M²	2.99			
	Concrete block HB-10	71.69	M²	2.27	162.74		
	Concrete block Finish plaster		M²	0.92			
	WC/M floor mortar	26.01	M²	1.34	34 85		
	R.-Course C_1		M	3.81			
	R.-Course C_2		M	2 92			
	R.-Course C_3		M	2.38			-incl. horizontal RC-brace
	R.-Course C_4		M	3.17			
	R.-Course C_5		M	3.77			
	R.-Course C_6	30.79	M	2 03	62 50		
	Wall reinforcement A-1	11 60	M	0 41	4 76		
	Wall reinforcement A-2	5 80	M	1.16	6.73		
	Wall reinforcement A-3	5 80	M	0.86	4.99		
	2F Floor — RC floor S_1		M²	13.16			
	2F Floor — RC floor S_2		M²	11.76		448.93	
	2F Floor — Wood floor		M²	7 02			
Wood Work	Upper wall etc — Head plate	24 00	M	0.41	9.84		-incl. bolts + nuts
	Upper wall etc — Upper unit wall	6 00	M²	5.76	34.56		
	Upper wall etc — Other upper wall	12 00	M	2.40	28.80		
	Upper staircase		Set				
	Upper WC/M	2	Set	2.70	5.40		
	Handrail — Wooden rail		Unit				
	Handrail — Pipe rail		Unit	10.76			
	Staircase (Wooden)		Unit			78.60	
Ceiling Work	Ceiling — Asbestos		M²	2.38			-per horizontal M²
Door & window Work	J_B	2	Pc	12.00	24.00		
	J_H	2	Pc	18.83	37.66		
	J_E	2	Pc	11.58	23.16		
			Pc				
			Pc				
			Pc				
	Lock + Hook	2+0	Pc	2.50+0.20	5 00	89.82	
Roof Work	Rafter + Batten + Tile	33 60	M²	5 82	195 55		-per horizontal M² (incl. laves)
	Canopy		Set				
	Ridge tile	4	M	1.04	4.16		
	Ridge column	2	Pc	1.54+1.79	8.04		L = 1.55M
	Ridge board	4	M	1.52	6.08		
	Brace	2	Pc	4 00	8 00		
	Eaves fascia	29.20	M	0 35	10.22		
	Valley gutter	4	M	2 40	9.60		
	Down pipe	4	M	1.80	7.20		
	Water-tightening	25 6	M	1 65	42.24		
	Collar		Pc			291.09	
Plumbing Work	Water tub	2	Unit	5.50	11.00		
	Closet	2	Unit	7 00	14.00		
	Cleanout, Trap	4	Pc	3 00	12.00		
	Waste pipe	12 00	M	3.60	43.20		
	Water pipe	14.00	M	0.62	8.68		
	Water head	4	Pc	1 50	6.00		
	Kitchen sink	2	Unit	7.00	14.00		
	Connection pit	2	Unit	3.00	6.00	114.88	
Electrical Work	Fixture etc	2	Unit	42.00	84.00		
	Power intake	-	Unit	-	-	84.00	-See. electricity cost
Outside Work	Step plate + gutter plate	12+2	Pc	0.30+0.90	5.40		
	Fence		M	1.61		5.40	-incl. foundation
Painting	Painting		M²				-incl. each item
Other Work	Guard	2	Unit	1.20	2.40		
	Cleaning	2	Unit	0.46	0.92		
	ALAF' Peselamato Karja	2	Unit	0.60	1.20	4.52	
Total	1,128 79 Rp/Building × 1.1 ÷ (2) Unit = 620.83 ×10³Rp/Unit ÷ 18.0 M² = 34.49 ×10³Rp/M²						

D-21 (2 Unit/Building)

FLOOR AREA — NET 24.00 M² — GROSS 24.00 M²

Section	Item		Volume	Unit	Unit cost ×10³Rp	Cost ×10³Rp	Sub-total ×10³Rp	Note
Temporary Work		Warehouse	2	Unit	0.90	1.80		
		Temp. water	2	Unit	1.20	2.40		-See. land development
		Grading	-	-	-	-		
		Setting & staking out	54	M	0.175	9 45		-per wall length (M)
		Scaffolding	-	Unit	4.50, 9.00	-	13.65	-only for 2F
Earth Work		Insectisidation		M	1.26			-Other cost incl. found ation and floor work
Masonry & Concrete Work	Foundation	F_1		M	5 96			
		F_2		M	3.13			
		F_3		M	3.07			
		F_4	50.60	M	2.69	136.83		
	1F. Floor	Slab on grade	60.00	M²	1.79	107.40		
		Soil floor		M²	0.11			
	Ridge stone	F_5		M	0.72			
		F_6	14.00	M	0.47	6.58		
	Concrete block	HB-15		M²	2.99			
		HB-10	91.94	M²	2.27	208.70		
		Finish plaster		M²	0.92			
		WC/M floor mortar	26.01	M²	1.34	34 85		
	RC-Course	C_1		M	3.81			-incl. horizontal RC-brace
		C_2		M	2.92			
		C_3		M	2.38			
		C_4		M	3.37			
		C_5		M	3.77			
		C_6	49.58	M	2.03	100.65		
	Wall reinforcement	A-1	34.80	M	0 41	14.27		
		A-2	-	M	1.16			
		A-3	14.50	M	0.86	12 47		
	2F. Floor	RC floor S_1		M²	13.16			
		RC floor S_2		M²	11 76		621.75	
		Wood floor		M²	7 02			
Wood Work	Upper wall etc.	Head plate	30.00	M	0.41	12.30		-incl. bolts + nuts
		Upper unit wall	10.38	M²	5 76	59.79		
		Other upper wall	10.38	M²	2 40	24.91		
		Upper staircase		Set				
		Upper WC/M		Set		5.40		
	Handrail	Wooden rail		Unit				
		Pipe rail		Unit	10.76			
	Staircase	(Wooden)		Unit			102 40	
Ceiling Work	Ceiling	Asbestos		M²	2.38			-per horizontal M²
Door & Window Work		J_{1a}	4	Pc	12.00	48 00		
		J_m	4	Pc	18.83	75 32		
		J_5	2	Pc	11.58	23 16		
				Pc				
				Pc				
				Pc				
	Lock + Hook		2+2	Pc	2 50+0 20	5 40	151.88	
Roof Work	Rafter + Batten + Tile		49.20	M²	5 82	286.34		-per horizontal M² (incl. laves)
	Canopy			Set				
	Ridge tile		6.00	M	1 04	6.24		
	Ridge column		2	Pc	1.31+4.79	8.04		L = 1.55M
	Ridge board		6.00	M	1.52	9.12		
	Brace		2	Pc	4 00	8.00		
	Eaves fascia		33.20	M	0.35	11.62		
	Valley gutter		4,00	M	2.40	9.60		
	Down pipe		4,00	M	1.80	7.20		
	Water-tightening		27.20	M	1.65	44.88		
	Collar			Pc			391.04	
Plumbing Work	Water tub		2	Unit	5.50	11.00		
	Closet		2	Unit	7.00	14.00		
	Cleanout, Trap		4	Pc	3.00	12.00		
	Waste pipe		12.00	M	3.60	43.20		
	Water pipe		14.00	M	0.62	8.68		
	Water head		4	Pc	1.50	6.00		
	Kitchen sink		2	Unit	7.00	14.00		
	Connection pit		2	Unit	3.00	6.00	114.88	
Electrical Work	Fixture etc.		2	Unit	42.00	84.00		
	Power intake	-	-	Unit	-	-	84.00	-See. electricity cost
Outside Work	Step plate + gutter plate		12+2	Pc	0.30+0 90	5 40		
	Fence			M	1.61		5.40	-incl. foundation
Painting	Painting			M²				-incl. each item
Other Work	Guard		2	Unit	1.20	2.40		
	Clearing		2	Unit	0.46	0.92		
	Alat² Keselamato Karja		2	Unit	0.60	1.20	4.52	
Total	1,409.52 Rp/Building × 1.1 ÷ (2) Unit = 819.24 ×10³Rp/Unit 24 M² = 34.14 ×10³Rp/M²							

D-36 (2 Unit/Building)

FLOOR AREA — NET 36.00 M² — GROSS 36.00 M²

Section	Item	Volume	Unit	Unit cost ×10³Rp	Cost ×10³Rp	Sub-total ×10³Rp	Note
Temporary Work	Warehouse	2	Unit	0.90	1.80		
	Temp water	2	Unit	1.20	2.40		
	Grading	-	-	-	-		-See. land development
	Setting & staking out	70.00	M	0.175	12.25		-per wall length (M)
	Scaffolding	-	Unit	4.50, 9.00		16.45	-only for 2F
Earth Work	Insectisidation		M	1.26			-Other cost incl. foundation and floor work
Masonry & Concrete Work	Foundation F_1		M	5.96			
	F_2		M	3.33			
	F_3		M	3.07			
	F_4	70.00	M	2.69	188.30		
	1F Floor Slab on grade	77.70	M²	1.79	139.08		
	Soil floor		M²	0.11			
	Ridge stone F_5		M	0.72			
	F_6	15.60	M	0.47	7.33		
	Concrete Block HB-15		M²	2.99			
	HB-10	127.20	M²	2.27	288.74		
	Finish plaster		M²	0.92			
	WC/M Floor mortar	20.50	M²	1.34	27.47		
	RC-Course C_1		M	3.81			
	C_2		M	2.92			
	C_3		M	2.38			-incl. horizontal RC-brace
	C_4		M	3.37			
	C_5		M	3.77			
	C_6	97.15	M	2.03	197.21		
	Wall reinforcement A-1	52.87	M	0.41	21.68		
	A-2	24.00	M	1.16	27.84		
	A-3	16.80	M	0.86	14.45		
	2F Floor RC floor S_1		M²	13.16			
	RC floor S_2		M	11.76			
	Wood floor		M²	7.02			
Wood Work	Upper wall etc Head plate	56.00	M	0.41	22.96		-incl. bolts + nuts
	Upper unit wall	5.19	M²	5.76	29.89		
	Other upper wall	26.48	M²	2.40	63.55		
	Upper staircase		Set				
	Upper WC/M		Set				
	Handrail Wooden rail		Unit				
	Pipe rail		Unit	10.76			
	Staircase (wooden)		Unit			116.40	
Ceiling Work	Ceiling Asbestos		M²	2.38			-per horizontal M
Door & Window Work	J_1	6	Pc	18.01	144.08		
	J_2	6	Pc	10.29	61.74		
	J_3	2	Pc	11.58	23.16		
			Pc				
			Pc				
			Pc				
	Lock + Hook	2+2	Pc	2.50+0.20	5.40	234.38	
Roof Work	Rafter + Batten + Tile	93.6	M	5.82	544.75		-per horizontal M (incl. laves.
	Canvin		Set				
	Ridge tile	12.00	M	1.04	12.48		
	Ridge column	5	Pc	L=1.44+1.79	22.47		L = 1.6M
	Ridge board	12.00	M	1.52	18.24		
	Brace	5	Pc	4.00	20.00		
	Eaves fascia	42.40	M	0.35	14.84		
	Valley gutter		M	3.90			
	Down pipe		M	1.80			
	Water-tightening	30.40	M	1.65	50.16		
	Collar		Pc			680.94	
Plumbing Work	Water tub	2	Unit	5.50	11.00		
	Closet	2	Unit	7.00	14.00		
	Cleanout, Trap	4	Pc	3.00	12.00		
	Waste pipe	39.00	M	3.60	140.40		
	Water pipe	17.00	M	0.62	10.52		
	Water head	4	Pc	1.50	6.00		
	Kitchen sink	2	Unit	7.00	14.00		
	Connection pit	2	Unit	3.00	6.00	213.92	
Electrical Work	Fixture etc	2	Unit	42.00	84.00		
	Power intake	-	Unit	-	-	84.00	-See electricity (4)
Outside Work	Step plate + gutter plate	4+2	Pc	0.30+0.90	1.00		
	Fence		M	1.41		1.00	-incl. foundation
Painting	Painting		M²				-incl. each item
Other Work	Guard	2	Unit	1.20	2.40		
	Cleaning	2	Unit	1.46	0.92		
	ALAT Pesalamato Karja	2	Unit	0.60	1.20	4.52	
Total	2,265.71 Rp/Building × 1.1 ÷ (2) Unit = 1,246.14 ×10³Rp/Unit				36 M² = 34.62 ×10³Rp/M²		

D-45 (2 Unit/Building)

FLOOR AREA — NET 45.00 M² — GROSS 45.00 M²

Section	Item		Volume	Unit	Unit cost ×10³Rp	Cost ×10³Rp	Sub-total ×10³Rp	Note
Temporary Work		Warehouse	2	Unit	0.90	1.80		
		Temp. water	2	Unit	1.20	2.40		
		Grading	-	-	-	-		-See land development
		Setting & staking out	77.50	M	0.175	13.56		-per wall length (M)
		Scaffolding		Unit	4.50, 9.00		17.76	-only for 2F
Earth Work		Insectisidation		M	1.26			-Other cost incl. foundation and floor work
Masonry & Concrete Work	Foundation	F_1		M	5.96			
		F_2		M	3.33			
		F_3		M	3.07			
		F_4	77.50	M	2.69	208.48		
	1F. Floor	Slab on grade	95.10	M²	1.79	170.23		
		Soil floor		M²	0.11			
	Ridge stone	F_1		M	0.72			
		F_4	15.60	M	0.47	7.33		
	Concrete block	HB-15		M²	2.99			
		HB-10	140.64	M²	2.27	319.25		
		Finish plaster		M²	0.92			
		WC/M floor mortar	20.50	M²	1.34	27.47		
	RC-Course	C		M	3.81			
		C_2		M	2.92			
		C_3		M	2.38			
		C_4		M	3.37			-incl. horizontal RC-brace
		C_5		M	3.77			
		C_6	104.65	M	2.03	212.44		
	Wall reinforcement	A-1	52.80	M	0.41	21.65		
		A-2	24.00	M	0.16	27.84		
		A-3	16.80	M	0.86	14.45		
	2F. Floor	RC floor S_1		M²	13.16			
		RC floor S_2		M²	11.76		1,009.14	
		Wood floor		M²	7.02			
Wood Work	Upper wall etc.	Head plate	60.50	M	0.41	24.81		-incl. bolts + nuts
		Upper unit wall	8.14	M²	5.76	46.89		
		Other upper wall	32.38	M²	2.40	77.71		
		Upper staircase		Set				
		Upper WC/M		Set				
	Handrail	Wooden rail		Unit				
		Pipe rail		Unit	10.76			
	Staircase	(Wooden)		Unit			149.41	
Ceiling Work	Ceiling	Asbestos		M	2.38			-per horizontal M²
Door & Window Work		J_1	8	Pc	18.01	144.08		
		J_2	6	Pc	10.29	61.74		
		J_3	2	Pc	11.58	23.16		
				Pc				
				Pc				
				Pc				
	Lock + Hook		2+2	Pc	2.50+0.20	5.40	383.79	
Roof Work	Rafter + Batten + Tile		111.60	M²	5.82	649.51		-per horizontal M² (incl. laves)
	Canopy			Set				
	Ridge tile		12.00	M	1.04	12.48		
	Ridge column		5.00	M	1.44+1.29	23.35		L = 2.0M
	Ridge board		12.00	M	1.52	18.24		
	Brace		5	Pc	4.00	20.00		
	Eaves fascia		45.60	M	0.35	15.96		
	Valley gutter			M	3.90			
	Down pipe			M	1.80			
	Water-tightening		33.60	M	1.65	55.44		
	Collar			Pc			794.98	
Plumbing Work	Water tub		2	Unit	5.50	11.00		
	Closet		2	Unit	7.00	14.00		
	Cleanout, Trap		4	Pc	3.00	12.00		
	Waste pipe		42.00	M	3.60	151.20		
	Water pipe		20.00	M	0.62	12.40		
	Water head		4	Pc	1.50	6.00		
	Kitchen sink		2	Unit	7.00	14.00		
	Connection pit		2	Unit	3.00	6.00	226.60	
Electrical Work	Fixture etc.		2	Unit	42.00	84.00		
	Power intake		-	Unit	-	-	84.00	-See. electricity cost
Outside Work	Step plate + gutter plate		4+2	Pc	0.30+0.90	3.00		
	Fence			M	1.61		3.00	-incl. foundation
Painting	Painting			M²				-incl. each item
Other Work	Guard		2	Unit	1.20	2.40		
	Cleaning		2	Unit	0.46	0.92		
	ALAP' Keselamato Karja		2	Unit	0.60	1.20	4.52	

Total 2,673.20 Rp/Building × 1.1 ÷ (2) Unit = 1,470.26 ×10³Rp/Unit ÷ 45 M² = 32.67 ×10³Rp/M²

R-15 (6 Unit/Building)

FLOOR AREA — NET 18.00 M² / GROSS 18.00 M²

Section	Item		Volume	Unit	Unit cost ×10³Rp	Cost ×10³Rp	Sub-total ×10³Rp	Note
Temporary Work		Warehouse	6	Unit	0.90	5.40		
		Temp. water	6	Unit	1.20	7.20		
		Grading	-	-	-	-		-See. land development
		Setting & staking out	135.00	M	0.175	23.63		-per wall length (M)
		Scaffolding	-	Unit	4 50, 9.00		36.23	-only for 2f
Earth Work		Insectisidation		M	1.26			-Other cost incl. foundation and floor work
Masonry & Concrete Work	Foundation	F_1		M	5.96			
		F_2		M	3.33			
		F_3		M	3.07			
		F_4	135.00	M	2.69	363.15		
	1F. Floor	Slab on grade	115.98	M²	1.79	207.60		
		Soil floor		M²	0.11			
	Ridge stone	F_3		M	0.72			
		F_4	25.20	M	0.47	11.84		
	Concrete block	HB-15		M²	2.99			
		HB-10	176.16	M²	2.27	399.88		
		Finish plaster		M²	0 92			
		WC/M floor mortar	68.52	M²	1.34	91.82		
	RC-Course	C_1		M	3.81			
		C_2		M	2.92			
		C_3		M	2.38			-incl. horizontal RC-brace
		C_5		M	3.37			
		C_9		M	3.77			
		C_6	89.36	M	2.03	181.40		
	Wall reinforcement	A_1-1	57.60	M	0.41	23.62		
		A_2-2	9.60	M	1.16	11.14		
		A_3-3	24.00	M	0.86	20.64		
	2F Floor	RC floor S_1		M²	13.16			
		RC floor S_2		M²	11 76		1,311.09	
		Wood floor		M²	7.02			
Wood Work	Upper wall etc	Head plate	69 00	M	0 41	28.29		-incl. bolts + nuts
		Upper unit wall	-	M²	5.76			
		Other upper wall	27.72	M	2.40	66.53		
		Upper staircase	-	Set				
		Upper WC/M	6	Set	9.335	56.01		
	Handrail	Wooden rail		Unit				
		Pipe rail		Unit	10.76			
	Staircase	(Wooden)		Unit			150.83	
Ceiling Work	Ceiling	Asbestos		M²	2.38			-per horizontal M²
Door & Window work		J_1	12	Pc	18.01	216.12		
		J_2	12	Pc	10.29	123.48		
		J_3	6	Pc	11.58	69.48		
				Pc				
				Pc				
				Pc				
	Lock + Hook		6+6	Pc	2.50+0.20	16.20	576.11	
Roof Work	Rafter + Batten + Tile		141.30	M²	5.82	822.37		-per horizontal M² (incl. laves)
	Accessory			Set				
	Ridge tile		14.40	M	1.04	14.98		
	Ridge column		6	Pc	1*1.44+1.79	28.88		L = 2.1M
	Ridge board		14.40	M	1.52	21.89		
	Brace		6	Pc	4.00	24.00		
	Eaves fascia		125.40	M	0.35	43.89		
	Valley gutter		14.40	M	3.90	56.16		
	Down pipe		16.20	M	1.80	29.16		
	Water-tightening collar		109.20	M	1.65	180.18		
				Pc			1,221.51	
Plumbing Work	Water tub		6	Unit	5.50	33.00		
	Closet		6	Unit	7.00	42.00		
	Cleanout, Trap		12	Pc	3.00	36.00		
	Waste pipe		20.00	M	3.60	72.00		
	Water pipe		15.00	M	0.62	9.30		
	Water head		12	Pc	1.50	18.00		
	Kitchen sink		6	Unit	7.00	42.00		
	Connection pit		6	Unit	3.00	18.00	270.30	
Electrical Work	Fixture etc.		6	Unit	42.00	252.00		
	Power intake	-	-	Unit	-	-	252.00	-See. electricity cost
Outside Work	Step plate + gutter plate		18*12	Pc	0 30+0.90	16.20		
	Fence		-	M	1.61	-	16.20	-incl. foundation
Painting	Painting			M²				-incl. each item
Other work	Guard		6	Unit	1.20	7.20		
	Cleaning		6	Unit	0.46	2.76		
	ITAE Keselamato Kerja		6	Unit	0.60	3.60	13.56	

Total 3,847.83 Rp/Building × 1.1 · (6) Unit = 705.44 ×10³Rp/Unit ÷ 18 M² = 39.19 ×10³Rp/M²

R-22 (6 Unit/Building)

FLOOR AREA — NET 2 00 M² / GROSS 27 00 M²

Section	Item		Volume	Unit	Unit cost ×10³Rp	Cost ×10³Rp	Sub-total ×10³Rp	Note
Temporary Work		Warehouse	6	Unit	0 90	5 40		
		Temp. water	6	Unit	1 20	7.20		
		Grading	-	-	-	-		-See. land development
		Setting & staking out	198.0	M	0.175	34.65		-per wall length (M)
		Scaffolding		Unit	4 50, 9.00		47.25	-only for 2F
Earth Work		Insectinidation		M	1.26			-Other cost incl. foundation and floor work
Masonry & Concrete Work	Foundation	F_1		M	5 96			
		F_2		M	3 33			
		F_3		M	3 07			
		F_4	186.00	M	2.69	500.34		
	1F Floor	Slab on grade	148.50	M²	1.79	265.82		
		Soil floor		M²	0 11			
	Ridge stone	F_5		M	0.72			
		C_4	12.00	M	0.47	5.64		
	Concrete block	HB-15		M²	2.99			
		HB-10	282.00	M²	2.27	640 14		
		Finish plaster		M²	0 92			
		WC/H floor mortar	68.52	M²	1.34	91 82		
	RC-Course	C_1		M	3.81			
		C_2		M	2 92			
		C_3		M	2.38			-incl. horizontal RC-brace
		C_4		M	3.37			
		C_5		M	3 77			
		C_6	160 73	M	2.03	326.28		
	Wall reinforcement	A-1	108.00	M	0.41	44.28		
		A-2	19.20	M	1.16	22 27		
		A-3	36.00	M	0 86	30 96		
	2F. Floor	RC floor S_1		M²	13.16			
		RC floor S_2		M²	11 76		1,927.55	
		Wood floor		M²	7 92			
Wood Work	Upper wall etc.	Head plate	84.00	M	0 41	34 44		-incl. bolts + nuts
		Upper unit wall	41.58	M²	5.76	239.50		
		Other upper wall	62.28	M²	2 40	149 47		
		Upper staircase	6	Set	4.065	24.39		
		Upper WC/H	6	Set	9.335	56 01		
	Handrail	Wooden rail		Unit				
		Pipe rail		Unit	10 76			
	Staircase	(Wooden)		Unit			503.81	
Ceiling Work	Ceiling	Asbestos		M²	2 38			-per horizontal M²
Door & Window Work		J_{11}	12	Pc	18.01	216 12		
		J_{π}	12	Pc	10 29	123 48		
		J_8	6	Pc	11.58	69.48		
				Pc				
				Pc				
				Pc				
	Lock + Hook		6+6	Pc	2.50+0 20	16 20	576 11	
Roof Work	Rafter + Batton + Tile		203.40	M²	5 82	1,183.79		-per horizontal M² (incl. laves)
	Canopy			Set				
	Ridge tile		23.40	M	1 04	24 34		
	Ridge column		9	Pc	4*1.44+1.79	43.11		L = 2 1M
	Ridge board		23.40	M	1 52	35 57		
	Brace		9	Pc	4 00	36 00		
	Eaves fascia		143.40	M	0.35	50 19		
	Valley gutter		23.40	M	3 90	91 26		
	Down pipe		16.20	M	1.80	29 16		
	Water-tightening		118.20	M	1.65	195 03		
	Collar			Pc			1,688.67	
Plumbing Work	Water tub		6	Unit	5.50	33.00		
	Closet		6	Unit	7.00	42 00		
	Cleanout, Trap		12	Pc	3.00	36 00		
	Waste pipe		20.00	M	3.60	72.00		
	Water pipe		15.00	M	0.62	9.30		
	Water head		12	Pc	1.50	18.00		
	Kitchen sink		6	Unit	7.00	42.00		
	Connection pit		6	Unit	3.00	18 00	270.30	
Electrical Work	Fixture etc.		6	Unit	42.00	252 00		-See electricity cost
	Power intake		-	Unit	-	-		
Outside Work	Step plain + gutter plate		10+12	Pc	0.10+0.90	19.80		
	Fence			M	1.61		19.80	-incl. foundation
Painting	Painting			M²				-incl. each item
Other Work	Guard		6	Unit	1.20	7.20		
	Cleaning		6	Unit	0.46	2.76		
	ALAT Keselamato Kerja		6	Unit	0.60	3.60	13 56	
Total	5,299.05 Rp/Building × 1.1 (6) Unit = 971.49 ×10³Rp/Unit 25 M² = 38.86 ×10³Rp/M²							

R=36M (6 Unit/Building)

FLOOR AREA — NET 38.00 M; GROSS 38.00 M²

Section	Item	Volume	Unit	Unit cost ×10³Rp	Cost ×10³Rp	Sub-total ×10³Rp	Note
Temporary work	Warehouse	6	Unit	0.90	5.40		
	Temp. water	6	Unit	1.20	7.20		
	Grading	-	-	-	-		-Sec. land development
	Setting & staking out	214.0	M	0.175	37.45		-per wall length (M)
	Scaffolding	-	Unit	4.50, 9.00		50.05	-only for 2F
Earth work	Insectisidation		M	1.26			-Other cost incl. foundation and floor work
Masonry & Concrete work	Foundation F_1		M	5.96			
	Foundation F_2		M	3.33			
	Foundation F_3		M	1.07			
	Foundation F_4	214.00	M	2.69	575.66		
	1F Floor: Slab on grade	228.05	M²	1.79	408.75		
	1F Floor: Soil floor		M²	0.21			
	Ridge stone F_3		M	0.72			
	Ridge stone F_4	29.10	M	0.47	13.68		
	Concrete block HB-15		M²	2.99			
	Concrete block HB-10	359.04	M²	2.27	815.02		
	Finish plaster		M²	0.92			
	WC/M floor mortar	11.21	M²	1.34	15.02		
	RC-Course C_1		M	3.81			
	RC-Course C_2		M	2.92			
	RC-Course C_3		M	2.38			-incl. horizontal RC-brace
	RC-Course C_4		M	3.37			
	RC-Course C_5		M	3.77			
	RC-Course C_6	291.46	M	2.03	591.66		
	Wall reinforcement A_1-1	225.60	M	0.41	92.50		
	Wall reinforcement A_1-2	33.60	M	1.16	38.96		
	Wall reinforcement A_1-3	52.80	M	0.86	45.41		
	2F. Floor: RC floor S_1		M	13.16			
	2F. Floor: RC floor S_2		M	11.76		2,596.68	
Wood Work	2F. Floor: Wood floor		M²	7.02			
	Upper wall etc: Head plate	210.0	M	0.41	86.10		-incl. bolts + nuts
	Upper wall etc: Upper unit wall	51.9	M²	5.76	298.94		
	Upper wall etc: Other upper wall	54.14	M²	2.40	129.94		
	Upper staircase		Set				
	Upper WC/M		Set				
	Handrail: Wooden rail		Unit				
	Handrail: Pipe rail		Unit	10.76			
	Staircase (wooden)		Unit			514.98	
Ceiling Work	Ceiling: Asbestos		M	2.38			-per horizontal M
Door & Window Work	J_{D2}	12	Pc	15.39	184.68		
	J_{D3}	24	Pc	18.01	432.24		
	J_{D5}	18	Pc	10.29	185.22		
	J_{D1}	6	Pc	5.11	30.66		
			Pc				
			Pc				
	Lock + Hook	6+12	Pc	2.50+0.20	17.40	1,347.78	
Roof Work	Rafter + Batter + Tile	275.76	M²	5.82	1,604.92		-per horizontal M² (incl. laves)
	Canopy		Set				
	Ridge tile	54.60	M	1.03	56.78		
	Ridge column	L_1=12pc L_2=12pc	Pc	L=1.44+1.79	75.38		L_1 = 1.5M L_2=0.79
	Ridge board	107.76	M	1.52	163.80		
	Brace	22	Pc	4.00	88.00		
	Eaves fascia	106.40	M	0.35	37.24		
	Valley gutter		M	3.90			
	Down pipe		M	1.80			
	Water-tightening collar	174.56	M	1.65	288.02		
			Pc			2,314.14	
Plumbing Work	Water tub	6	Unit	5.50	33.00		
	Closet	6	Unit	7.00	42.00		
	Cleanout, Trap	12	Pc	3.00	36.00		
	Waste pipe	63.00	M	3.60	226.80		
	Water pipe	72.00	M	0.62	44.64		
	Water head	12	Pc	1.50	18.00		
	Kitchen sink	6	Unit	7.00	42.00		
	Connection pit	6	Unit	3.00	18.00	460.44	
Electrical Work	Fixture etc	6	Unit	42.00	252.00		
	Power intake	-	Unit	-	-	252.00	-See. electricity
Outside work	Step plate + gutter plate	30+12	Pc	0.30+0.90	19.80		
	Fence		M	1.61		19.80	-incl. foundation
Painting	Painting		M²				-incl. each item
Other Work	Guard	6	Unit	1.20	7.20		
	Cleaning	6	Unit	0.46	2.76		
	ALAP² Keselamato Kerja	6	Unit	0.60	3.60	13.56	
Total	7,569.43 Pp/Building × 1.1 : (6) Unit = 1,387.73 ×10³Rp/Unit 38 M² = 36.52 ×10³Rp/M²						

R-36			(6 Unit/Building)				FLOOR AREA	NET 3 . 5 M GROSS 4 . 0 M	
Section	Item		Volume	Unit	Unit cost ×10³Rp	Cost ×10³Rp	Sub-total ×10³Rp	Note	
Temporary Work		Warehouse	6	Unit	0.90	5.40			
		Temp. water	6	Unit	1.20	7.20			
		Grading	-	-	-	-		-See, land development	
		Setting & staking out	207.00	M	0.175	36.23		-per wall length (M)	
		Scaffolding	-	Unit	4 50, 9.00		48.83	-only for 2F	
Earth Work		Insectisidation		M	1.26			-Other cost incl. foundation and floor work	
Masonry & Concrete Work	Foundation	F_1		M	5.96				
		F_2		M	3.33				
		F_3		M	3.07				
		F_4	207.00	M	2.69	556.83			
	1F. Floor	Slab on grade	217.23	M^2	1.79	388.84			
		Soil floor		M^2	0.11				
	Ridge stone	F_5		M	0.72				
		Γ_6	17.40	M	0.47	8.18			
	Concrete block	HB-15		M^2	2.99				
		HB-10	360.96	M^2	2.27	819.38			
		Finish plaster		M^2	0 92				
		WC/M floor mortar	12 48	M^2	1.34	16.72			
	RC-Course	C_1		M	3.81				
		C_2		M	2.92				
		C_3		M	2.38			-incl. horizontal RC-brace	
		C_4		M	3.37				
		C_5		M	3 77				
		C_6	285.46	M	2 03	579.48			
	Wall reinforcement	A_1-1	194.40	M	0.41	79.70			
		A_2-2	67.20	M	1.16	77.95			
		A_3-3	50.40	M	0.86	43.34			
	2F. Floor	RC floor S_1		M^2	13.16				
		RC floor S_2		M^2	11.76		2,570.42		
Wood Work	Upper wall etc.	Wood floor		M^2	7 02				
		Head plate	174.00	M	0.41	71.34		-incl. bolts + nuts	
		Upper unit wall	25.95	M^2	5.76	149.47			
		Other upper wall	76.26	M^2	2 40	183.02			
		Upper staircase		Set					
		Upper WC/M		Set					
	Handrail	Wooden rail		Unit					
		Pipe rail		Unit	10.76				
	Staircase	(Wooden)		Unit			403 83		
Ceiling Work	Ceiling	Asbestos		M^2	2 38			-per horizontal M^2	
Door & Window Work		J_{12}	12	Pc	15.39	184.68			
		J_{13}	18	Pc	18 01	324.18			
		J_{28}	18	Pc	10.29	185.22			
		J_{21}	6	Pc	5.11	30.66			
				Pc					
				Pc					
	Lock + Hook		6+6	Pc	2.50+0 20	16.20	740.94		
Roof Work	Rafter + Batten + Tile		280.80	M^2	5.82	1,634.26		-per horizontal M^2 (incl. laves)	
	Canopy			Set					
	Ridge tile		36.0	M	1.04	37.44			
	Ridge column		19	Pc	L×1.44+1.79	77.79		L = 1 6M	
	Ridge board		36.00	M	1.52	54.72			
	Drace		19	Pc	4.00	76.00			
	Eaves fascia		152.80	M	0.35	53.48			
	Valley gutter			M	3.90				
	Down pipe			M	1.80				
	Water-tightening		164.80	M	1.65	271.92			
	Collar			Pc			2,205.61		
Plumbing Work	Water tub		6	Unit	5.50	33.00			
	Closet		6	Unit	7.00	42.00			
	Cleanout, Trap		12	Pc	3.00	36 00			
	Waste pipe		53.00	M	3.60	190.80			
	Water pipe		54.00	M	0.62	33 48			
	Water head		12	Pc	1.50	18 00			
	Kitchen sink		6	Unit	7.00	42 00			
	Connection pit		6	Unit	3 00	18 00	413.28		
Electrical Work	Fixture etc.		6	Unit	42.00	252 00			
	Power intake		-	Unit	-	-	252.00	-See electricity cost	
Outside Work	Step plate + gutter plate		30+12	Pc	0.30+0.90	19.80			
	Fence			M	1.61		19.80	-incl. foundation	
Painting	Painting			M^2				-incl. each iter	
Other Work	Guard		6	Unit	1.20	7.20			
	Cleaning		6	Unit	0.46	2,76			
	ALAP' Kesalamato Karja		6	Unit	0.60	3.60	13.56		
Total	6,668.27 Rp/Building × 1.1 ÷ (6) Unit = 1,222.52 ×10³Rp/Unit ÷ 39 M^2 = 31.35 ×10³Rp/M^2								

R-45 (6 Unit/Building)

FLOOR AREA — NET 48.00 M² / GROSS 48.00 M²

Section	Item	Volume	Unit	Unit cost ×10³Rp	Cost ×10³Rp	Sub-total ×10³Rp	Note
Temporary Work	Warehouse	6	Unit	0.90	5.40		
	Temp water	6	Unit	1.20	7.20		
	Grading	-	-	-	-		-See. land development
	Setting & staking out	226.50	M	0.175	39.64		-per wall length (M)
	Scaffolding	-	Unit	4.50, 9.00		52.24	-only for 2F
Earth work	Insectisidation		M	1.26			-Other cost incl. foundation and floor work
Masonry & Concrete work	Foundation F_1		M	5.96			
	F_2		M	3.33			
	F_3		M	3.07			
	F_4	226.50	M	2.69	609.29		
	1F Floor: Slab on grade	269.43	M²	1.79	482.28		
	Soil floor		M²	0.11			
	Ridge stone F_5		M	0.72			
	F_6	17.40	M	0.47	8.18		
	Concrete block HB-15		M²	2.99			
	HB-10	400.56	M²	2.27	909.27		
	Finish plaster		M²	0.92			
	WC/M floor mortar	62.28	M²	1.34	83.46		
	RC-Course C_1		M	3.81			
	C_2		M	2.92			
	C_3		M	2.38			-incl. horizontal RC-brace
	C_4		M	3.37			
	C_5		M	3.77			
	C_6	304.96	M	2.03	619.07		
	Wall reinforcement A-1	194.40	M	0.41	79.70		
	A-2	67.20	M	1.16	77.95		
	A-3	50.40	M	0.86	43.34		
	2F Floor: RC floor S_1		M²	13.16			
	RC floor S_2		M²	11.76		2,912.54	
Wood Work	Wood floor		M²	7.02			
	Upper wall etc: Head plate	193.50	M	0.41	79.34		-incl. bolts + nuts
	Upper unit wall	40.76	M²	5.76	234.43		
	Other upper wall	102.50	M²	2.40	246.00		
	Upper staircase		Set				
	Upper WC/M		Set				
	Handrail: Wooden rail		Unit				
	Pipe rail		Unit	10.76			
	Staircase (wooden)		Unit			559.77	
Ceiling Work	Ceiling: Asbestos		M²	2.38			-per horizontal M²
Door & Window work	J_{12}	12	Pc	15.39	184.68		
	J_{13}	18	Pc	18.01	324.18		
	J_{25}	18	Pc	10.29	185.22		
	J_{27}	6	Pc	5.11	30.66		
			Pc				
			Pc				
	Lock + Hook	6+6	Pc	2.50+0.20	16.20	740.94	
Roof Work	Rafter + Batten + Tile	334.80	M²	5.82	1,948.54		-per horizontal M² (incl. laves)
	Canopy		Set				
	Ridge tile	36.00	M	1.04	37.44		
	Ridge column	19	Pc	4×1.44+1.79	88.73		L = 2.6M
	Ridge board	36.00	M	1.52	54.72		
	Brace	19	Pc	4.00	76.00		
	Eaves fascia	165.60	M	0.35	57.96		
	Valley gutter		M	3.90			
	Down pipe		M	1.80			
	Water-tighten ng Collar	187.20	M	1.65	308.88		
			Pc			2,572.27	
Plumbing Work	Water tub	6	Unit	5.50	33.00		
	Closet	6	Unit	7.00	42.00		
	Cleanout, Trap	12	Pc	3.00	36.00		
	waste pipe	45.00	M	1.60	162.00		
	Water pipe	48.00	M	0.62	29.76		
	water head	12	Pc	1.50	18.00		
	Kitchen sink	6	Unit	7.00	42.00		
	Connection pit	6	Unit	3.00	18.00	380.76	
Electrical Work	Fixture etc	6	Unit	42.00	252.00		
	Power intake	-	Unit	-	-	252.00	-See. electricity cost
Outside Work	Step plate + gutter plate	10+12	Pc	0.30+0.90	19.80		
	Fence		M	1.61		19.80	-incl. foundation
Painting	Painting		M²				-incl. each item
Other Work	Guard	6	Unit	1.20	7.20		
	Cleaning	6	Unit	0.46	2.76		
	ALAP' Keselamato Karja	6	Unit	0.60	3.60	13.56	
Total	7,503.88 Rp/Building × 1.1 ÷ (6) Unit = 1,375.71 ×10³Rp/unit ÷ 48 M² = 28.66 ×10³Rp/M²						

M-24 (6 Unit/Building)

FLOOR AREA — NET 36.40 M² / GROSS 40.04 M²

Section	Item		Volume	Unit	Unit cost ×10³Rp	Cost ×10³Rp	Sub-total ×10³Rp	Note
Temporary Work		Warehouse	6	Unit	0.90	5.40		
		Temp. water	6	Unit	1.20	7.20		
		Grading	-	-	-	-		-See. land development
		Setting & staking out	162.20	M	0.175	28.39		-per wall length (M)
		Scaffolding	6	Unit	4.50, 9.00	27.00	67.99	-only for 2F
Earth Work		Insectinidation		M	1.26			-Other cost incl. foundation and floor work
Masonry & Concrete Work	Foundation	F_1		M	5.96			
		F_2	94.80	M	3.33	315.68		
		F_3	3.90	M	3.07	11.97		
		F_4	68.00	M	2.69	182.92		
	1F. Floor	Slab on grade	98.78	M²	1.79	176.82		
		Soil floor		M²	0.11			
	Ridge stone	F_5		M	0.72			
		F_6	25.20	M	0.47	11.84		
	Concrete block	HB-15	207.98	M²	2.99	621.66		
		HB-10	100.80	M²	2.27	228.82		
		Finish plaster		M²	0.92			
		WC/M floor mortar	68.52	M²	1.34	91.82		
	RC-Course	C_1		M	1.81			
		C_2		M	2.92			
		C_3	165.48	M	2.38	393.84		-incl. horizontal RC-brace
		C_4	72.00	M	3.37	242.64		
		C_5	6.00	M	3.77	22.62		
		C_6		M	2.03			
	Wall reinforcement	B_1 -1	290.40	M	0.88	255.55		
		B_2 -2	46.00	M	2.72	125.12		
		B_3 -3	32.80	M	2.71	88.89		
	2F. Floor	RC floor S_1		M²	13.16			
		RC floor S_2		M²	11.76		2,770.39	
Wood Work	Upper wall etc.	Wood floor	64.80	M²	7.02	454.90		
		Head plate	81.60	M	0.41	33.46		-incl bolts + nuts
		Upper unit wall	2.62	M²	5.76	15.09		
		Other upper wall	10.48	M²	2.40	25.15		
		Upper staircase		Set		13.04		
		Upper WC/M		Set		56.01		
	Handrail	Wooden rail	3	Pc	4.98	14.94		
		Pipe rail		Unit	10.76			
	Staircase	(Wooden)	1	Pc	35.32	105.96	718.55	
Ceiling Work	Ceiling	Asbestos		M²	2.38			-per horizontal M²
Door & Window Work		J_1	6	Pc	16.63	99.78		
		J_{11}	18	Pc	11.74	211.32		
		J_{12}	12	Pc	18.01	216.12		
		J_{15}	18	Pc	16.10	289.80		
		J_{16}	6	Pc	11.97	71.82		
		J_8	6	Pc	11.58	69.48		
	Lock + Hook		12+6	Pc	2.50+0.20	31.20	989.52	
Roof Work	Rafter + Batten + Tile		144.72	M²	5.82	842.27		-per horizontal M² (incl. laves)
	Canopy			Set				
	Ridge tile		24.00	M	1.04	24.96		
	Ridge column		8	Pc	L=1.44+1.79	22.38		L = 0.7M
	Ridge board		20.40	M	1.52	31.01		
	Brace		8	Pc	4.00	32.00		
	Eaves fascia		157.60	M	0.35	55.16		
	Valley gutter			M	3.90			
	Down pipe			M	1.80			
	Water-tightening		130.60	M	1.65	215.49		
	Collar		3	Pc	5.76	17.28	1,210.55	
Plumbing Work	Water tub		6	Unit	5.50	33.00		
	Closet		6	Unit	7.00	42.00		
	Cleanout, Trap		12	Pc	3.00	36.00		
	Waste pipe		20.00	M	3.60	72.00		
	Water pipe		15.00	M	0.62	9.30		
	Water head		12	Pc	1.50	18.00		
	Kitchen sink		6	Unit	7.00	42.00		
	Connection pit		6	Unit	3.00	18.00	270.30	
Electrical Work	Fixture etc.		6	Unit	42.00	252.00		
	Power intake		-	Unit	-	-	252.00	-See. electricity cost
Outside Work	Step plate + gutter plate		18+12	Pc	0.30+0.90	16.20		
	Fence			M	1.61		16.20	-incl. foundation
Painting	Painting			M²				-incl. each item
Other Work	Guard		6	Unit	1.20	7.20		
	Cleaning		6	Unit	0.46	2.76		
	AIAF' Keselamato Karja		6	Unit	0.60	3.60	13.56	
Total	6,139.06 Rp/Building × 1.1 ÷ (6) Unit = 1,162.16 ×10³Rp/Unit (30 M² = 38.74 ×10³Rp/M²							

A-30
(In case of roof tile) (6 Unit/Building)

FLOOR AREA — NET 38.00 M² — GROSS 38.00 M²

Section	Item	Volume	Unit	Unit cost ×10³Rp	Cost ×10³Rp	Sub-total ×10³Rp	Note
Temporary work	Warehouse	6	Unit	0.90	5.40		
	Temp water	6	Unit	1.20	7.20		
	Grading	-	-	-	-		-Sue. land development
	Setting & staking out	146 00	M	0.175	25.55		-per wall length (M)
	Scaffolding	6	Unit	4.50, 9.00	27.00	65.15	-only for 2F
Earth Work	Insectisidation		M	1.26			-Other cost incl. foundation and floor work
Masonry & concrete work	Foundation F_1		M	5.96			
	Foundation F_2	146.00	M	3.33	486.18		
	Foundation F_3		M	3.07			
	Foundation F_4		M	2.69			
	1F Floor: Slab on grade	131.46	M²	1.79	235.31		
	1F Floor: Soil floor		M²	0.11			
	Ridge stone F_5		M	0.72			
	Ridge stone F_6	29.40	M	0.47	13.82		
	Concrete block HB-15	408 98	M²	2.99	1,222.85		
	Concrete block HB-10		M²	2.27			
	Finish plaster		M²	0.92			
	W/C floor mortar	10.97	M²	1 34	14.70		
	RC-Course C_1		M	3.81			
	RC-Course C_2		M	2.92			
	RC-Course C_3	264.00	M	2.38	628.32		-incl. horizontal RC-brace
	RC-Course C_4	67 00	M	3 37	225.79		
	RC-Course C_5	41 50	M	3 77	156.46		
	RC-Course C_6		M	2 03			
	Wall reinforcement B-1	231 90	M	3.88	204 07		
	Wall reinforcement B-2	73 60	M	2.72	200.19		
	Wall reinforcement B-3	51.20	M	2.71	138.75		
	2F Floor: RC floor S_1		M²	13.16			
	2F Floor: RC floor S_2		M²	11.76		3,526.44	
	2F Floor: Wood floor	88.20	M²	7.02	619.16		
Wood Work	Upper wall etc: Head piece	102.50	M	0.41	42.03		-incl. bolts + nuts
	Upper wall etc: Upper unit wall	7.50	M²	5.76	43.20		
	Upper wall etc: Other upper wall	31.13	M²	2.40	74.71		
	Upper staircase		Set		14.25		
	Upper W/C M		Set				
	Handrail: Wooden rail	6	Unit	5.73	34.38		
	Handrail: Pipe rail		Unit	10.76			
	Staircase (Wooden)	6	Pc	35.32	211.92	1,039.65	
Ceiling Work	Ceiling: Asbestos		M²	2 38			-per horizontal M²
Door & window work	J_4	6	Pc	16.63	99.78		
	J_4'	6	Pc	7.32	43.92		
	J_7	6	Pc	28.56	171.36		
	J_8	6	Pc	27.23	163 38		
	J_{10}	6	Pc	16.10	96.60		
	J_5	6	Pc	11 58	69.48		
	Lock + Hook	6+6	Pc	2.50+0.20	16.20	660 72	
Roof Work	Rafter + Batter + Tile	155.40	M²	5 82	904 43		-per horizontal M² (incl. laves)
	Canopy		Set		115.95		
	Ridge tile	24 00	M	1.04	24 96		
	Ridge column	10	Pc	1.44+1.79	36.62		L = 1.34
	Ridge board	18.30	M	1 52	27.36		
	Brace	12	Pc	4.00	48.00		
	Eaves fascia	112 00	M	0.35	39.20		
	Valley gutter		M	3 90			
	Down pipe		M	1.86			
	water-tightening	91.30	M	1.65	150.15		
	Collar	3	Pc	11.70	35.10	1,381.77	
Plumbing Work	Water tub	6	Unit	5.50	33.00		
	Closet	6	Unit	7.00	42.00		
	Cleanout, Trap	12	Pc	3.00	36.00		
	Waste pipe	45.00	M	3.60	162.00		
	Water pipe	9.00	M	0.62	5.58		
	Water head	12	Pc	1.50	18.00		
	Kitchen sink	6	Unit	7.00	42.00		
	Connection pit	6	Unit	3.00	18.00	356.58	
Electrical Work	Fixture etc	6	Unit	42.00	252.00		
	Power intake	-	Unit	-	-	252.00	-See. electricity cost
Outside Work	Step plate + gutter plate	4+2	Pc	0.30+0.90	3.00		
	Fence		M	1.61		3.00	-incl. foundation
Painting	Painting		M²				-incl. each item
Other Work	Guard	6	Unit	1.20	7.20		
	Cleaning	6	Unit	0.46	2.76		
	ALAP' Keselamato Karja	6	Unit	0.60	3.60	13.56	

Total: 7,298.87 Rp/Building × 1.1 ÷ (6) Unit = 1,338.13 ×10³Rp/Unit ÷ 38 M² = 35.21 ×10³Rp/M²

M-36
(In case of corrugated asbestos) (6 Unit/Building)

FLOOR AREA: NET 36.00 M² / GROSS 38.00 M²

Section	Item		Volume	Unit	Unit cost ×10³Rp	Cost ×10³Rp	Sub-total ×10³Rp	Note
Temporary Work		Warehouse	6	Unit	0.90	5.40		
		Temp. water	6	Unit	1.20	7.20		
		Grading	-	-	-	-		-See. land development
		Setting & staking out	146.00	M	0.175	25.55		-per wall length (M)
		Scaffolding	6	Unit	4.50, 9.00	27.00	65.15	-only for 2F
Earth Work		Insectisidation		M	1.26			-Other cost incl. foundation and floor work
Masonry & Concrete Work	Foundation	F_1		M	5.96			
		F_2	146.00	M	3.33	486.18		
		F_3	-	M	3.07	-		
		F_4		M	2.69			
	1F. Floor	Slab on grade	131.46	M²	1.79	235.31		
		Soil floor		M²	0.11			
	Ridge stone	F_3		M	0.72			
		F_4	29.40	M	0.47	13.82		
	Concrete block	BB-15	424.70	M²	2.99	1,269.85		
		BB-10		M²	2.27			
		Finish plaster		M²	0.92			
		WC/M floor mortar	10.97	M²	1.34	14.70		
	RC-Course	C_1		M	3.81			
		C_2		M	2.92			
		C_3	264.00	M	2.38	628.32		-incl. horizontal RC-brace
		C_5	67.00	M	3.37	225.79		
		C_3	41.50	M	3.77	156.46		
		C_4		M	2.03			
	Wall reinforcement	B-1	240.9	M	0.88	211.93		
		B-2	76.8	M	2.72	208.90		
		B-3	52.8	M	2.71	143.09		
	2F. Floor	RC floor S_1		M²	13.16			
		RC floor S_2		M²	11.76		3,594.41	
Wood Work	Upper wall etc.	Wood floor	88.20	M²	7.02	619.16		
		Head plate	102.50	M	0.41	42.03		-incl. bolts + nuts
		Upper unit wall	3.50	M²	5.76	20.16		
		Other upper wall	14.57	M²	2.40	34.97		
		Upper staircase		Set				
		Upper WC/M		Set				
	Handrail	Wooden rail	6	Unit	5.73	34.38		
		Pipe rail		Unit	10.76			
	Staircase	(Wooden)	6	Unit	35.32	211.92	962.62	
Ceiling Work	Ceiling	Asbestos		M²	2.38			-per horizontal M²
Door & Window Work		J_{13}	6	Pc	18.005	108.03		
		J_4'	6	Pc	7.320	43.92		
		J_7	6	Pc	28.560	171.36		
		J_{10}	6	Pc	30.225*	181.35		
		J_{15}	6	Pc	17.600*	105.60		
		J_8	6	Pc	11.575	69.45		
	Lock + Hook		6+6	Pc	2.50+0.20	16.20	679.71	
Roof Work	Rafter + Batten + Tile Perlin		155.40	M	4.535	704.74		-per horizontal M² (incl. laves)
	Canopy			Set	115.95	115.95		
	Nok patent		24.00	M	2.00	48.00		
	Ridge column			M				
	Roof truss		119.50	M	1.44	172.08		
	Brace		48.00	Pc	0.45	21.60		
	Eaves fascia		105.60	M	0.35	36.96		
	Valley gutter			M	1.90			
	Down pipe			M	1.80			
	Water-tightening		24.00	M	1.65	39.60		
	Collar		3	Pc	11.70	35.10	1,174.03	
Plumbing Work	Water tub		6	Unit	5.50	33.00		
	Closet		6	Unit	7.00	42.00		
	Cleanout, Trap		12	Pc	3.00	36.00		
	Waste pipe		45.00	M	3.60	162.00		
	Water pipe		9.00	M	0.62	5.58		
	Water head		12	Pc	1.50	18.00		
	Kitchen sink		6	Unit	7.00	42.00		
	Connection pit		6	Unit	3.00	18.00	356.58	
Electrical Work	Fixture etc.		6	Unit	42.00	252.00		
	Power intake		-	Unit	-	-	252.00	-See. electricity cost
Outside Work	Step plate + gutter plate		4+2	Pc	0.30+0.90	3.00		
	Fence			M	1.61		3.00	-incl. foundation
Painting	Painting			M²				-incl. each item
Other Work	Guard		6	Unit	1.20	7.20		
	Cleaning		6	Unit	0.46	2.76		
	ALAT Keselamato Karja		6	Unit	0.60	3.60	13.56	

Total 7,101.06 Rp/Building × 1.1 ÷ (6) Unit = 1,301.86 ×10³Rp/Unit ÷ 38 M² = 34.26 ×10³Rp/M²

Section	Item		Volume	Unit	Unit cost ×10³Rp	Cost ×10³Rp	Sub-total ×10³Rp	Note
	M-45A		(6 Unit/Building)				FLOOR AREA	NET 50.00 M²
								GROSS 50.00 M
		Warehouse	6	Unit	0.00	5.40		
		Temp water	6	Unit	1.20	7.20		
Temporary work		Grading	-	-	-	-		-See. land development
		Setting & staking out	174.50	M	0.175	30.54		-per wall length (M)
		Scaffolding	6	Unit	4.50, 9.00	27.00	62.94	-only for 2F
Earth Work		Insectisidation		M	1.26			-Other cost incl foundation and floor work
		F_1		M	5.96			
	Foundation	F_2	153.50	M	3.33	511.16		
		F_3		M	3.07			
		F_4		M	2.69			
	1F Floor	Slab on grade	137.96	M²	1.79	246.95		
		Soil floor		M²	0.11			
		F_3		M	0.72			
	Ridge stone	F_4	18.00	M	0.47	8.46		
		HB-15	508.00	M²	2.99	1,518.92		
		HB-10		M²	2.27			
	Concrete block	Finish plaster		M²	0.92			
Masonry & Concrete work		W/M floor mortar	62.86	M²	1.34	84.26		
		C_1		M	3.81			
		C_2		M	2.92			
		C_3	324.87	M	2.38	773.19		-incl. horizontal RC-brace
	RC-Course	C_4	88.00	M	3.37	296.56		
		C_5	31.00	M	3.77	116.87		
		C_6		M	2.03			
		B -1	336.90	M	0.88	296.47		
	wall reinforcement	B -2	68.80	M	2.72	187.14		
		B_3-3	41.60	M	2.71	112.74		
		RC floor S_1		M²	13.16			
	2F Floor	RC floor S_2		M	11.76		4,152.72	
		wood floor	121.28	M²	7.02	851.39		
		steel floor	125.00	M	0.41	51.25		-incl. bolts + nuts
		Upper part wall	16.15	M	5.76	93.02		
Wood work	Upper wall etc	Other upper wall	48.88	M²	2.40	117.31		
		Upper staircase		Set		18.81		
		Other work		Set				
	Handrail	wooden rail	6	Unit	5.73	34.38		
		Pipe rail		Unit	19.76			
	Staircase	(Wooden)	9	Unit	35.12	211.92	1,178.08	
Ceiling Work	Ceiling	Asbestos		M²	2.38			-per horizontal M²
		J_1-12×16.63	J_4-6×8.64	Pc				
		J_2-6×7.32	J_5-12×16.10	Pc				
Door & Window work		J_3-6×11.74	J_6-6×7.77	Pc				
		J_4-12×15.39	J_8-12×11.58	Pc				
		J_5-6×18.91		Pc				
				Pc		1,011.28		
	Lock + Hook		6+6	Pc	2.50+0.20	16.20	1,053.48	
	Rafter + Batten + Tile		191.40	M	5.82	1,113.95		-per horizontal M² (incl. laves)
	Angle		3	Set	19.59	58.77		
	Ridge tile		24.00	M	1.04	24.96		
	Ridge column		1,10pc+L 6Pc	Pc	1×1.44+3.79	59.17		L_1= 1.77 L_2= 7
	Ridge board		24.00	M	1.52	36.48		
Roof work	Brace		16	Pc	4.00	64.00		
	Eaves fascia		130.00	M	0.35	45.50		
	Valley gutter			M	3.90			
	Down pipe			M	1.80			
	Water tightening		136.60	M	1.65	225.39		
	Collar			Pc			1,628.22	
	Water tub		6	Unit	5.50	33.00		
	Closet		6	Unit	7.00	42.00		
	Cleanout, Trap		12	Pc	3.00	36.00		
Plumbing work	Waste pipe		42.00	M	3.60	151.20		
	Water pipe		42.00	M	0.62	26.04		
	Water head		12	Pc	1.50	18.00		
	Kitchen sink		6	Unit	7.00	42.00		
	Connection pit		6	Unit	3.00	18.00	366.24	
Electrical work	Fixture etc		6	Unit	42.00	252.00		
	Power intake		-	Unit	-	-	252.00	-See. electricity cost
Outside work	Step plate + gutter plate		30+12	Pc	0.30+0.90	19.80		
	Fence			M	1.61		19.80	-incl. foundation
Painting	Painting			M²				-incl. each item
	Guard		6	Unit	1.20	7.20		
Other work	Cleaning		6	Unit	0.46	2.76		
	ALAF Keselamato Karja		6	Unit	0.60	3.60	13.56	
Total	8,927.28 Rp/Building × 1.1 ÷ (6) Unit = 1,636.67 ×10³Rp/Unit ÷ 50 M² = 32.73 ×10³Rp/M²							

FS'-2-36 (5.4M) (12 Unit/Building)

FLOOR AREA — NET 35.70 M² / GROSS 37.80 M²

Section	Item		Volume	Unit	Unit cost ×10³Rp	Cost ×10³Rp	Sub-total ×10³Rp	Note
Temporary work		Warehouse	12	Unit	0.90	10.80		
		Temp. water	12	Unit	1.20	14.40		
		Grading	-	-	-	-		-See land development
		Setting & staking out	230.80	M	0.175	40 39		-per wall length (M)
		Scaffolding	12	Unit	4.50, 9.00	108.00	171.59	-only for 2F
Earth Work		Insectisidation		M²	1.26			-Other cost incl foundation and floor work
Masonry & concrete work	Foundation	F_1	198.70	M	5 96	1,184 25		
		F_2	28.20	M	3.33	93.91		
		F_3	3 90	M	3.07	11.97		
		F_4		M	2 69			
	1F. Floor	Slab on grade	246.44	M²	1.79	405.33		
		Soil floor		M²	0 11			
	Ridge stone	F_3		M	0 72			
		F_4	43.50	M	0.47	20.45		
	Concrete block	HB-15	596.32	M²	2 99	1,783.00		
		HB-10		M²	2.27			
		Finish plaster		M²	0 92			
		WC/M floor mortar	121 80	M²	1 34	163.21		
	RC-Course	C_1	230.50	M	3.81	878.21		
		C_2	308.36	M	2.92	900.41		
		C_3		M	2.38			-incl. horizontal RC-brace
		C_4		M	1 37			
		C_5		M	1 77			
		C_6		M	2 03			
	Wall reinforcement	C -1	237.60	M	1.44	342 14		
		B -1	198.00		6.88	174.24		
		C -2	96 00	M	3 92	376.32		
		B -2	68 00		2.72	184.96		
		C -3	48.60	M	4.37	209.76		
		B -3	40 00		2.71	108 40		
	2F Floor	RC floor S_1	23 94	M²	13 16	315.05		
		RC floor S_2	168 84	M	11 76	1,985 56	9,137.17	
		Wood floor		M²	7 02			
Wood Work	Upper wall etc.	Head plate	156.10	M	0 41	64.00		-incl. bolts + nuts
		Upper unit wall	14 00	M²	5 76	80.64		
		Other upper wall	72 21	M²	2 40	173.30		
		Upper staircase		Set		18 93		
		Upper WC/M		Set				
	Handrail	Wooden rail		Unit				
		Pipe rail	6	Unit	8 37	50 22		
	Staircase	(Wooden)	1	Unit	41.69	125.07	512.16	
Ceiling Work	Ceiling	Asbestos		M²	2 38			-per horizontal M²
Door & Window Work		J₁6*18 48	J₁6*14 23	Pc				
		J₂6*20 995	J₂6*17 73	Pc				
		J₃30*16.63	J₃6*2? 23	Pc				
		J₄6*24 86	J₄24*18 91	Pc				
		J₅6*28 56	J₅12*5 11	Pc				
			J₆12*4 81	Pc		1,962 67		
	Lock + Hook		12*18	Pc	2 50*0 26	33 66	1,996 29	
Roof Work	Rafter + Batten + Tile		291 36	M²	5 82	1,693 97		-per horizontal M² (incl lap)
	Canopy			Set		136 98		
	Ridge tile		32 40	M	1.04	33 70		
	Ridge column		7.00	Pc	4*1,44*1.79	31.68		L = 1 94
	Ridge board		32 40	M	1 52	49 25		
	Brace		7	Pc	4 00	28 00		
	Eaves fascia		136 20	M	0 35	47 67		
	Valley gutter			M	3 90			
	Down pipe			M	1 8			
	Water-tightening		12' 6	M	1 65	198 99	2 220 24	
	Collar			Pc				
Sanitary & Water Work	Water tub		12	Unit	5 5	66 00		
	Closet		12	Unit	7 00	84 00		
	Cleanout, Trap		10	Pc	3 00	4? 0		
	Waste pipe		8? 00	M	3 1	113 4		
	Water pipe		63.00	M	0 62	39 06		
	Water head		24	Pc	1 50	36 00		
	Kitchen sink		12	Unit	7.00	84.00		
	Connection pit		6	Unit	3.00	18 00	730 4	
Electrical Work	Fixture etc		12	Unit	42 00	504.00	504 00	
	Power intake		-	Unit	-	-		-See, elect.
Corridor Work	Step plate + gutter plate		60*24	Pc	0.30*0 90	39 60		
	Fence		56 00	M	1 61	90 16		-incl. foundation
Painting	Painting			M²				-incl each item
	Guard		12	Unit	1.20	14 40		
Other Work	Cleaning		12	Unit	0.46	5 52		
	ALAT Keselamato Kerja		12	Unit	0.60	7.20	27.12	

Total 35,430.59 Rp/Building × 1.1) (12) Unit = 1,414.47 ×10³Rp/Unit ÷ 37.8 M² = 37.42 ×10³Rp/M²

33.6 47.10

FS-2-26		(12 Unit/Building)					FLOOR AREA	NFT 25.90 M² / GROSS 28.00 M²
Section		Item	Volume	Unit	Unit cost ×10³Rp	Cost ×10³Rp	Sub-total ×10³Rp	Note
Temporary Work		Warehouse	12	Unit	0.90	10.80		
		Temp. water	12	Unit	1.20	14.40		
		Grading	-	-	-	-		-See. land development
		Setting & staking out	161.50	M	0.175	28.26		-per wall length (M)
		Scaffolding	12	Unit	4.50, 9.00	108.00	161.46	-only for 2F
Earth work		Insectisidation	-	M	1.26			-Other cost incl. foundation and floor work
Masonry & concrete work	Foundation	F_1	152.50	M	5.96	908.90		
		F_2	9.00	M	3.33	29.97		
		F_3	3.90	M	3.07	11.97		
		F_4		M	2.69			
	1F Floor	Slab on grade	204.90	M²	1.79	366.77		
		Soil floor		M²	0.11			
	Ridge stone	F_5		M	0.72			
		F_6	36.61	M	0.47	17.20		
	Concrete block	HB-15	407.02	M²	2.99	1,216.99		
		HB-10	14.04	M²	2.27	31.87		
		Finish plaster		M²	0.92			
		WC/M floor mortar	123.12	M²	1.34	164.98		
	RC-Course	C_1	156.1[illegible]	M	3.81	594.74		-incl. horizontal RC-brace
		C_2	203.41	M	2.92	593.96		
		C_3		M	2.38			
		C_4		M	3.37			
		C_5		M	3.77			
		C_6		M	2.03			
	Wall reinforcement	B -1	115.20	M	1.44	165.89		
			96.00		0.68	64.48		
		B -2	24.00	M	3.92	94.08		
			20.00		2.72	54.40		
		B -3	48.00	M	4.37	209.76		
			40.00		[illegible].71	108.40		
	2F Floor	RC floor S_1	29.97	M²	13.16	394.41		
		RC floor S_2	114.57	M²	11.76	1,347.34	6,396.11	
Wood work		Wood floor		M²	7.02			
	Upper wall etc.	Head plate	141.1[illegible]	M	0.41	57.85		-incl. bolts + nuts
		Upper unit wall	14.00	M²	5.76	80.64		
		Other upper wall	66.50	M	2.40	159.60		
		Upper staircase		Set		18.93		
		Upper WC M		Set				
	Handrail	Wooden rail		Unit				
		Pipe rail		Unit	10.76			
	Staircase	(wooden)	3	Unit	41.69	125.07	442.09	
Ceiling Work	Ceiling	Asbestos		M²	2.38			-per horizontal M²
Door & window work		[illegible]×6×31.57	Js 12×11 58	Pc		941.22		
		3×6×18.48		Pc				
		3×6×21.[illegible]		Pc				
		3×6×21.1[illegible]		Pc				
		3×6×16.63		Pc				
		3×6×24.86		Pc				
	Lock + Hook		12+18	Pc	2.50+0.20	33.60	974.82	
Roof work	Rafter + Batten + Tile		225.7[illegible]	M²	5.82	1,311.69		-per horizontal M² (incl. eaves)
	[illegible]			Set		90.90		
	Ridge tile		24	M	1.04	24.96		
	Ridge column		7	Pc	L×1.44+1.79	31.68		L = 1.98
	Ridge board		24	M	1.52	36.48		
	Brace		7	Pc	4.00	28.00		
	Eaves fascia		99.00	M	0.35	34.65		
	Valley gutter			M	1.90			
	Down pipe			M	1.80			
	Water-[illegible]		115.80	M	1.65	191.07		
	Collar			Pc			1,751.43	
Plumbing Work	Water tap		12	Unit	5.50	66.00		
	Closet		12	Unit	7.00	84.00		
	Transit Trap		24	Pc	3.00	72.00		
	Waste pipe		87.00	M	3.60	313.20		
	Water pipe		63.00	M	0.62	39.06		
	Water head		24	Pc	1.50	36.00		
	Pit for tank		12	Unit	7.00	84.00		
	Connection pit		6	Unit	3.00	18.00	712.26	
Electrical Work	Fixture etc		12	Unit	42.00	504.00		
	Power intake		-	Unit	-	-	504.00	-See. electricity [illegible]
Outside Work	Step plate + gutter plate		66+24	Pc	0.30+0.90	39.60		
	Fence		56.00	M	1.61	90.16	129.76	-incl. foundation
Painting	Painting			M²				-incl. each item
Other Work	Guard		12	Unit	1.20	14.40		
	Cleaning		12	Unit	0.46	5.52		
	ALAT Keselamatan Kerja		12	Unit	0.60	7.20	27.12	
Total	11,?99.05 Rp/Building × 1.1 ÷ (12) Unit = 1,017.41 ×10³Rp/Unit ÷ 28 M² = 36.34 ×10³Rp/M²							

39.13

I-9 COST DATA FOR WALK-UP FLAT

FS'5-24			FLOOR AREA	NET 26.18 M^2		
				GROSS 30.80 M^2		
Items		Unit cost $\times 10^3$Rp	Volume	Unit	Cost $\times 10^3$Rp	Sub-total $\times 10^3$Rp
Temporary Work	Warehouse, site office etc.				3.75	27.76
	Setting & staking out	0.26	2.11	M	0.55	
	Scaffolding	0.80	29.33	M^2	23.46	
Earth Work & 1FL. Floor Work	Excavation	0.42	5.87	M^3	2.47	24.79
	Backfilling	0.10	4.68	M^3	0.47	
	Sand bedding	5.60	0.28	M^3	1.57	
	Batukali bedding	9.40	0.54	M^3	5.08	
	1FL. concrete slab	22.35	0.54+0.14 =0.68	M^3	15.20	
Structural Work						1,348.03
Outer Wall Work	Doors & windows				119.59	137.58
	Brick exposure	5.45	3.30	M^2	17.99	
Inside Door & Partition						71.71
Concrete Block and other Mortar Work	Concrete block t=100	2.27	21.36	M^2	48.49	101.43
	Light-weight concrete t=120	2.68	3.78	M^2	10.13	
	Floor mortar t=30	0.84	28.70	M^2	24.11	
	Water proof mortor t=30	1.23	15.18	M^2	18.67	
Roof Work						106.55
Miscellaneous Work	Outside painting	1.00	14.18	M^2	14.18	43.68
	Veranda screen					
	Handrail	10.76	2.00	M	21.52	
	Gutter	1.90	4.20	M	7.98	
Equipment Work	Plumbing				41.16	83.16
	Electricity				42.00	
Cleaning & Safety Work					2.26	2.26
Total	1,946.92 × 1.1 = 2,141.61 $\times 10^3$Rp/unit			NET. 81.80		$\times 10^3$Rp/M^2
				GROSS 69.53		$\times 10^3$Rp/M^2

FS'5-36			FLOOR AREA	NET	38.78	M^2
				GROSS	43.40	M^2

Items		Unit cost $\times 10^3$Rp	Volume	Unit	Cost $\times 10^3$Rp	Sub-total $\times 10^3$Rp
Temporary Work	Warehouse, site office etc.				3.75	35.96
	Setting & staking out	0.26	2.83	M	0.74	
	Scaffolding	0.80	39.34	M^2	31.47	
Earth Work & 1FL. Floor Work	Excavation	0.42	8.27	M^3	3.47	30.63
	Backfilling	0.10	6.59	M^3	0.66	
	Sand bedding	5.60	0.40	M^3	2.24	
	Batukali bedding	9.40	0.75	M^3	7.05	
	1FL. concrete slab	22.35	0.20+0.75 =0.77	M^3	17.21	
Structural Work						1,858.48
Outer Wall Work	Doors & windows				200.51	218.50
	Brick exposure	5.45	3.30	M^2	17.99	
Inside Door & Partition						139.67
Concrete Block and other Mortar Work	Concrete block t=100	2.27	22.80	M^2	51.76	115.25
	Light-weight concrete t=120	2.68	3.78	M^2	10.13	
	Floor mortar t=30	0.84	41.30	M^2	34.69	
	Water proof mortor t=30	1.23	15.18	M^2	18.67	
Roof Work						140.04
Miscellaneous Work	Outside painting	1.00	20.24	M^2	20.24	63.40
	Veranda screen	22.79	0.50		11.90	
	Handrail	10.76	2.00	M	21.52	
	Gutter	1.90	5.60	M	10.64	
Equipment Work	Plumbing				41.16	83.16
	Electricity				42.00	
Cleaning & Safety Work					2.26	2.26
Total	2,687.35 × 1.1 = 2,956.09 $\times 10^3$Rp/unit			NET.	76.23	$\times 10^3$Rp/M^2
				GROSS	68.11	$\times 10^3$RP/M^2

FS'5-45			FLOOR AREA	NET 46.84 M^2		
				GROSS 51.46 M^2		
Items		Unit cost $\times 10^3$Rp	Volume	Unit	Cost $\times 10^3$Rp	Sub-total $\times 10^3$Rp
Temporary Work	Warehouse, site office etc.				3.75	36.69
	Setting & staking out	0.26	2.90	M	0.75	
	Scaffolding	0.80	40.24	M^2	32.19	
Earth Work & 1FL. Floor Work	Excavation	0.42	9.81	M^3	4.12	41.47
	Backfilling	0.10	7.81	M^3	0.78	
	Sand bedding	5.60	0.47	M^3	2.63	
	Batukali bedding	9.40	0.90	M^3	8.46	
	1FL. concrete slab	22.35	0.90+0.24 =1.14	M^3	25.48	
Structural Work						2,176.90
Outer Wall Work	Doors & windows				200.51	209.98
	Brick exposure	5.45	4.02	M^2	9.47	
Inside Door & Partition						151.83
Concrete Block and other Mortar Work	Concrete block t=100	2.27	27.35	M^2	62.08	132.34
	Light-weight concrete t=120	2.68	3.78	M^2	10.13	
	Floor mortar t=30	0.84	49.36	M^2	41.46	
	Water proof mortor t=30	1.23	15.18	M^2	18.67	
Roof Work						167.50
Miscellaneous Work	Outside painting	1.00	20.44	M^2	20.44	63.40
	Veranda screen	22.79	0.50		11.9	
	Handrail	10.76	2.00	M	21.52	
	Gutter	1.90	5.60	M	10.64	
Equipment Work	Plumbing				41.16	83.16
	Electricity				42.00	
Cleaning & Safety Work					2.26	2.26
Total	3,065.53 × 1.1 = 3,372.08 $\times 10^3$Rp/unit			NET. 71.99 $\times 10^3$Rp/M^2		
				GROSS 65.53 $\times 10^3$Rp/M^2		

FG5-36			FLOOR AREA	NET	38.88	M^2
				GROSS	49.74	M^2

Items		Unit cost $\times 10^3$Rp	Volume	Unit	Cost $\times 10^3$Rp	Sub-total $\times 10^3$Rp
Temporary Work	Warehouse, site office etc.				3.75	38.52
	Setting & staking out	0.26	2.64	M	0.69	
	Scaffolding	0.80	42.60	M^2	34.08	
Earth Work & 1FL. Floor Work	Excavation	0.42	11.66	M^3	4.90	41.37
	Backfilling	0.10	9.32	M^3	0.93	
	Sand bedding	5.60	0.52	M^3	2.91	
	Batukali bedding	9.40	0.88	M^3	8.27	
	1FL. concrete slab	22.35	0.88+0.21 =1.09	M^3	24.36	
Structural Work						1,957.07
Outer Wall Work	Doors & windows				152.52	172.52
	Brick exposure	5.45	3.67	M^2	20.00	
Inside Door & Partition						118.36
Concrete Block and other Mortar Work	Concrete block t=100	2.27	33.19	M^2	75.34	143.92
	Light-weight concrete t=120	2.68	2.16	M^2	5.79	
	Floor mortar t=30	0.84	35.52	M^2	29.84	
	Water proof mortor t=30	1.23	26.79	M^2	32.95	
Roof Work						133.44
Miscellaneous Work	Outside painting	1.00	25.16	M^2	25.16	142.72
	Veranda screen	18.23	0.50		9.12	
	Handrail	10.76	8.81	M	94.80	
	Gutter	1.90	5.60	M	10.64	
	Corridor roof drain				3.00	
Equipment Work	Plumbing				41.16	83.16
	Electricity				42.00	
Cleaning & Safety Work					2.26	2.26
Total	2,833.34 × 1.1 = 3,116.67 $\times 10^3$Rp/unit			NET.	80.16	$\times 10^3$Rp/M^2
				GROSS	62.66	$\times 10^3$RP/M^2

FG5-45			FLOOR AREA	NET 48.06 M^2		
				GROSS 58.92 M^2		
Items		Unit cost $\times 10^3$Rp	Volume	Unit	Cost $\times 10^3$Rp	Sub-total $\times 10^3$Rp
Temporary Work	Warehouse, site office etc.				3.75	39.81
	Setting & staking out	0.26	2.75	M	0.72	
	Scaffolding	0.80	44.18	M^2	35.34	
Earth Work & 1FL. Floor Work	Excavation	0.42	13.92	M^3	5.85	49.36
	Backfilling	0.10	11.14	M^3	1.11	
	Sand bedding	5.60	0.62	M^3	3.47	
	Batukali bedding	9.40	1.05	M^3	9.87	
	1FL. concrete slab	22.35	1.05+0.25 =1.30	M^3	29.06	
Structural Work						2,317.15
Outer Wall Work	Doors & windows				191.51	218.27
	Brick exposure	5.45	4.91	M^2	26.76	
Inside Door & Partition						155.87
Concrete Block and other Mortar Work	Concrete block t=100	2.27	34.68	M^2	78.72	155.67
	Light-weight concrete t=120	2.68	2.16	M^2	5.79	
	Floor mortar t=30	0.84	43.0	M^2	36.12	
	Water proof mortor t=30	1.23	28.49	M^2	35.04	
Roof Work						153.08
Miscellaneous Work	Outside painting	1.00	26.44	M^2	26.44	160.14
	Veranda screen	18.23	0.50		9.12	
	Handrail	10.76	10.31	M	110.94	
	Gutter	1.90	5.60	M	10.64	
	Corridor roof drain				3.00	
Equipment Work	Plumbing				41.16	83.16
	Electricity				42.00	
Cleaning & Safety Work					2.26	2.26
Total	3,334.77 × 1.1 = 3,668.25 $\times 10^3$Rp/unit			NET.	76.33	$\times 10^3$Rp/M^2
				GROSS	62.26	$\times 10^3$Rp/M^2

FM6-36			FLOOR AREA	NET	38.70	M^2
				GROSS	46.36	M^2

Items		Unit cost $\times 10^3$Rp	Volume	Unit	Cost $\times 10^3$Rp	Sub-total $\times 10^3$Rp
Temporary Work	Warehouse, site office etc.				3.75	40.18
	Setting & staking out	0.26	2.68	M	0.70	
	Scaffolding	0.80	44.67	M^2	35.74	
Earth Work & 1FL. Floor Work	Excavation	0.42	8.41	M^3	3.53	31.27
	Backfilling	0.10	6.72	M^3	0.67	
	Sand bedding	5.60	0.38	M^3	2.13	
	Batukali bedding	9.40	0.68	M^3	6.39	
	1FL. concrete slab	22.35	0.68+0.15 =0.83	M^3	58.55	
Structural Work						1,843.85
Outer Wall Work	Doors & windows				241.55	323.95
	Brick exposure	5.45	15.12	M^2	82.40	
Inside Door & Partition						77.54
Concrete Block and other Mortar Work	Concrete block t=100	2.27	23.05	M^2	52.32	101.12
	Light-weight concrete t=120	2.68	3.60	M^2	9.65	
	Floor mortar t=30	0.84	13.65	M^2	11.47	
	Water proof mortor t=30	1.23	22.50	M^2	27.68	
Roof Work						131.35
Miscellaneous Work	Outside painting	1.00	11.70	M^2	11.70	318.60
	Veranda screen	13.67	1.0		13.67	
	Handrail	10.76	7.24	M	77.90	
	Gutter	1.90	5.60	M	10.64	
	Wood floor + staircase				194.69	
	Roofdrain				10.00	
Equipment Work	Plumbing				41.16	83.16
	Electricity				42.0	
Cleaning & Safety Work					2.26	2.26
Total	2,953.28 × 1.1 = 3,248.61 $\times 10^3$Rp/unit			NET.	83.94	$\times 10^3$Rp/M^2
				GROSS	70.07	$\times 10^3$RP/M^2

FM6-45			FLOOR AREA	NET 46.80 M^2		
				GROSS 54.46 M^2		
Items		Unit cost $\times 10^3$Rp	Volume	Unit	Cost $\times 10^3$Rp	Sub-total $\times 10^3$Rp
Temporary Work	Warehouse, site office etc.				3.75	40.77
	Setting & staking out	0.26	2.75	M	0.72	
	Scaffolding	0.80	45.38	M^2	36.30	
Earth Work & 1FL. Floor Work	Excavation	0.42	9.95	M^3	4.18	37.24
	Backfilling	0.10	7.95	M^3	0.80	
	Sand bedding	5.60	0.45	M^3	2.52	
	Batukali bedding	9.40	0.81	M^3	7.61	
	1FL. concrete slab	22.35	0.81+0.18 =0.99	M^3	22.13	
Structural Work						2,132.81
Outer Wall Work	Doors & windows				266.42	336.94
	Brick exposure	5.45	12.94	M^2	70.52	
Inside Door & Partition						97.68
Concrete Block and other Mortar Work	Concrete block t=100	2.27	28.08	M^2	63.74	117.04
	Light-weight concrete t=120	2.68	3.96	M^2	10.61	
	Floor mortar t=30	0.84	17.34	M^2	14.57	
	Water proof mortor t=30	1.23	22.86	M^2	28.12	
Roof Work						157.03
Miscellaneous Work	Outside painting	1.00	11.97	M^2	11.97	346.23
	Veranda screen	18.23	1.00		18.23	
	Handrail	10.76	9.39	M	90.28	
	Gutter	1.90	5.60	M	10.64	
	Wood floor + staircase				205.11	
	Roofdrain				10.0	
Equipment Work	Plumbing				41.16	83.16
	Electricity				42.00	
Cleaning & Safety Work					2.26	2.26
Total	3,351.16 × 1.1 = 3,686.28 $\times 10^3$Rp/unit			NET.	78.77	$\times 10^3$Rp/M^2
				GROSS	67.69	$\times 10^3$RP/M^2

FT5-36			FLOOR AREA	NET	36.90	M^2
				GROSS	40.93	M^2

Items		Unit cost $\times 10^3$Rp	Volume	Unit	Cost $\times 10^3$Rp	Sub-total $\times 10^3$Rp
Temporary Work	Warehouse, site office etc.				3.75	51.54
	Setting & staking out	0.26	4.20	M	1.09	
	Scaffolding	0.80	58.38	M^2	46.70	
Earth Work & 1FL. Floor Work	Excavation	0.42	7.80	M^3	3.28	36.67
	Backfilling	0.10	6.21	M^3	0.62	
	Sand bedding	5.60	0.38	M^3	5.98	
	Batukali bedding	9.40	0.71	M^3	6.67	
	1FL. concrete slab	22.35	0.71+0.19 =0.90	M^3	20.12	
Structural Work						1,874.10
Outer Wall Work	Doors & windows				126.79	238.68
	Brick exposure	5.45	20.53	M^2	111.89	
Inside Door & Partition						76.79
Concrete Block and other Mortar Work	Concrete block t=100	2.27	26.90	M^2	61.06	120.10
	Light-weight concrete t=120	2.68	2.63	M^2	7.05	
	Floor mortar t=30	0.84	37.21	M^2	31.26	
	Water proof mortor t=30	1.23	16.85	M^2	20.73	
Roof Work						286.84
Miscellaneous Work	Outside painting	1.00	27.34	M^2	27.34	85.33
	Veranda screen	22.79	0.50		11.90	
	Handrail	10.76	2.80	M	30.13	
	Gutter	1.90	8.40	M	15.96	
Equipment Work	Plumbing				41.16	83.16
	Electricity				42.00	
Cleaning & Safety Work					2.26	2.26
Total	2,855.47 × 1.1 = 3,141.02 $\times 10^3$Rp/unit			NET.	85.12	$\times 10^3$Rp/M^2
				GROSS	76.74	$\times 10^3$RP/M^2

2 ROUGH STRUCTURAL CALCULATION (EXAMPLES)

FS'5-36 WALK-UP FLATS

We will apply the Indonesian Standards 'NI-2' in principle, but when the relevant standards do not exist, we will refer to the Japanese Building Standards, etc.

1. STRUCTURAL PLANNING

1-1 PLANNING POLICY

Super structure

This building is a five storied reinforced concrete above the ground, consisting of 6 units per floor; and pure Rahmen structure with spans of 2.5 m width and 3.5 m depth. It is desirable to avoid irregular surfaces in rooms for better use of space. Also the types of columns used -, L and T are suited to room arrangement, and - shaped columns only supply bending resistance in one direction. Thus, caution shall be taken as to the direction of columns. In addition, column thickness on each floor makes minimum size enough to be able to place concrete to a height of 2.8 m. And the changing length of columns on each floor shall correspond to the stresses. Each floor will be of concrete but will likely be made thin to lighten the structure. The roof will consist of roof tiles and wooden truss beams, and horizontal bracing will be provided to maintain horizontal rigidity and to prevent spiral grain twist.

Sub-structure

Underground beams are being considered as a measure against bending stress due to unexpected settlement and the ratio of rigidity with the columns of upper structure, and for maintaining the stability of the whole building, supposing it is larger than upper beams. Also, the first floor slab is a slab on grade. The foundation should be of isolated footings and should maintain sufficient rigidity and bending bearing capacity in order to transmit the upper load to the piles. The piles to be used will be of reinforced concrete cast in place by the formwork method. Piles will be driven by Drop-hammer, or Diesel-hammer, etc. because the bearing layer is located from 10 m to 15 m below the ground, and concrete of high strength (Fc=400 kg/cm^2) is used to protect the pile head from damage. The amount of additional tensile reinforcement is more than 0.8 %, increasing the bending bearing capacity of piles.

2. ALLOWABLE UNIT STRESS OF MATERIALS

Concrete (Refer to 'NI-2')

Unit; kg/cm^2

	Permanent stress			Temporary stress		
	Compression	Tension	Shearing	Compression	Tension	Shearing
$\delta'bk$	$0.33\delta'bk$	$0.36\sqrt{\delta'bk}$	$0.43\delta'bk$	$0.56\delta'bk$	$0.51\sqrt{\delta'bk}$	$0.68\delta'bk$
175	60	5	5.5	100	6.5	9

Reinforcing Bar (Refer to 'NI-2')

Unit; kg/cm^2

Kind	Permanent stress	Temporary stress
u-24	1,400	2,000

Cast-in-situ Pile

Unit; ton/pile

Section (cm)	Permanent stress		Temporary stress	
	Boring No.1	Boring No.2	Boring No.1	Boring No.2
25 x 25	19.2	27.0	Double of permanent stress, respectively	
30 x 30	27.2	40.5		

Note. Basic data for the design of pile driving footings; The bearing capacity of piles should be 1/3 of ultimate bearing capacity (Ru) obtained from the bearing capacity formula.

$$Ru = 30\bar{N}\cdot Ap + 1/5\cdot\bar{N}s\cdot\psi\cdot Ls = \bar{q}u/2\cdot\psi\cdot Lc \quad \cdots\cdots (1)$$

$\bar{N}$. Tip Resistance b, Ap: Total Area of Tip of Pile (m^2)

c, $\bar{N}s$: Average measured N value for the loose portion of earth around the piles

Ls : Length of Pile in the loose portion

qu Averaged Axial Compression Strength for clay portion around the piles

Lc : Length of Pile in the clay portion

ψ : Length of periphery of pile (m)

Here, $\bar{N} \leq 60$, $\bar{N}s/5 \leq 10$ t/m^2, $\bar{q}u/2 \leq 10$ t/m^2.

3. LOAD

i) Dead load

roof (tile)(average 20 mm)	40 kg/m^2
Truss for gable roof	20 "
2 ~ 4F slab (100 mm)	240 "
1F slab slab on grade	-

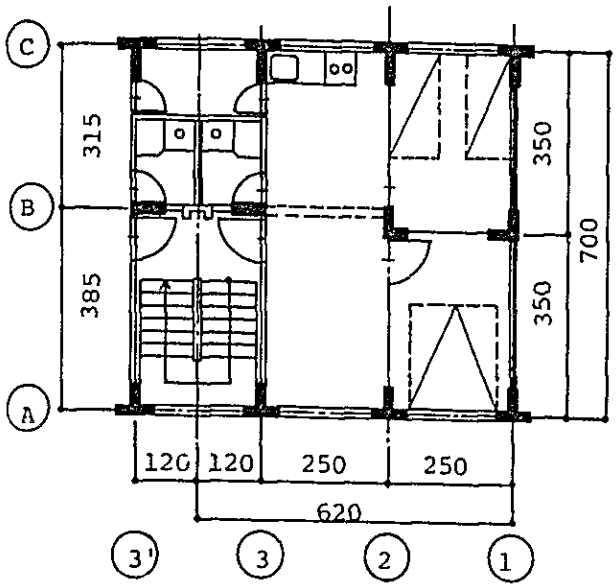
ii) Table for load

	Contents			For floor	For frame	For earthquake
roof	tile (20 mm)	40	D.L	60	60	60
	truss	20	B	-	70	70
		60	L.L	-	-	-
				60	130	130
each floor	morolithic finish 5 mm		D.L	252	252	252
	slab	12	B	-	70	70
		240	L.L	200	140	60
		252		452	462	382
W.C sand,	cinder concrete (150 mm)		D.L	465	465	465
	slabs	225	B	-	70	70
		240	L.L	200	140	60
		465		665	675	595
Stairway	Slab (22, mm)	528	D.L	528	528	528
			B	-	-	-
			L.L	200	150	60
				728	668	588

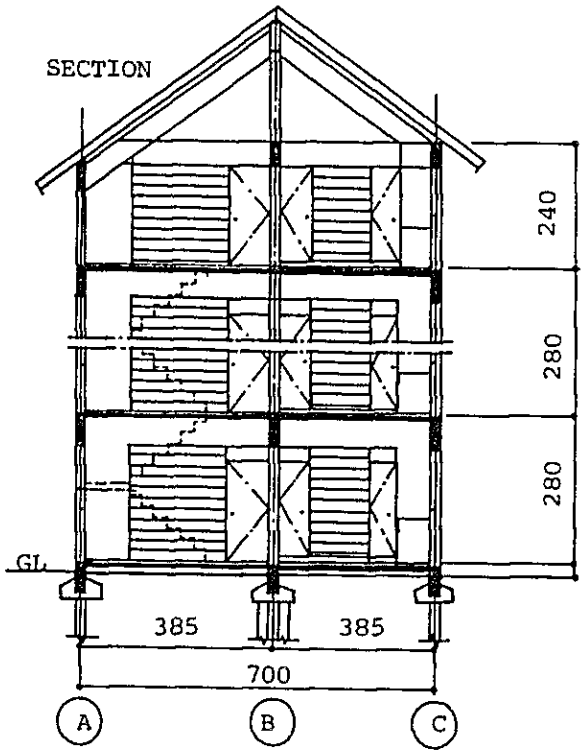
iii) Walls

Bamboo mat (double)	10 kg/m^2
Concrete block (100 mm)	200 "

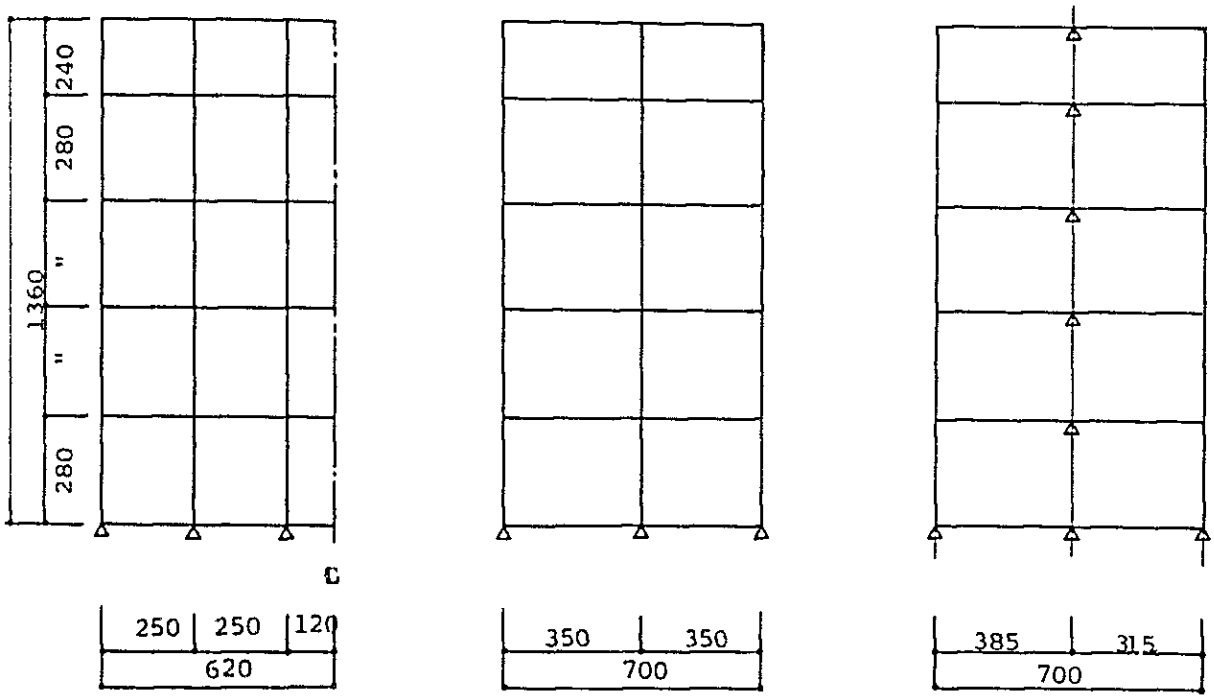
PLAN



SECTION

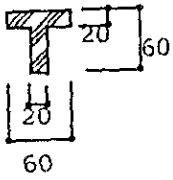


FLAME



line A,B,C　　line 1,2　　line 3

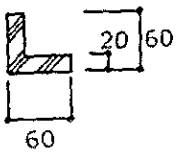
iv) Columns

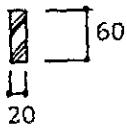


A_1 = 60 c — 480 kg/m

A_2 = 100 c — 672 "

480 "

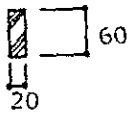




288 "

v) Girders

general girder — 288 "



ground-girdes — 840 "

4. C, Mo, Q

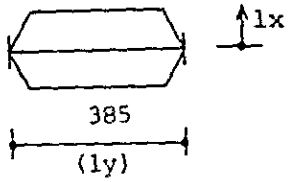
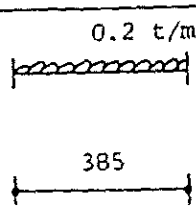
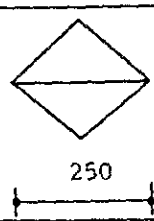
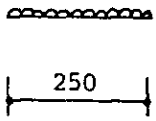
	Diagram	Floor	Contents
Line x_2		2 ∿ 5	lx = 2.5 λ = 1.54 ly = 3.85 w = 0.462 t/m² c = (1.3) x 0.462 x 2 = 1.2 tm Mo = (2.1) x 0.462 x 2 = 1.94 tm Q = (1.65) x 0.462 x 2 = 1.53 t
		R	c = $\frac{1}{12}$ x 0.2 x 3.85² = 0.25 tm Mo = 1.5 x c = 0.37 tm Q = 0.39 t
		2 ∿ 5	lx = 2.5 λ = 1.0 w = 0.462 t/m² c = (0.4) x 0.462 = 0.19 tm Mo = (0.65) x 0.462 = 0.30 tm Q = (0.80) x 0.462 = 0.37 t

	Diagram	Floor	Contents
Line B	0.2 t/m  250	R	w = 0.2 t/m c = $\frac{1}{12}$ x 0.2 x 2.5^2 = 0.11 tm Mo = 0.17 tm Q = 0.25 t

5. PERMANENT STRESS

Omitted because stress is small

6. COLUMN AXIAL LOAD

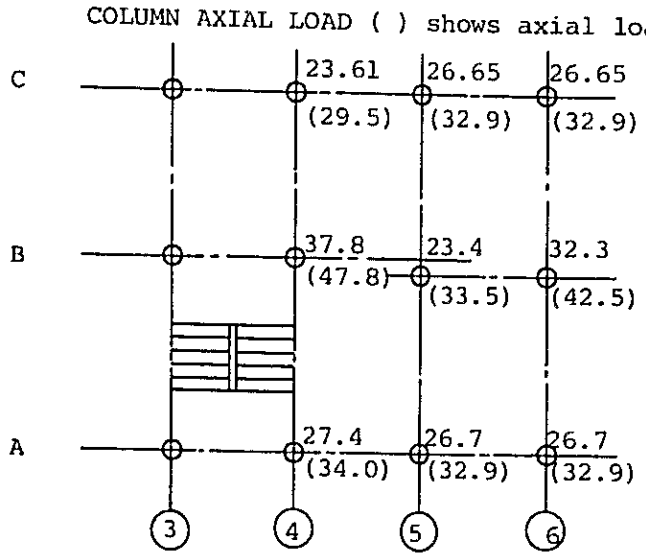
Unit: ton

C	Floor	Position	Contents		Sub-total	Total
3-B	5	roof block	0.13 x 2.45 x 3.5 0.20 x 2.0 x (1.59 + 1.2 + 0.9)	1.12 1.48	2.60	2.60
	4	mandy living room block stairway column	0.675 x 1.59 x 1.2 0.462 x 3.5 x 1.25 0.2 x (1.59 + 1.2 + 0.9) x 2.8 0.668 x 1.2 x 1.92 0.675 x 2.8	1.29 2.02 2.07 1.54 1.89	8.81	11.41
	3		the same to above		"	20.22
	2		"		"	29.03
	1		"		"	37.84
	Footing	mandy living room " ground-girder footing	0.675 x 1.59 x 1.2 0.462 x 3.5 x 1.25 0.462 x 3.5 x 1.25 2.4 x 1.2 x 0.2 x (3.5 + 3.7) 0.5 x 0.8 x 1.5 x 2.4	1.29 2.02 1.06 4.20 1.44	10.00	47 84
2-B	5	roof partition	0.13 x 3.5 x 2.5 0.01 x 2.0 x (3.5 + 1.25)	1.14 0.10	1.15	1.15
	4	room wall column	0.462 x 3.5 x 2.5 0.01 x 2.8 x (3.5 + 1.25) 0.48 x 2.8	4.07 0.13 1.35	5.56	6.71
	3		The same above		5.56	12.27
	2		"		5.56	17.83
	1		"		5.56	23.39
	Footing	living room ground-girder footing	0.462 x 3.5 x 2.5 0.576 x (3.5 + 2.5)	4.07 4.00 1.44	10.11	33.50
1-B	5	roof block	0.13 x 3.5 x 2.5 0.20 x (3.5 x 2.0)	1.14 1.40	2.54	2.54
	4	living room wall block column	0.462 x 3.5 x 2.5 0.01 x 2.5 x 2.8 0.2 x 2.8 x 3.5 0.48 x 2.8	4.07 0.07 1.96 1.35	7.45	10.0
	3		The same above		7.45	17.45
	2				7.45	24.90
	1				7.45	32.35

Unit; ton

C	Floor	Position	Contents		Sub-total	Total
	Footing	floor ground-girder footing	0.462 x 3.5 x 2.5 0.576 x (3.5 + 2.5)	4.07 4.60 1.44	10.11	42.46
3-C	5	roof block	0.13 x 2.6 x 2.5 0.2 x 2.0 x 2.5	0.845 1.00	1.85	1.85
	4	mandy living room block column	0.675 x 1.2 x 1.575 0.462 x 1.25 x 1.575 0.2 x (2.4 + 1.0) x 2.8 0.48 x 2.8	1.28 0.91 1.91 1.31	5.44	7.29
	3		The same above		5.44	12.73
	2		"		5.44	18.17
	1				5.44	23.61
	Footing	mandy living room ground-girder footing	0.675 x 1.2 x 1.575 0.462 x 1.25 x 1.575 0.576 x (2.4 + 1.575)	1.28 0.91 2.29 1.44	5.91	29.52
3-A	5	roof block	0.13 x 2.4 x 2.6 0.2 x 2.0 x (1.93 + 1.25)	0.82 1.27	2.10	2.10
	4	living room stairway block column	0.462 x 1.25 x 1.93 0.668 x 1.2 x 1.92 0.2 x 2.8 x (1.93 + 1.25) 0.675 x 2.8	1.12 1.54 1.78 1.89	6.33	8.43
	3		The same above		6.33	14.76
	2				6.33	21.10
	1				6.33	27.42
	Footing	living room ground-girder	0.462 x 1.25 x 1.93 0.668 x 1.2 x 1.93 0.576 x (2.4 + 1.93)	1.12 1.55 2.49 1.44	6.60	34.02
1-A	5	roof block	0.13 x 2.5 x 1.93 0.2 x 2.0 x (1.93 + 2.5)	0.63 1.77	2.41	2.41
	4	loving room block column	0.462 x 2.5 x 1.93 0.2 x (2.5 + 1.93) x 2.8 1.48 x 2.8	2.23 2.48 1.35	6.06	8.47
	3		The same above		6.06	14.53
	2				6.06	20.60
	1				6.06	26.65
	Footing	living room ground-girder footing	0.462 x 2.5 x 1.93 0.576 x (2.5 + 1.93)	2.23 2.55 1.44	6.22	32.87

Diagram for foundation axial load



7. SEISMIC LOAD

Calculated on 6 units per building

Floor	Position	Contents		Sub-total	Total
5	roof (tile)	0.04 x (7.0 + 2.0) x (6.2 x 6 + 2) x 1.3	16.00	16.00	35.62
	block (out)	0.2 x 2.0 x (3.7 x 2 x 6)	17.76		
	(in)	0.2 x 2.0 x 2.5 x 2 x 4	8.00		
		0.2 x 2.0 x 2.0 x 2 x 6	9.60	19.62	
		0.2 x 2.0 x (1.8 x 3 + 2.4 + 1.4)	3.68		
	partition	0.01 x 2.0 x (2.85 + 2.15 + 1.5 + 3.0)	0.19		
4	Floor			19.62	156.02
	L.room	0.38 x (7.0 x 5.0) x 6	80.22		
		0.382 x 1.35 x 1.2 x 6	3.72		
	M/W	0.595 x 1.8 x 2.4 x 3	7.72	107.96	
	stairway	0.588 x 2.4 x 3.85 x 3	16.30		
	column				
	-type	0.288 x 2.8 x 2	1.62		
	L,T type	0.24 x 2.8 x 8	10.76		
1	T type	0.672 x 2.8 x 2	3.77		
	wall				
	block (out)	0.20 x (2.8-1.0) x 3.7 x 2 x 6	16.00	28.44	164.84
	(in)	0.20 x (2.8-0.5) x 2.5 x 2 x 4	9.20		
		0.20 x (2.8-0.5) x 2.0 x 2 x 6	11.04		
		0.20 x (2.8-0 5) x (1.8 x 3 + 2.4 + 1.4)	4.24		
	partition	0.01 x 2.8 x (2.85 + 2.15 + 1.5 + 3.0)	0.27		
				28.44	

Floor	HM	K	W	KW	Σkw
5	14.6	0.15	35.62	5.35	5.35
4	12.2	0.11^{3}	156.02	22.31	27.66
3	9.4	0.13^{4}	164.84	22.09	49.75
2	6.6	0.10	164.84	16.49	66.24
1	3.8	0.10	164.84	16.49	82.73

Here:

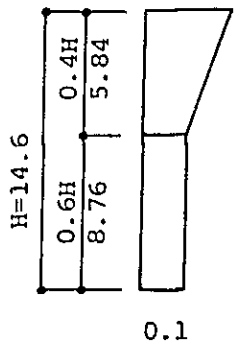
$10^{M} < H$, Ko = 0.1

$Kih/Kbh = 1 + 0.5H$

$Kbh = \frac{1}{10 + 0.1 \times H}$

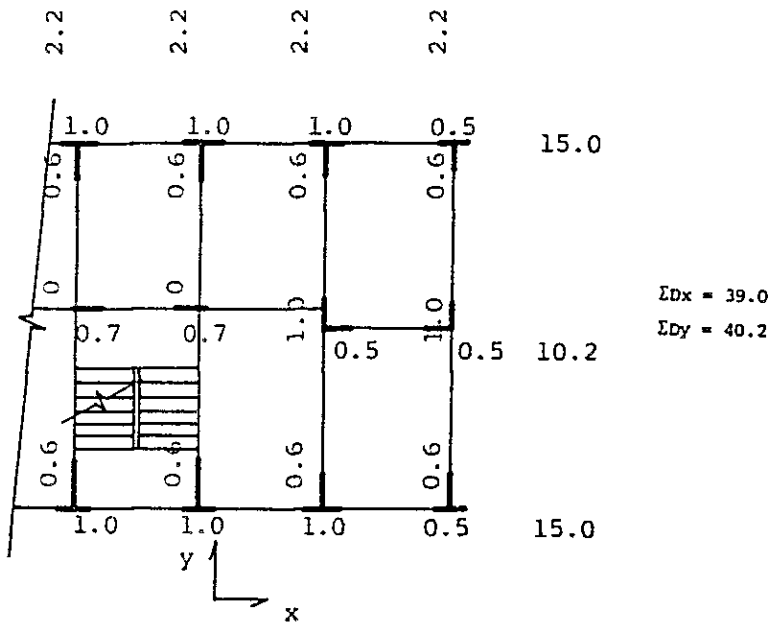
Kth: Top floor

Kbh: Base floor



8. RATIO OF DISTRIBUTION FOR COLUMNS

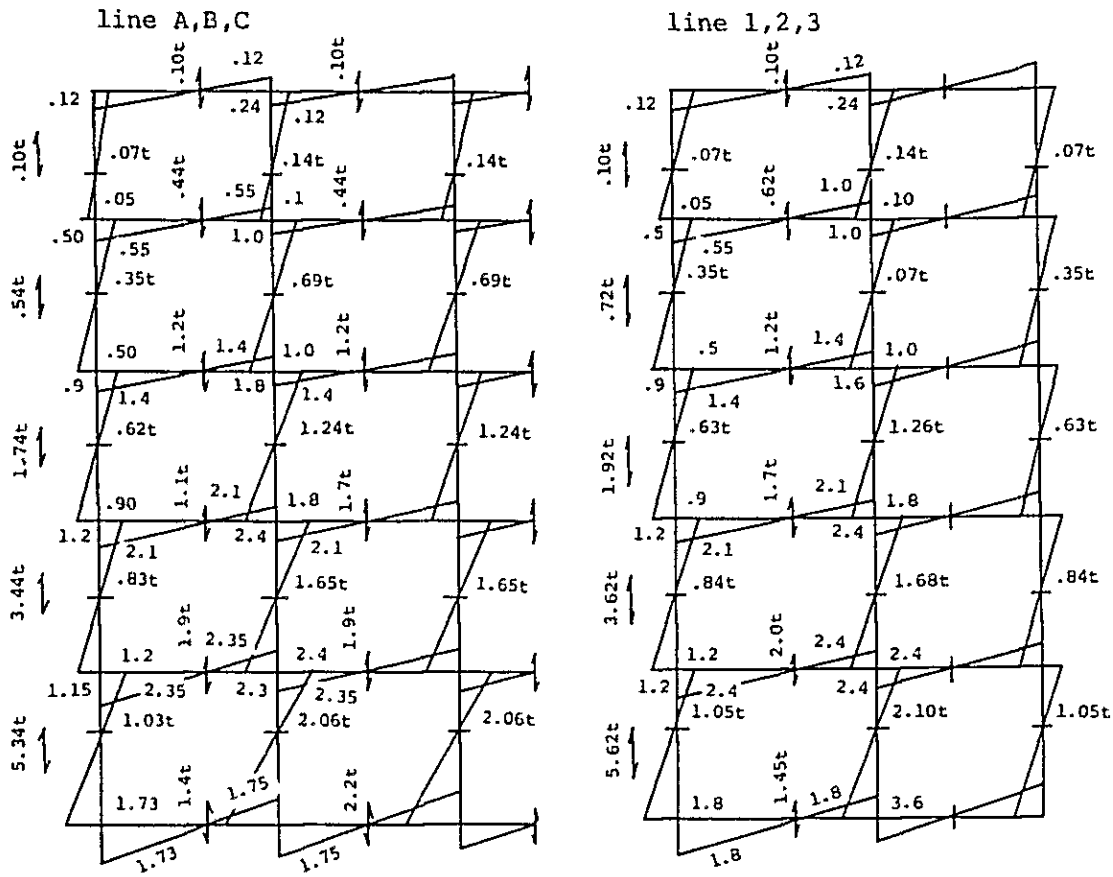
This is based on the Muto's D method and the following values are estimated: That is, the exterior column is 0.5, inside column is 1.0 ~ 0.7, inflection point is 0.3 at highest floor, 0.5 at middle floors and 0.7 at lowest floor.



Shearing stress shared at D = 1.0

Floor	ΣY·W	X-Direction		Y-Direction	
		ΣDx	Σkw/ΣDx	ΣDy	Σkw/ΣDy
5	5.35	39.6	0.14	40.2	0.14
4	27.66	"	0.70	"	0.69
3	49.75	"	1.26	"	1.24
2	66.24	"	1.68	"	1.65
1	82.73	"	2.10	"	2.06

9. SEISMIC STRESS



MOMENT STRESS DIAGRAMME

10. CROSS SECTION

i) Girder (Both X & Y-Direction)

RF $\quad sM = 0.25 \pm 1.09 = 1.34$ tm

$sQ = 0.39 + 0.1 = 0.49$ t

18C x 40C $\quad j = 7/8 \times 35 = 30.6 \quad ft \cdot j = 2.0 \times 30.6 = 61.2$

$$at = \frac{1.34 \cdot 10^2}{61.2} = 2.2 \text{ cm}^2 \qquad 2 - 16\phi$$

$$\tau = \frac{8.49 \cdot 10^1}{18 \times 30.6} = 0.9 \text{ kg/cm}^2, < 5.5$$

5F $\quad sM = 1.2 \pm .55 = 1.75$ tm

$xQ = 1.53 \pm .62 = 2.15$ t

18C x 40C

$at = 2.9 \text{ cm}^2$

$$\tau = \frac{2.15 \cdot 10^1}{18 \times 30.6} = 3.91 \text{ kg/cm}^2, < 5.5 \qquad 2 - 16\phi$$

4 \ 2F

$sM = 1.2 \pm 2.4 = 3.6$ tm

$uQ = 1.53 \pm 2.0 = 3.53$ t

18C x 60C $\quad j = 7/8 \times 55 = 48 \quad ft \cdot j = 2.0 \times 48 = 96$

$$at = \frac{3.6 \cdot 10^2}{96} = 3.75 \text{ cm}^2 \qquad 2 - 16\phi$$

$$\tau = \frac{3.53 \cdot 10^1}{18 \times 48} = 4.1 \text{ kg/cm}^2, < 5.5$$

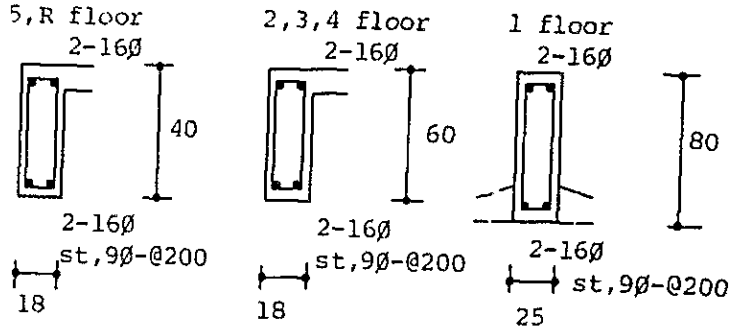
1F

sM = 1.8 tm

sQ = 1.45 t

25C x 80C j = 7/8 x 74 = 65 ft·j = 2.0 x 65 = 130

at = 1.4 cm² 2 - 13φ → 2 - 16φ



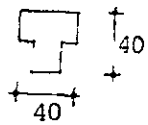
ii) Column

Exterior column (1-A)

1F

$$\begin{cases} Nx = 26.65 \pm 5\ 62 = 32.27\ t,\ 21.03\ t \\ Mx = \ - \ \pm 1.8 = 1.8\ tm \\ Qx = 1.05\ t \end{cases}$$

$$\begin{cases} Ny = 26.65 \pm \ - \ = 26.65\ t \\ My = \ - \ \pm 3.5 = 3.5\ tm \\ Qy = \ - \ \pm 2.06 = 2.06\ t \end{cases}$$



$BD = 20 \times (40 + 20) = 1.2 \times 10^3$

$BD^2 = 20 \times 40^2 = 0.32 \times 10^5$

Nx/BD = 26.9, 17.5 Ny/BD = 22.2

$Mx/BD^2 = 5.62$ $My/BD^2 = 11.0$

From the diagram

xPt = - yPt = 0.3 %

xat = - yat = $0.003 \times 1.2 \times 10^3$

$= 3.6\ cm^2$

2 - 16φ

$Jy = \frac{2.06 \cdot 10^3}{20 \times 7/8 \times 35} = 0.66\ kg/cm^2$ st - 9φ - c200 (Pw = 0.32 %)

3F

$$\begin{cases} Nx = 14.53 \pm 1.92 = 16.45t,\ 12.61t \\ Mx = \ - \ \pm .9 = .9\ tm \\ Qx = .63\ t \end{cases}$$

$$\begin{cases} Ny = 14.53 \pm \ - \ = 14.53\ t \\ My = \ - \ \pm 1.8 = 1.8\ tm \\ Qy = 1.24 \quad = 1.24\ t \end{cases}$$

Section is the same above $BD = 1.2 \times 10^3$

$BD^2 = 0.32 \times 10^5$

Nx/BD = 13.7 10.5 Ny/BD = 12.1

$Mx/BD^2 = 2.8$ $My/BD^2 = 5.6$

From the diagram

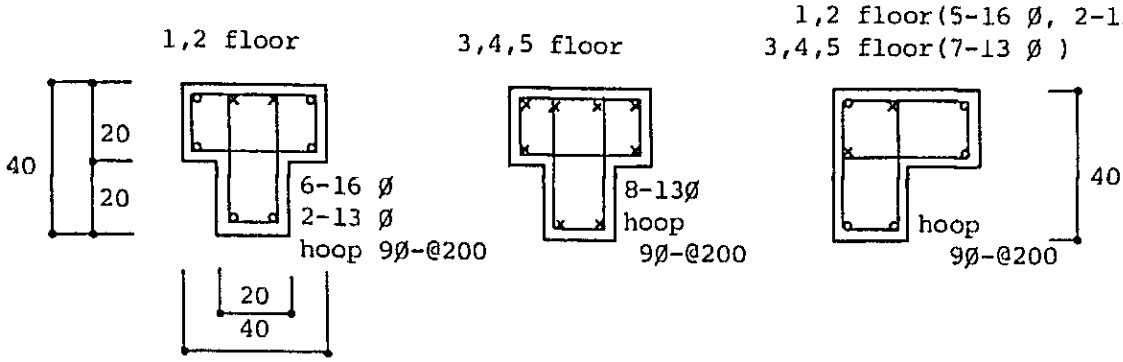
xPt = -

yPt = 0.05

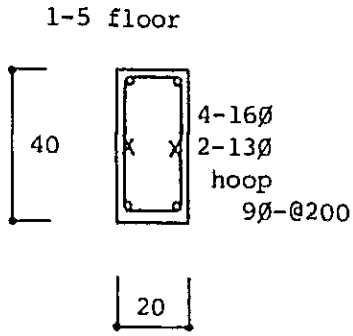
$\therefore$ yat = 0.0005 x 1.2 x 10^3

= 0.6 cm^2

1 - 16ϕ



(Pt=14.6 /1200 =1.2 %, Pt= 10.15/1200 =0.85 %)



11. PILES

supposed cast-in-situ Piles

Strength of materials; Fc $\leq$ 400 kg/cm^2

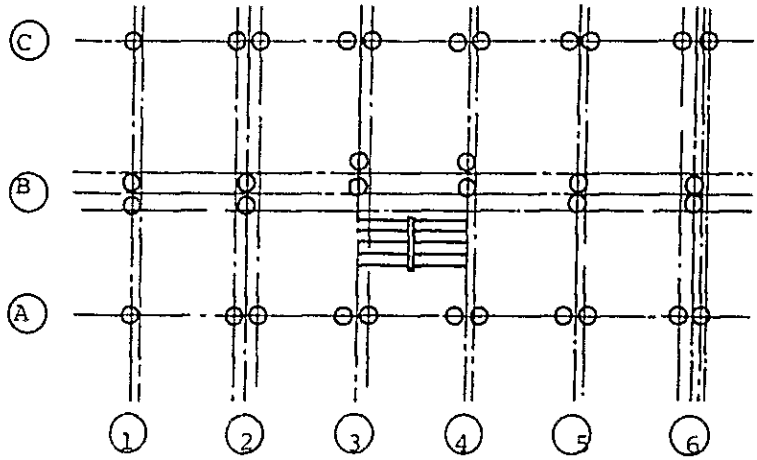
Formula for bearing strength of piles, Formula (1)

The bearing capacity is obtained by the bearing strength of pile head from the below.

Unit; ton

Pile section	A cm^2	L^M	Wt	Strength of materials	Strength of pile head	
				Fc = 75	Boring No.1	Boring No.2
25 x 25	607	10 or 15	1.46	45.5	19.2	27.0
30 x 30	882	"	2.11	66.0	27.2	40.5
35 x 35	1207	"	2.90	90.5	37.0	54.8

Arrangement of piles



Ex. 25 x 25 cm

point No.1 (L = 15 m)

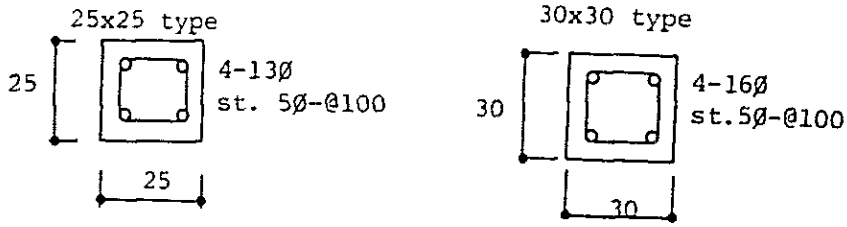
We get $\bar{N}$ = 30, $\bar{Ns}$ = 0, $\bar{qu}$ = 1.0 kg/cm^2, Ap = 0.0607 m^2, ψ = 1.0 m, Lc = 6.0 m from the boring data and the bearing strength of pile head from formula (1)

$$qu = \frac{1}{3} \times (30 \times 30 \times 0.0607 + 0 + \frac{1}{2} \times 1.0 \times 6.0)$$

$$= \frac{1}{3} \times (54 + 0 + 3)$$

$$= 19.2 \text{ t}$$

Cross section of pile is as follow.



12. SLAB

Calculation is made on the assumption that the edge side of slab is fixed elastically and the axis of center of gravity is less than the balanced steel ratio in analysis.

1) Case; S_1

Common to both X & Y-direction

$l_x = 2.7$ $\quad \lambda = 1.0 \quad \omega_1 = 0.54\ t/m^2$

$l_y = 2.7$ $\quad \omega_1 l_x^2 = 0.54 \times 2.7^2 = 3.94$

$M_{x_1} = (0.04) \times 3.94 = 0.16$ tm/m, $(= M_{y_1})$

$x_2 = (0.028)$ " $= 0.11$ tm/m, $(= My_2)$

D = 100 cm $\quad j = 6.5 \quad ft \cdot j = 1.6 \times 6.5 = 10.4$

End ; $at = M_{x_1}/ft \cdot j = 1.54\ cm^2/m$

9φ - 250@

Center; $at = M_{x_2}/ft \cdot j = 1.06\ cm^2/m$

9φ - 250@

ii) Case; S_2

$l_x = 2.7$ $\quad \lambda = 1.37 \quad \omega_2 = 0.452\ t/m^2$

$l_y = 3.7$ $\quad \omega_1 \cdot l_x^2 = 3.30$

$M_{x_1} = (0.065) \times 3.3 = 0.215$ tm/m

$x_2 = (0.044) \times$ " $= 0.145$ "

$M_{y_1} = (0.042) \times 3.3 = 0.139$ "

$y_2 = (0.028) \times$ " $= 0.093$ "

D = 100 cm

Short span

End ; $at = 0.215 \cdot 10^2/10.4 = 2.07\ cm^2/m$

9φ - @ 200

Center; at = $= 1.40$

9φ - @ 200

Long span

End ; $at = 1.34\ cm^2/m$

9φ - @ 300

Center; $at = 0.9\ cm^2/m$

9φ - @ 300

Note; Slab thickness is regulated more than 12 cm in general floors under 'NI-2' standards, but it is sufficient for the existing stress, here.

13. FOUNDATION

i) In the case of two piles

Spacing of pile; $2.5 \times D = 2.5 \times 30 = 75$ cm

$N = 47.84$ t (Axial load)

$n = N/27.2 \quad \doteq \quad 2$

Reaction of one pile

$\bar{N} \doteqdot 24.0$ t

Bending moment

$M = 0.375 \times 24.0 = 9.0$ tm

$Q = 24.0$ t

$D = 60$ cm, $j = 48$ cm $\quad ft \times j = 1.4 \times 48 = 67.2$ t/cm

$at = M/ft \times j = 13.4\ cm^2 \quad \doteq \quad 6 - 16\phi$

Shearing force

$\bar{D} = 55$ cm, $j = 41$ cm, $b = 800$

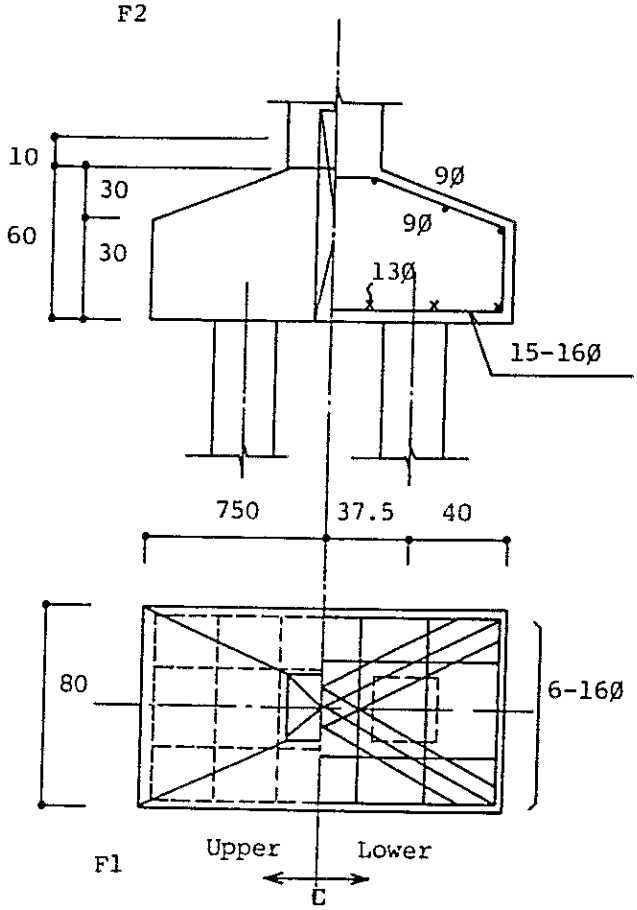
$J = \bar{N}/bxj \doteqdot 7.0\ kg/cm^2$ OK

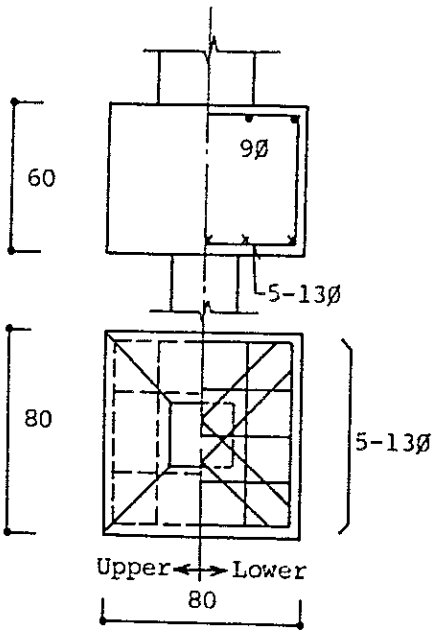
11) In the case of one pile

No stress occurs

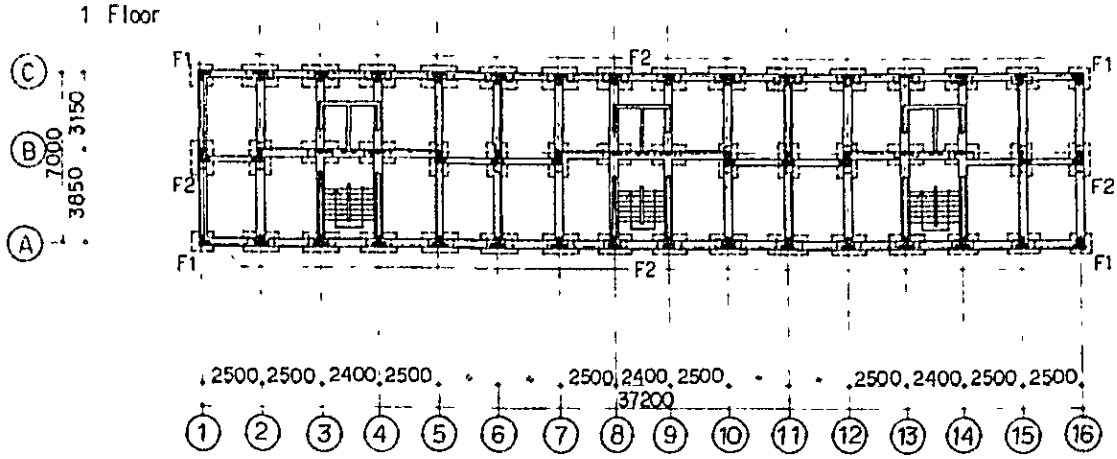
FOOTING

F2



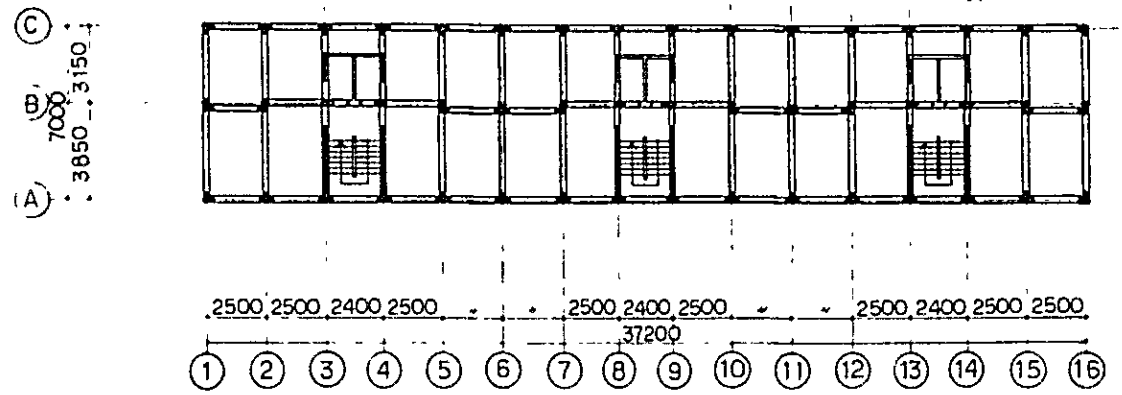


1 Floor



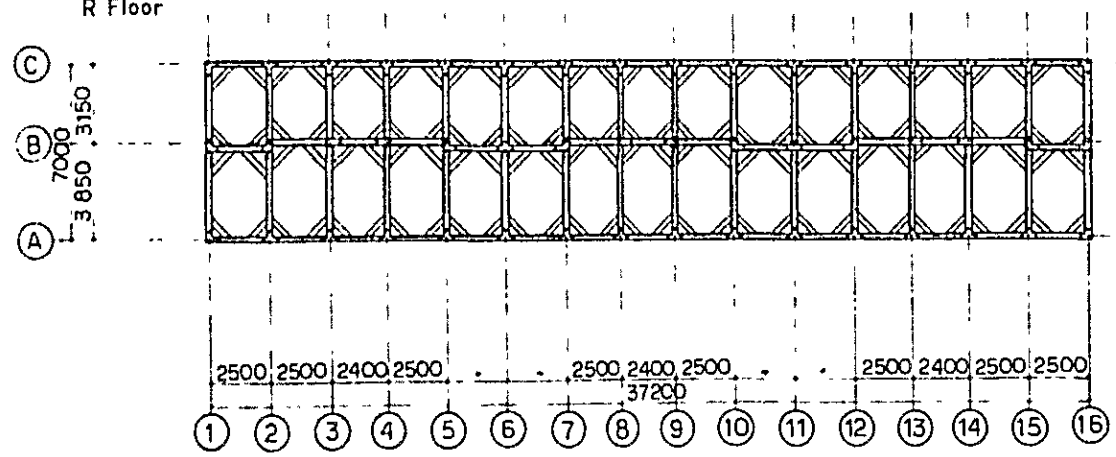
Except written specially
1 Mateial of floor is composed of sand and lime addicy to compaction
2 Foundations are all F3 Types.
3 Girders are all G1 Types
4 Inside walls are concrete blocks, outside walls are bricks
5 Columns are —, L and T typs

2~5 Floor

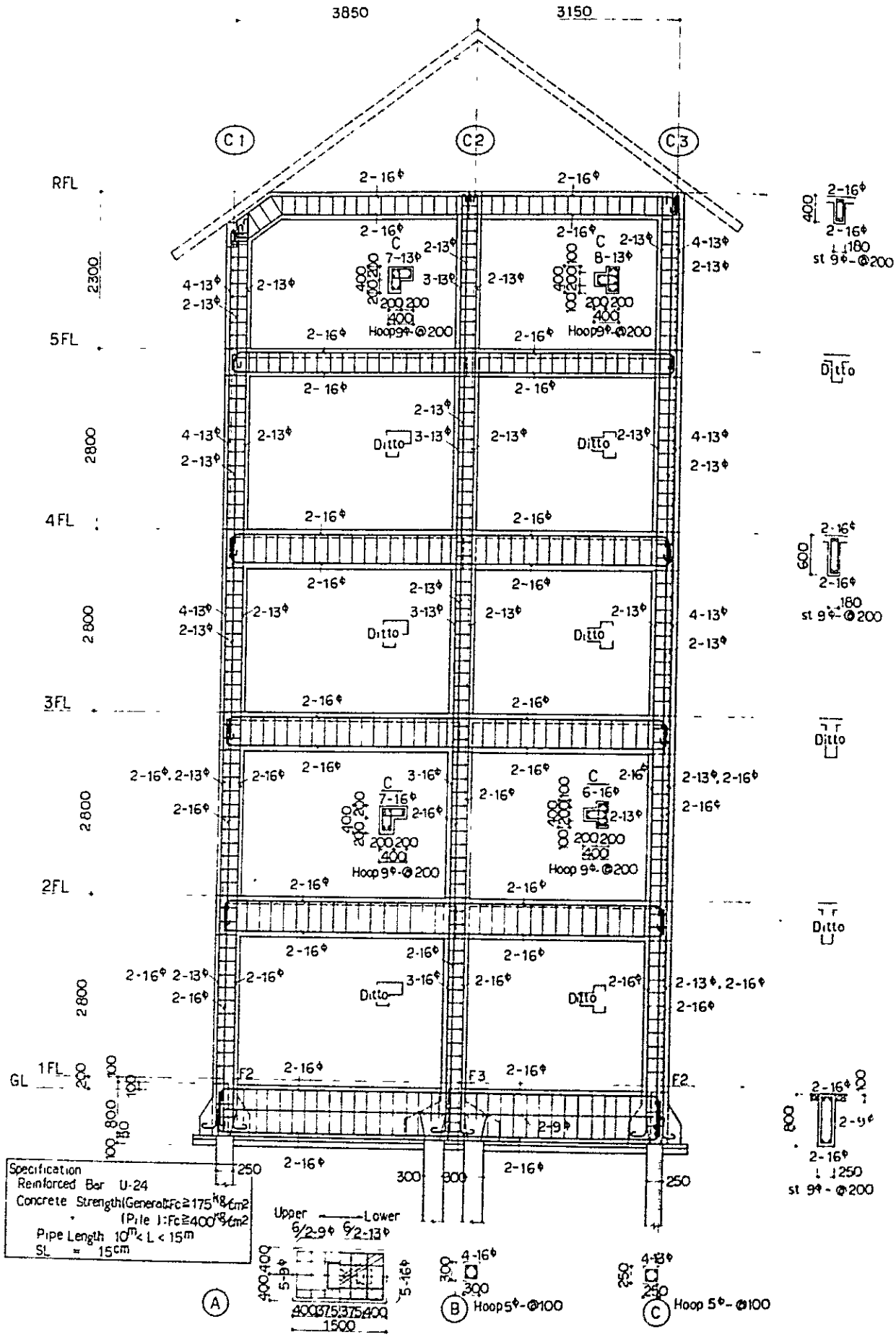


Except witten specially
1 Girdess are all G1 types
2 Slabs are R C with thickness of 10 cm
3 Inside and outside walls are the same above

R Floor



Except witten specially
1 Girders and lateral braces are G1 types
2 Slabs are unnecessary


3850
3150
C1
C2
C3
RFL
5FL
4FL
3FL
2FL
GL
1FL
2300
2800
2800
2800
2800
2-16φ
2-13φ
4-13φ
7-13φ
8-13φ
3-13φ
Hoop9φ-@200
Ditto
7-16φ
6-16φ
3-16φ
Hoop 9φ-@200
2-9φ
F2
F3
Specification
Reinforced Bar U-24
Concrete Strength(General Fc≧175kg/cm2
(Pile) :Fc≧400kg/cm2
Pipe Length 10m< L < 15m
SL = 15cm
Upper
Lower
6/2-9φ
6/2-13φ
5-16φ
1500
4-16φ
Hoop5φ-@100
st 9φ-@200

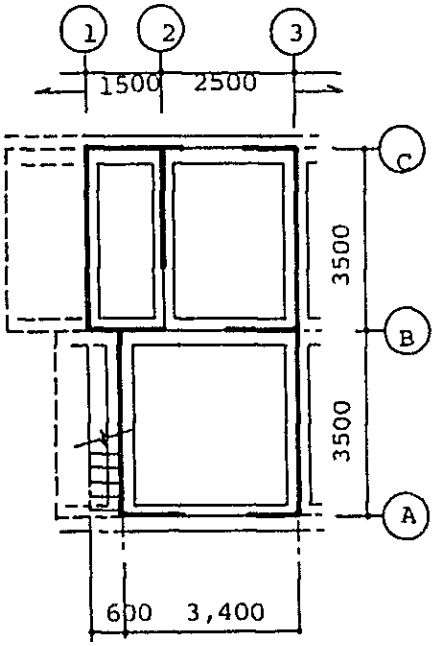
2-2

FS'2-26

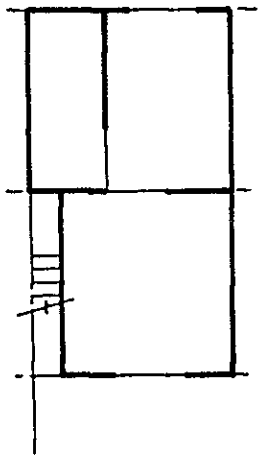
1. SCOPE OF PLANNING

The building is two storied, having six units of 26 m^2 each floor. The inside are of concrete hollow blocks, the roof covering is tile on the joist, and the slab in the second floor is of 10 cm thick concrete and of direct slab on grade in the first floor. The structural planning was made to satisfy the above mentioned specifications, and the figures were obtained after analysis of the required stresses.

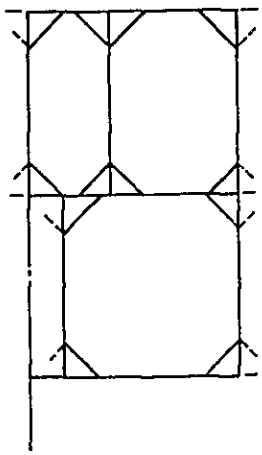
PLAN



sym. 1 FLOOR

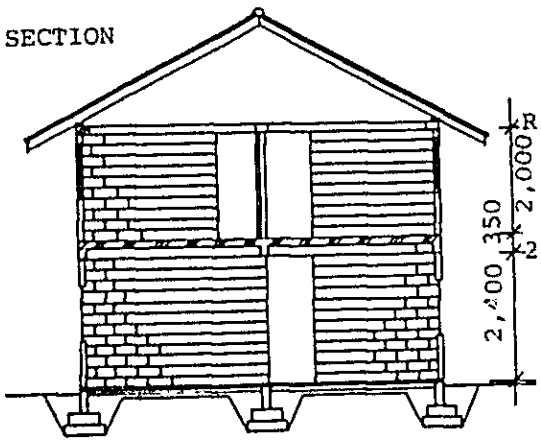


sym. 2 FLOOR



sym. R FLOOR

SECTION



2. LOADS

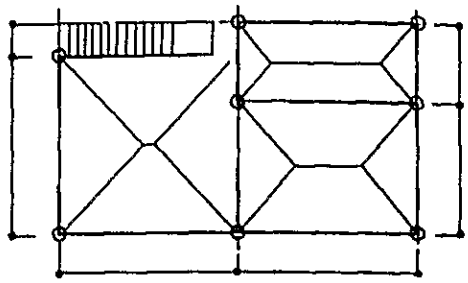
Dead load

Roof (tile), 15 mm γ = 1.6	25 kg/m^2
Wooden joist	10 "
Concrete slab, sF (100 mm thick)	240 "
Exterior & enterior wall (concrete block 150 mm)	200 "
Beams, 35 x 15 cm	126 kg/m
Stairway (wood)	15 kg/m^2

Contents		kg/m^2		For floor	For frame	For earthquake
roof	tile	25	D.L	35	35	35
	truss	10	B	-	30	30
			L.L	-	-	-
		35		35	65	65
2nd floor	concrete slsb	240	D.L	240	240	240
			B	-	30	30
			L.L	200	140	60
				440	410	330
wc mandı	water-proof mortar (30 mm)	60	D.L	300	300	300
	concrete slsb	240	B	-	30	30
			L.L	200	140	60
		300		500	470	390
stairway	wooden stair	15	D.L	15	15	15
			B	-	-	-
			L.L	200	140	60
				215	155	75

3. AXIAL LOAD (EXCLUDING DEAD LOAD OF FOUNDATION)

C	Floor	Position	Contents		Sub-total	Total
YW1 YW2	2	roof block	0.065 x (3.5/2 + 1.0) x (3.4 + 0.6) 0.2 x 2.0 x 2.0 0.2 x 1.6 x 1.0	0.72 0.81 0.32	1.85	1.85
	1	floor block	0.41 x 3.4 x 3.5/4 0.2 x 2.0 x 2.4 0.2 x 1.6 x 1.0	1.22 0.96 0.32	2.50	4.35
	ΣLy = 1.9 m then 2.29 t/m					
YW3 YW4	2	roof block	0.065 x 3.5 x 4.0 0.2 x 1.65 x 3.5 0.2 x (1.5 + 1.3) x 2.0	0.91 1.16 1.12	3.19	3.19
	1	floor wc/m floor block	0.45 x 3.4 x 3.5/4 0.45 x 1.2 x 1.2 0.47 x 1.5 x 0.75 x 1/2 0.41 x 2.5 x 1.25 x 1/2 0.2 x (1.5 + 1.3) x 2.4	1.22 0.95 0.27 0.64 1.35	4.07	7.26
	ΣLy = 1.5 + 1.3 = 2.8 m then 2.60 t/m					
YW5 YW6	2	roof block	0.065 x (3.5/2 + 1.0) x 4.0 0.2 x 2.0 x (2.0 + 0.9) 0.2 x 1.0 x 1.2	0.715 1.16 0.24	2.11	2.11
	1	wc/m floor block	0.47 x 1.5 x 0.75 x 1/2 0.41 x 2.5 x 1.25 x 1/2 0.2 x 2.4 x (2.0 + 0.9) 0.2 x 1.0 x 1.2	0.27 0.64 1.40 0.24	2.55	4.66
	ΣLy = 1.5 + 0.9 = 2.4 m then 1.95 t/m					
XW1	2	roof block	0.065 x 2.0 x (3.5 + 1.0) 0.2 x 3.5 x 3.1	0.59 2.17	2.76	2.76
	1	wc/m block	0.47 x 1/2 x 0.75 x (3.5 + 2.1) x2 0.2 x 3.5 x 2.4	1.94 1.68	3.62	6.38
	ΣLx = 3.5 m then 1.83 t/m					
XW2	2	roof block	0.065 x 2.0 x 4.5 0.2 x 3.5 x 3.1	0.59 2.17	2.76	2.76
	1	stair floor block	0.155 x 0.6 x 2.5 0.41 x 3.5 x 3.4/4 0.2 x 3.5 x 2.4	0.33 1.19 1.68	3.20	5.96
	ΣLx = 2.6 m then 2.3 t/m					
XW3	2	roof block	0.065 x (0.75 + 1.0) x 4.5 0.2 x 3.5 x 3.1	0.51 2.17	2.68	2.68
	1	wc/m floor block	0.47 x 1/2 x 0.75 x (3.5 + 2.0) 0.41 x 1/2 x (3.5 + 1.0) x 1.25 0.2 x 3.5 x 2.4	0.97 1.16 1.68	3.81	6.49
	ΣLx = 2.5 m then 2.6 t/m					
XW4	2	roof block	0.065 x 2.0 x 4.5 0.2 x 3.5 x 3.1	0.59 2.17	2.76	2.76
	1	floor block	0.41 x 3.4 x 3.5/4 x 2 0.2 x 3.5 x 2.4	2.44 1.68	4.12	6.88
	ΣLx = 3.5 m then 1.97 t/m					
XW5	2	roof block	0.065 x 2.0 x 4.5 0.2 x 3.5 x 3.1	0.59 2.17	2.76	2.76
	1	floor block	0.41 x 1/2 x (3.5 + 1.0) x 1.25 x 2 0.2 x 3.5 x 2.4	2.31 1.68	3.99	6.75
	ΣLx = 3.5 m then 1.93 t/m					



Maximum and minimum compressive unit stresses

$$\max \sigma c = \frac{1040}{15 \times 40} = 1.74 \text{ kg/cm}^2$$

$$\min \sigma c = \frac{732}{15 \times 40} = 1.23 \text{ kg/cm}^2$$

4. HORIZONTAL LOAD

2nd floor

Floor	Position	Contents		Sub-total	Total
2	roof	0.065 x 9.0 x 4.0 x 6 x 1.13	15.87		82.1+
	block (x)	0.20 x 3.5 x 3.1 x 8	17.36		
		0.20 x (3.5 x 3.1 - 0.9 x 2.0) x 6	10.86		
		0.20 x (3.5 x 3.1 x 9) -(1.0 x 2.0 x 6)	17.13		
	(y) (out)	0.20 x (3.4 x 2.0 - 1.6 x 1.0) x 6	6.24		
		0.20 x (4.0 x 2.0 - 1.6 x 1.0) x 6	7.68		
	(in)	0.20 x (4.0 x 2.0 - 1.1 x 2.0) x 6	6.96		
	2nd floor wc/m floor	0.39 x 1.5 x 3.5 x 6	12.30	56.1	85.1+
		0.33 x 2.5 x 3.5 x 6	17.33		
		0.33 x 3.4 x 3.5 x 6	23.60		
		0.33 x 1.2 x 1.2 x 6	2.86		
	block (x)	0.20 x 3.5 x 2.4 x 8	13.44	29.0	
		0.20 x (3.5 x 2.4- 0.9 x 2.0) x 6	8.16		
		0.20 x (3.5 x 2.4- 1.0 x 2.0) x 6	7.68		
	(y) (out)	0.20 x (3.4 x 2.4- 1.6 x 1.0) x 6	7.88	56.9	
		0.20 x (4.0 x 2.4- 1.6 x 1.0) x 6	9.60		
	(in)	0.20 x (4.0 x 2.4-1.1 x 2.0) x 6	8.68		
	stairway	0.075 x 1.2 x 2.3 x 6	1.25	29.0	

5. SEISMIC LOAD AND LENGTH OF WALL

	K x W	KW	ΣKW	ΣLx [m]	ΣLy [m]
2 F	0.1 x 82.10	8.21	8.21	68.5	7.5 x6
1 F	0.1 x 85.10	8.51	16.72	"	"

6. AVERAGE SHEARING UNIT STRESS

(τ kg/cm^2)

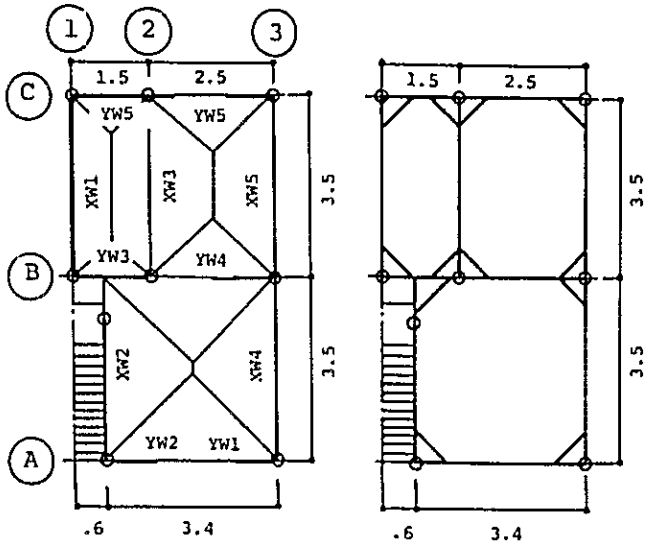
	Shearing stress	
	x-direction	y-direction
2 F	0.13	0.18 [1]
1 F	0.25	0.37 [2]

$$\tau = \frac{KW \times 1.5}{\Sigma L \times t}$$

Both figures satisfy the allowable shearing unit stress of blocks (1.36 kg/cm^2)

7. STUDY AFTER THE FAILURE OF UNREINFORCED BLOCKS

Calculations were made supposing a sufficiently sound reinforced block column at the end of a wall and a regid-framed structure of beams.



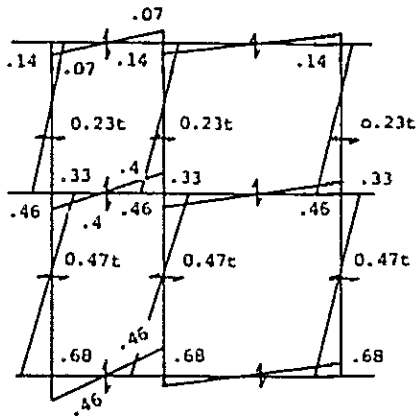
O shows reinforced block column.

1 FLOOR 2 FLOOR

7-1 PERMANENT STRESS

Omitted because the stress is small.

7-2 SEISMIC STRESS



	No. of column/Building	Shearing force / Column
	36	0.23 t
	36	0.47 t

7-3 CROSS SECTION

a. Beams

1F; M = 0.46 tm

Q = 0.31 t

B x D = 15C x 25C j = 17.5C

at = $0.46 \cdot 10^2 / 2.0 \times 17.5 = 1.31\ cm^2$ → 1-13φ

Q = $0.31 \times 10^3 / 15 \times 17.5 = 1.2 < 9.0\ kg/cm^2$

2F; M = 0.40 tm

Q = 0.54 t

B x b = 15C x 25C

at = $1.16\ cm^2$ → 1-13φ

Same to 1F.

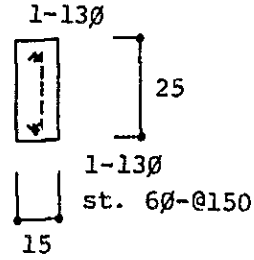
RF. (Include lateral blace)

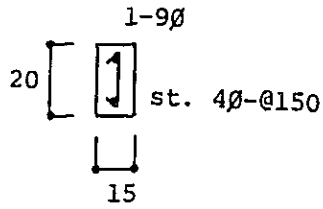
M = 0.07 tm

Q = 0.1 t

B x D = 15C x 20C

at = $0.28\ cm^2$ → 1-9φ





7-4 AXIAL LOAD

Supposing the reinforced block columns will support a floor load near the column after the failure of the unreinforced block wall

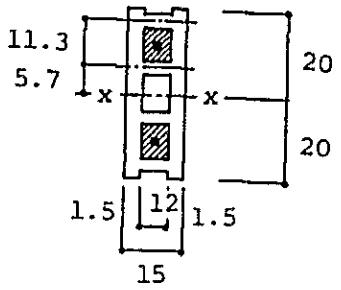
Colum (2-B)

roof	0.065 x (0.75 x 1.25) x 1.13	0.15		
	0.065 x (1.65 x 1.75) x 1.13	0.25	1.3	
wall	0.20 x 2.0 x (1.25 + 1.0)	0.90		
2nd floor slab	0.47 x 0.75 x 1.75	0.62		
	0.41 x 1.25 x 1.75	0.90		
	0.41 x 1.7 x 1.75	1.22	3.92	5.22^+
wall	0.20 x 2.4 x (0.45 + 2.0)	1.18		

Colum (3-B)

roof	0.065 x 1.75 x 3.4 x 1.13	0.44		
	0.065 x 1.75 x 2.5 x 1.13	0.33	3.14	
wall	0.20 x 2.0 x (2.5 + 3.4)	2.36		
2nd floor slab	0.41 x 1.75 x (2.5 + 3.4)	4.24		
wall	0.20 x 2.0 x (2.5 + 3.4)	2.36	6.60	9.74^+

7-5 EFFICIENCY OF REINFORCED BLOCK COLUMN



a. With no filling

x-x axis

$Ix_1 = \frac{1}{12} \times 1.5 \times 40^3 \times 2 + (12 \times 1.5) \times (20 - 3.0)^2 \times 2 + (12 \times 1.5) \times 5.7^2 \times 2$

$= 27{,}737.5\ cm^4$

$Zx_1 = 1386.8\ cm^3$

$A_1 = 192.0\ cm^2$

b. With filling (No.1)

$Ix_2 = 78557.0\ cm^4$

$Zx_2 = 3928\ cm^3$

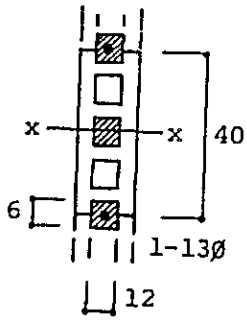
$A_2 = 415.2\ cm^2$

c. With filling (No.2)

$Ix_2 = 86137.5\ cm^4$

$Zx_3 = 4306.9\ cm^3$

$A_3 = 447.6\ cm^2$



Fiber stress of column

$6c = \frac{N}{A} \pm \frac{M}{Z} = \frac{5220}{447.6} \pm \frac{68000}{4306.9} = 11.7 \pm 15.8$

$= 27.5$ or $-4.1\ kg/cm^2$

$\tau = \frac{470}{40 \times 20} = 0.59\ kg/cm^2 < 1.36\ kg/cm^2$

From the bending moment, the fiber stress gives the above value. Reinforcement is provided on the tension side and twice the 13.6 kg/cm² specified is provided on the compression side. But, it is enough, if the above value in compression stress is less than two third strength of additional cement mortar or concrete. Therefore, it will be necessary to appraise the strength of these composite columns.

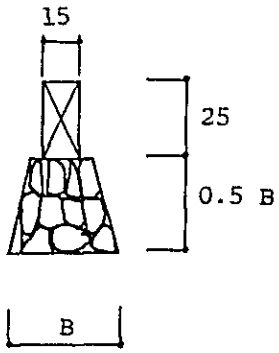
8. FOUNDATION

Upper axial load; Two kinds of less than 2.0 t/m and 2.6 t/m bearing capacity of soil; Two kinds of 3.0 t/m² and 5.0 t/m²

Footing weight

Ground-beam	0.15 x 1.0 x 2.4	= 0.36 t/m	≒ 1.0 t/m
Batukali	0.6 x 1.0 x 0.4 x 2.6 t/m²	= 0.63	

Contact pressure is both 3.0 t/m and 3.6 t/m per meter. We get effective widths of footing according to the bearing capacity of soil.



In case of 3.0 t/m^2

$B_1 = \frac{3.0\ t/m}{3.0\ t/m^2} \rightarrow 1.0\ m$

$B_2 = \frac{3.6\ t/m}{5.0\ t/m^2} \rightarrow 1.2\ m$

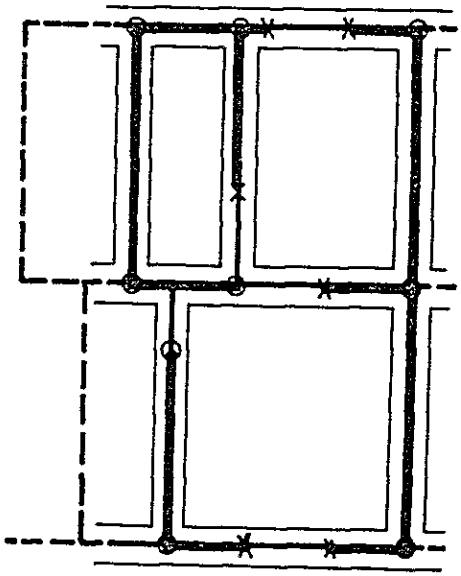
In case of 5.0 t/m^2

$B_1 = \frac{3.0\ t/m}{5.0\ t/m^2} \rightarrow 0.6\ m$

$B_2 = \frac{3.6\ t/m}{5.0\ t/m} \rightarrow 0.75\ m$

Conclusion

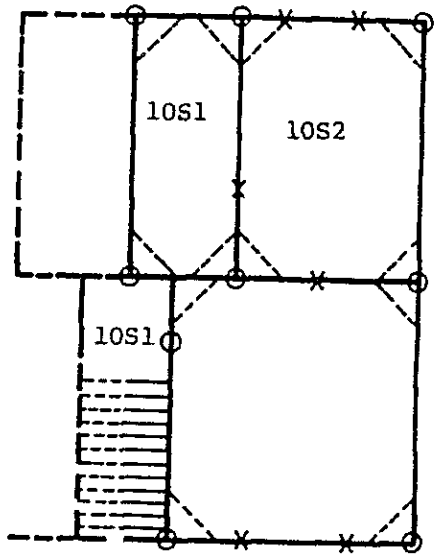
PLAN



1 FLOOR

Besides above

1. Footing F1
2. Ground-beam G1
3. Slab-on-grade



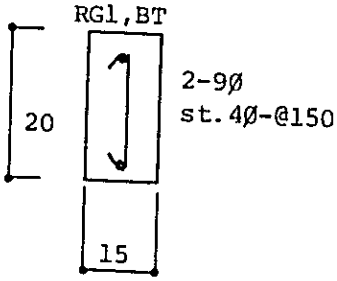
2 FLOOR

Besides above

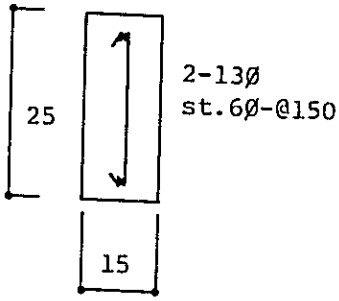
1. shows DT
2. Beam G1
3. Slab 10S2
4. Stairway wood
5. O shows reinforced concrete block (Type B.C)
6. × shows the open reinforcement (Type A)

CROSS SECTION

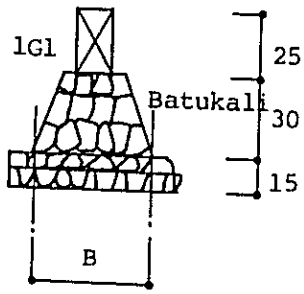
RG1,BT



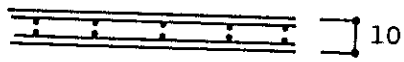
1G1,2G1



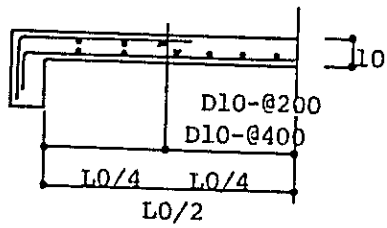
F1



S1 9Ø-@250(cross double)



S2 D10-@200



Same arrangement of bar
both in long and short span.

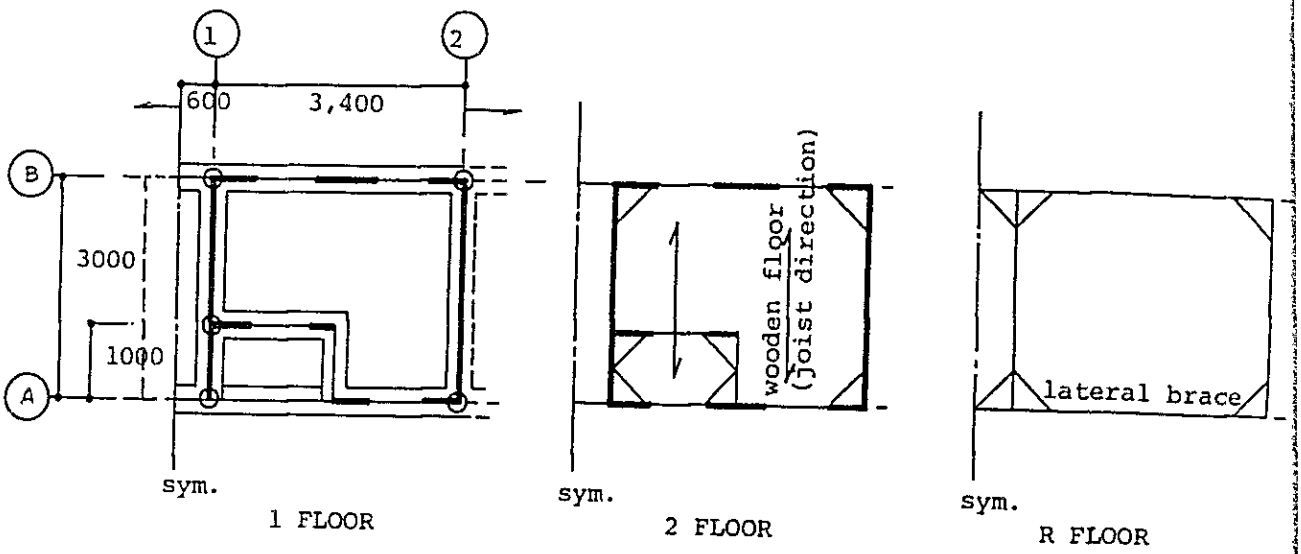
2-3

M-24

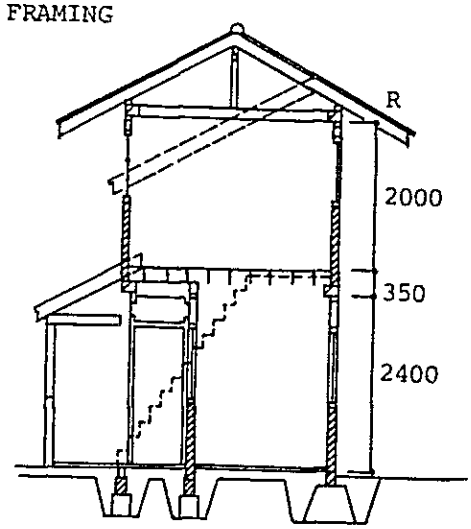
1. OUTLINE OF PLANNING

The building is a six units per floor, two storey house of 24 square meter maisonettes. This material is used the same ones for FS'2-26, but the building itself is light in weight because of the use of wooden floor joists for the second floor. The structural planning satisfy the above-mentioned specifications and stresses are obtained by the analysis.

2. PLANS AND FRAMING



FRAMING



3. LOADS

Dead load

Same to FS'2-28 type except below

Wooden floor, 2F 25 kg/m^2

Beam 20 x 15 72 kg/m

	Contents		Floor	Frame	Seismic
2F	Wooden floor 25 kg/m^2	D.L	25	25	25
		Beam		20	20
		L.L	200	140	60
			225	185	105

4. AXIAL LOAD

· Averaged axial stress of wall along line (B) (Y-Direction)

2F

roof 0.065 x (1 + 1.5) = 0.163 t/m

wall 0.20 x 2.0 = 0.40 > 0.563 t/m

1F

slab 0.185 x 1.5 = 0.278

wall 0.20 x 2.4 = 0.48 > 0.758 t/m

Total 1.32 t/m

· Averaged axial stress of wall along line (1) (X-Direction)

2F

roof (0.065 + 1/2 x 3.0 x 1.5) x 2 x 1/3 = 0.1 t/m

wall 0.2 x 2.0 = 0.4 > 0.50 t/m

1F

slab 0.185 x 1.0 = 0.185 > 0.665 t/m

wall 0.2 x 2.4 = 0.48

Total 1.265 t/m

5. HORIZONTAL LOAD AND SHEARING UNIT STRESS

2nd floor

roof 0.065 x 4.0 x (3.0 + 2.0) x 6 x 1.13 = 10.14 t 27.19 t

block 0.2 x 2.0 x (3.0 x 10 + 4.6 x 6 x 2) = 34.10

1st floor

floor 0.185 x 3.0 x 4.0 x 6 = 13.32

stairway 0.155 x 1.2 x 3.0 x 1.2 x 3 = 2.0 52.82 t

block 0.2 x 2.4 x (3.0 x 10 + 4.6 x 6 x 2) = 40.9

For each building (6 units)

Floor	W	K	Kw	ΣKW	ΣBwx^m	ΣBwy^m	τx kg/cm^2	τy kg/cm^2
2	27.19	0.1	2.72	2.72	31.2	24	0.09	0.1
1	52.82	0.1	5.32	8.02	31.2	30	0.26	0.27

Average shearing unit stress is sufficient in the allowable shearing unit stress.

6. STUDY AFTER THE FAILURE OF UNREINFORCED BLOCKS

Taking FS'2-28 into account.

6-1 PERMANENT STRESS

Line (A) : The distance between supporting points on the beam is small due to reinforced blocks being placed at the opening near the corner so, stress is small.

Span 2.0m, ω = 0.075 t/m (beam itself)

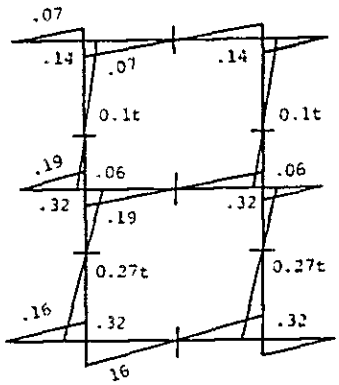
$c = \frac{1}{12} \times 0.075 \times 2.0^2 = 0.025$ tm

Mo = 0.038 tm

Q = 0.075 t

6-2 SEISMIC STRESS

Line (B) stress



No. of column	Shearing force	Shearing force/ Column
30	1.82	0.1
30	5.35	0.27

Shearing force is the same to x and y directions.

6-3 AXIAL LOAD ON REINFORCED BLOCK COLUMN AT CORNER

(2)-(A), (2)-(B) column.

2F

Line (A) 0.563 t/m x 1.0 = 0.563 t
Line (1) 0.5 x 3.0/2 = 0.750 } 1.31 t

1F

Line (A) 0.758 t/m x 1.0 = 0.758 t
Line (1) 0.665 x 3.0/2 = 1.00 } 1.76

Total 3.07 t

6-4 CROSS SECTION

a. Beams

1F, M = 0.16 tm

Q = 0.11 t

B x D = 15C x 20C j = 13.0

at = 0.16/2.0 x 13.0 = 0.62 cm^2 → 1-9φ

$\tau = 0.11 \times 10^3/15 \times 13 = 0.6$ kg/cm^2 OK

2F; M = 0.215 tm

Q = 0.21 t

B x D = 20C x 15C j = 8.3

at = 1.3 cm^2 → 2-9φ

τ = 1.23 kg/cm^2 OK

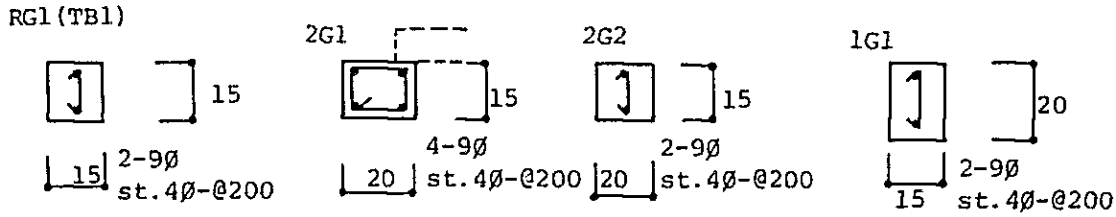
RF; M = 0.095 tm

Q = 0.13 t

B x D = 15C x 15C

at = 0.58 cm^2 1-9φ

τ = 1.1 kg/cm^2 OK



b. Column

1F; Nx = 3.07 ± 0.36 = 3.43 t or 2.71

Mx = 0.32 tm

Qx = 0.27 t

Efficiency of column

I = 85333.5 cm^4

Z = 4266.6 cm^3

A = 303.6 cm^2

Fiber stress

$$\sigma c_1,\ t_1 = \frac{3.43 \times 10^3}{303.3} \pm \frac{0.32 \times 10^5}{4266.6}$$

$$= 11.3 \pm 7.5$$

$$= 18.8 \text{ or } 3.8 \text{ kg/cm}^2$$

Only compression stress.

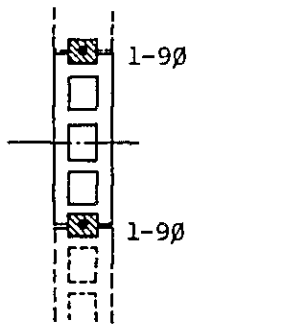
$$\sigma c_2,\ t_2 = \frac{2.71 \times 10^3}{303.3} \pm \frac{0.32 \times 10^5}{4266.6} = 8.9 \pm 7.5$$

$$= 16.4 \text{ or } 1.4 \text{ kg/cm}^2$$

Only compression stress

$$\tau = \frac{0.27 \times 10^3}{40 \times 15} = 0.45 \text{ kg/cm}^2 < 1.36 \text{ kg/cm}^2$$

OK



reinforced concrete block

7. FOUNDATION

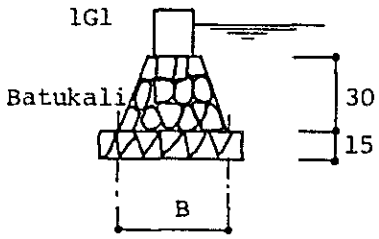
We calculate the same condition as FS'2-38 type.

Upper axial load		1.32 t/m	
Footing;	Groundbeam	0.06	Total 1.62 t/m
	Batukali	0.24	

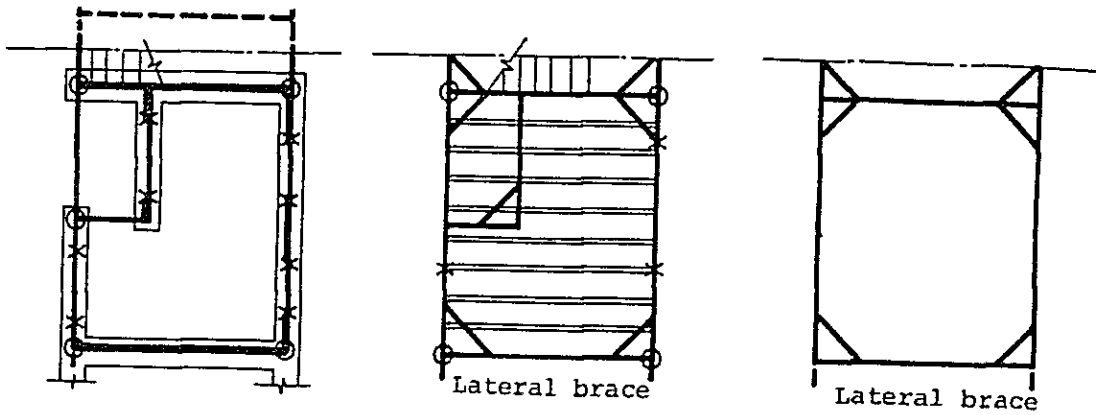
We get effective widths of footing according to the bearing capacity of soil,

In case of 3.0 t/m^2: $B_1 = \frac{1.62\ t/m}{3.00\ t/m^2} \rightarrow 55$ cm

In case of 5.0 t/m^2: $B_2 = \frac{1.62\ t/m}{5.00\ t/m^2} \rightarrow 35$ cm



CONCLUSION



Besides above

1. Footing F1
2. Ground beam G1
3. Slab on grade

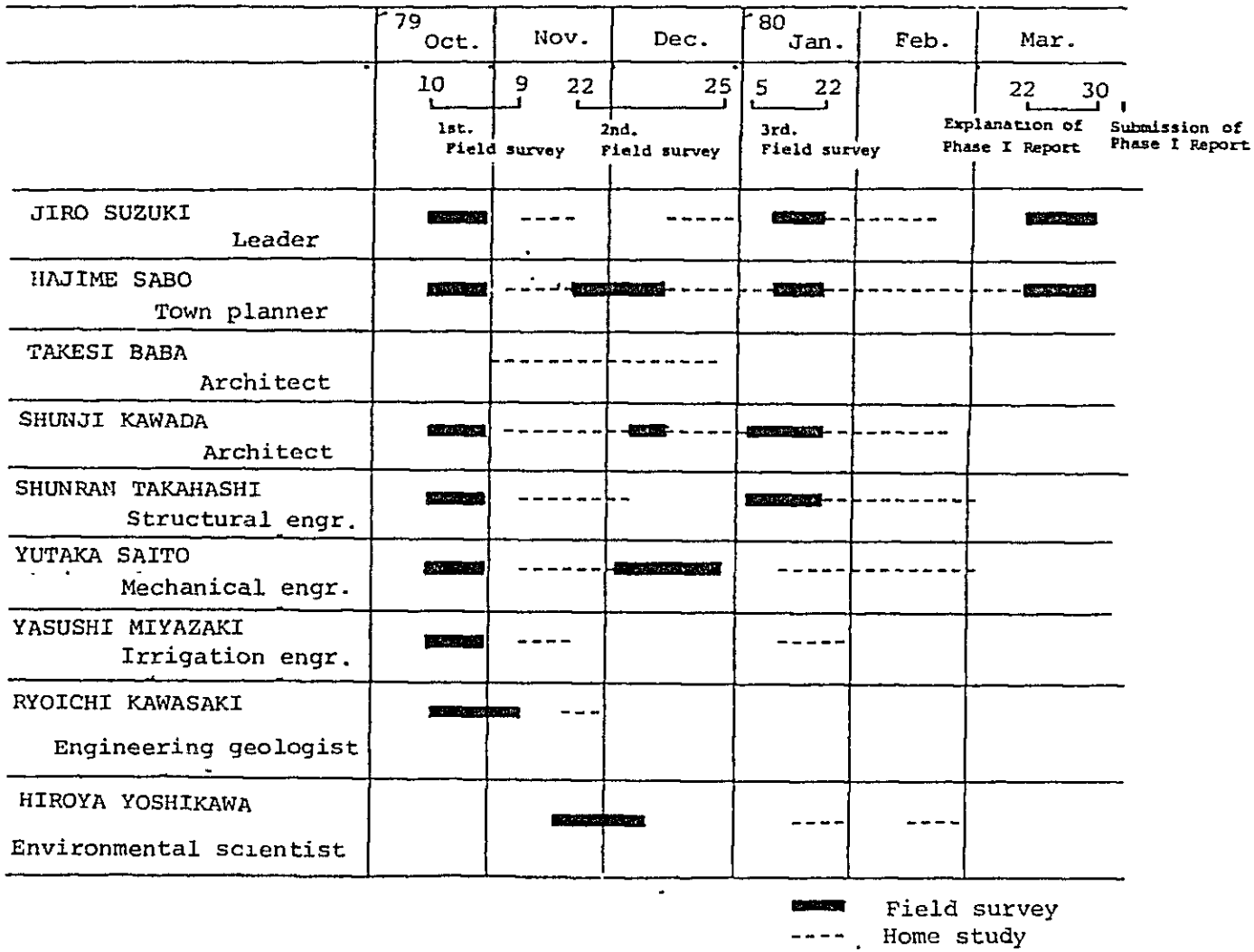
1. Beam G1
2. Wooden floor + joist
3. Staircase;wood
4. O shows reinforced concrete block(type B,C)
5. x shows open reinforcement (type A0

3 SCHEDULES AND MINUTES

SCHEDULE OF PHASE I STUDY (Oct.1979 ~ March.1980)

Studies including field surveys, which were carried out three times consecutively, were carried out according to the following schedule.

General schedule



Main items

1979 12th Oct.	Inception report discussion
16th Oct.	-do-
17th Oct.	-do-
18th Oct.	Arrangement of studies and schedule
26th Oct.	Inceptioh report discussion and signature of the minutes on the discussion by Ir. Suyono,and Suzuki.
26th Oct.	Discussion on the results of the first field survey
27th Oct.	"
14th Dec.	Presentation report by the Japanese Study Team. (Joint conference with Indonesian Steering Committee and Counterpart.)
15th Jan.	Discussion on the results of the studies based on the first and second field surveys.
18th Jan.	Interim report by the Japanese Study Team. Joint conference of Indonesian Steering Committee, Counterpart, Japanese Advisory Committee, delegated experts, Japanese Embassy and JICA.
21st Jan.	Signature of the minutes on the interim report conference by Ir. Suyono,and Suzuki.
27th March.	Signature of the minutes on the Phase I Report by Ir. Suyono and Mr. Suzuki.

SCHEDULE OF PHASE II STUDY (Jul.1980 ～ March.1981)

General schedule

	80 Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	81 Jan.	Feb.	Mar.
	16 — 29 1st. Field survey			7 — 3 2nd. Field survey					4 — 13 Explanation of Draft Report; Submission of Final Report
JIRO SUZUKI Leader	▬▬	▬▬			▬				▬
HAJIME SABO Town planner	▬▬	▬▬	- - - - - - -	▬▬	- - - - - - - - - -				▬
MASANORI ONOE Town planner	▬▬	- - - - - - -			- - - - - - - - - -				
MICHIKO INAGAKI Architect	▬▬	▬▬	- - - - - - -	- - - ▬▬	- - - - - - - - - -				
SHUNJI KAWADA Architect		- - - - - - -		- - - ▬▬	- - - - - - - - - -				
SHUNRAN TAKAHASHI Construction engr.	▬▬	- - - - - - -		- - - - - - - -	- - - - - - - - -				
NAOHARU NAGAO Structural engr.			- - - - - - -						
YUTAKA SAITO Mechanical engr.	▬▬	- - - - - - -		- - - ▬▬	- - - - - - - - -				
GEN FUJIWARA Civil engr.	▬▬	▬▬	- - - - - - -						
MIKIO TANEMURA Civil engr.	▬▬	- - - - - - -		▬▬	- - - - - - - - - -				
NAOFUMI HIROTA Cost analizer			- - - - - - -		- - - - - - - - -				
MOTOHIDE NISHIO Economist	▬▬	- - - - - - -		- - - ▬▬	- - - - - - - - - -				▬
TAKASHI INOUE Economist	▬▬	- - - - - - -		- - - - -	- - - - - - - - - -				

▬▬ Field survey

- - - - - Home study

Main items

1980	17th July	: Inception report discussion
	24th July	: Joint conference of Indonesian Steering Committee,Counterpart, Japanese Advisory Committee,delegated housing experts,Japanese Embassy and JICA.
	" "	: Signature of the minutes of the discussion on the Inception Report by Ir.Suwarno and Mr. Suzuki.
	9th Oct.	: Discussion with local government(DKI)
	17th Oct.	: Discussion with PERUM PERUMNAS directors (Planning and construction div.)
	22nd Oct.	: Discussion with relating government body on the drainage system at PERUMNAS.
	4th Nov.	: Joint conference of Indonesian Steering Committee,Counterpart,Japanese Advisory Committee,delegated housing experts, Japanese Embassy,JICA and other relating government body officials.
	7th Nov.	: Signature of the minute of the discussion on the Progress Report by Ir.Suwarno and Mr. Suzuki.
	12th Mar.	: Joint conference of Indonesian Steering Committee,Counterpart,Japanese Advisory Committee,delegated housing experts, Japanese Embassy, JICA and other relating government body officials.
	" "	: Signature of the minute of the discussion on the Draft Final Report by Ir.Radinal Moochtar and Mr.Suzuki.

SCOPE OF WORK

FOR

THE STUDY OF LOW COST HOUSING PROJECT

(KTA 20)

Agreed

Between

JAPAN INTERNATIONAL COOPERATION AGENCY

And

CIPTA KARYA

Dated :

(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. The feasibility study of housing development project in the site of Cengkareng.

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. The development study for the pilot walk-up flat.

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 provisions 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 :

(The first stage).

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.

(The second stage).

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. Sutono, M.Sc.
Director of Planning
PERUM PERUMNAS

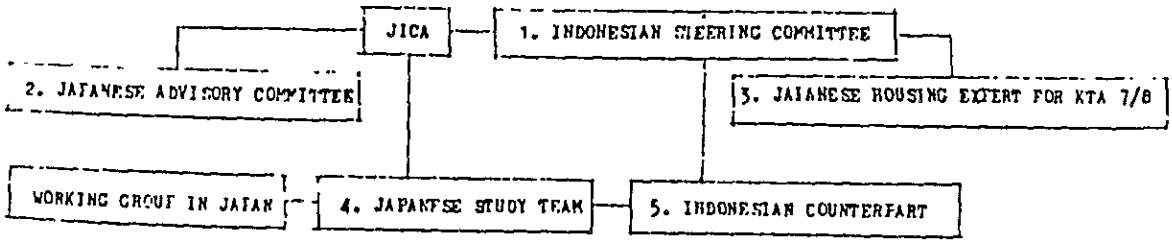
Jiro SUZUKI
Team Leader of Japanese
Study Team

ATTENDANTS' LIST OF MEETINGS

ATTACHMENT 1.

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

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. DODDY SOEGOTO Coordinater
PERUM PERUMNAS

IR. AZIZ DAHLAN Planner
PERUM PERUMNAS

IR. HERRY PURNOMO Architect
PERUM PERUMNAS

IR. PARYATNO PARNO Civil Engineer
PERUM PERUMNAS

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, 1981

JAPANESE STUDY TEAM (JICA)

18	19	20

21	17	16	15	14	13	12	11	10

	9	8	7	6	5	4	3	2

ATTENDANCE LIST
18TH JANUARY 1980

No	NAME	INSTITUTION	SIGNATURE
1	SUYONO	PERUMNAS	
2	[illegible]	[illegible]	
3	[illegible]	[illegible] Sanitary Engineering [illegible]	
4	IMAN SUNARIO	DKI Jakarta	
5	RAI PRATADJA	DKI Jakarta	
6	ROSITA D SAPUTRO	DKI - JKT	
7	Haryatno P.	Perumnas	
8	HERM PURNOMO	PERUMNAS	
9	AZIZ DAHLAN	PERUMNAS	
10	Yuji Ishiyama	IISEE, BRI. Ministry of Construction	
11	Yasunori YAMANAKA	Ministry of Construction	
12	Takeo YAMAZAKI	Embassy of Japan	
13.	Tadashi SHINOURA	J. I. C. A.	
14	Shinsaku Kametaki	Cipta Karya Expert	
15	JIRO SUZUKI	JICA TEAM (NIHON ARCHITECTS ENGINEERS & CONSULTANTS LTD INC.)	
16	Hajime SADO	"	
17	SHUNKAI TAKAHASHI	Jica Team	
18	Hajime Obata	Perumahan Expert	
19	Hajime YOKOBORI	Perumahan Expert	

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

The Phase I Report was submitted and explained by the Japanese Study Team and discussed by the participants (see attachment) at a joint meeting in Jakarta on the 27th of March in 1980. The report was principaly accepted by both parties , written comments will be sent to Japan by the end of April 1980.

The fundamental items of the further study was recognized as follows :

1). The planning area is around 400 Ha which is surrounded by trunk roads and major drainage canal based on the DKI Jakarta Master Plan. The supplementary survey will be mainly carried out in this planning area.

2). The first stage project area will be fixed in August 1980 on the basis of the results of the land acquisition at that moment.

3). The scope of work during the Phase II covers :
   a. general planning for the planning area.
   b. detail planning and preliminary engineering for the first stage project area.
   c. detailed engineering for land development expecially drainage system.
   d. detailed study on the walk up flat and other housing types.
   e. financial feasibility of the above aspects.

4). It was requested by the Indonesian party that the joint Study should be performed more continuously in Indonesia.

Jakarta, March 27, 1980

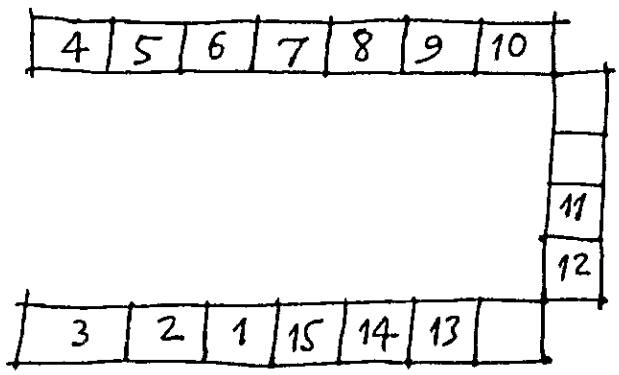
Ir. Suyono, M.Sc.
Director of Planning
PERUM PERUMNAS

Jiro Suzuki
Team Leader of Japanese
Study Team

Attachment

ATTENDANCE LIST
27TH MARCH 1980

NO	NAME	INSTITUTION	SIGNATURE
1.	Toshio A I	JICA Tokyo	
2.	Tadashi SHINOURA	JICA. Jakarta	
3.	Hajime YOKOBORI	Japanese Housing Expert	
4.	Tochio UETAMA	"	
5.	Shinsaku KANETAKI	"	
6.	Takeo Yamazaki	Embassy of Japan	
7.	Toshio ISHIGURO	Japanese Advisory Committee	
8.	Hajime OBATA	Japan Housing Expert	
9.	Hajime SABO	Japanese Study Team	
10.			
11.		Peruvian	
12.		"	
13.		—"—	
14.			
15.	AZIZ DAHLAN	—"—	



MINUTES OF THE DISCUSSIONS

ON

THE INCEPTION REPORT

FOR

THE LOW COST HOUSING PROJECT IN CENGKARENG (KTA-20)

PHASE II.

The discussions on the Inception Report were held between PERUM PERUMNAS and the Japanese Study Team at PERUM PERUMNAS on 18th and 21st of July in 1980.

The contents of the Inception Report were agreed upon and the following items were recognized by both the Japanese and Indonesia parties :

1. The feasibility study at the First Round will be carried out in the project area which will be acquired in September 1980,covered ± 110 Ha and is located at Kecamatan Cengkareng, wilayah Jakarta Barat.

2. The study at the Second Round will be carried out at the fixed project area which will be appointed by the Indonesian party by the beginning of October 1980 when the Japanese Study Team is expected to arrive in Indonesia.

Jakarta, July 24, 1980.

Mr. Jiro Suzuki
Team Leader of
JICA Low Cost Housing
Project Study Team

Ir. Suwarno Prawirasumantri
Director of Planning
PERUM PERUMNAS

DEPARTEMEN PEKERJAAN UMUM

PERUM PERUMNAS

Perusahaan Umum Pembangunan Perumahan Nasional
(National Urban Development Corporation)

Alamat : Jl. Letjen Haryono M.T. Kav. 17 Jakarta

Telpon : 822808 (4 saluran)

Kotak Pos No. 137/KBT

Nomor : Dirut/2843/10/VII/80 Jakarta, 22 Juli 1980

Lampiran : 1 (satu) lembar.

Kepada Yth.

Yr. Hajime Sabo

Japanese Study Team

di.

J A K A R T A

Perihal : U N D A N G A N

Dengan hormat kami mengundang Bapak/ Sdr untuk menghadiri rapat pengarahan Studi Proyek PERUM PERUMNAS Cengkareng Fase II yang akan diadakan pada :

Hari : K a m i s

Tanggal : 24 Juli 1980

J a m : 12.00 WIB - selesai

Tempat : Dit. Jen. Cipta Karya.

Atas perhatian dan kesediaannya kami ucapkan terima kasih.

An. Steering Committee
KTA 20 Cengkareng,

Ir. Soedarjono Danoedjo
Direktur Utama

Tembusan Yth.

1. Direksi PERUM PERUMNAS
2. A r s i p

---

ad/sd.

STEERING COMMITTEE

1.	Ir. Radinal Moochtar	- Dir. Jen. Cipta Karya
2.	Ir. Suyono, M.Sc.	- Direktur Perumahan Rakyat
3.	Ir. Susanto	- Direktur Direktorat Teknik Penyehatan
4.	Ir. Soenarjono Danoedjo	- Direktur Utama PERUM PERUMNAS
5.	Ir. Suwarno P	- Direktur Perencanaan PERUM PERUMNAS
6.	Ir. Nursaijidi M.K.	- Direktur Pembangunan PERUM PERUMNAS
7.	Ir. Herbowo	- Ketua BAPPEDA D.K.I.
8.	Ir. Imam Sunarjo	- Ketua Team Perencanaan Perumahan D.K.I.

JAPAN EMBASSY & JICA

1.	Mr. Takeo Yamazaki	- First Secretary, Embassy of Japan
2.	Mr. Tadashi Shinoura	- Assistant Resident Representative of JICA

JAPANESE ADVISORY COMMITTEE

1.	Mr. Yuji Ishiyama	- Advisor, Japanese Advisory Committee KTA 20 Cengkareng Project

JAPANESE HOUSING EXPERT

1.	Mr. Shinsaku Kanetaki	- Japanese Housing Expert
2.	Mr. Toshio Uetama	- Japanese Housing Expert
3.	Mr. Hajime Obata	- Japanese Housing Expert
4.	Mr. Hajime Yokobori	- Japanese Housing Expert

JAPANESE STUDY TEAM

1.	Mr. Jiro Suzuki	- Leader, Japanese Study Team KTA 20 Cengkareng Project.
2.	Mr. Hajime Sabo	- Japanese Study Team
3.	Mr. Masanori Onoe	- Japanese Study Team
4.	Mrs. Michiko Inagaki	- Japanese Study Team
5.	Mr. Shunran Takahashi	- Japanese Study Team
6.	Mr. Yutaka Saito	- Japanese Study Team
7.	Mr. Gen Fujiwara	- Japanese Study Team
8.	Mr. Mikio Tanemura	- Japanese Study Team
9.	Mr. Motohide Nishio	- Japanese Study Team
10.	Mr. Takashi Inone	- Japanese Study Team

COUNTERPART

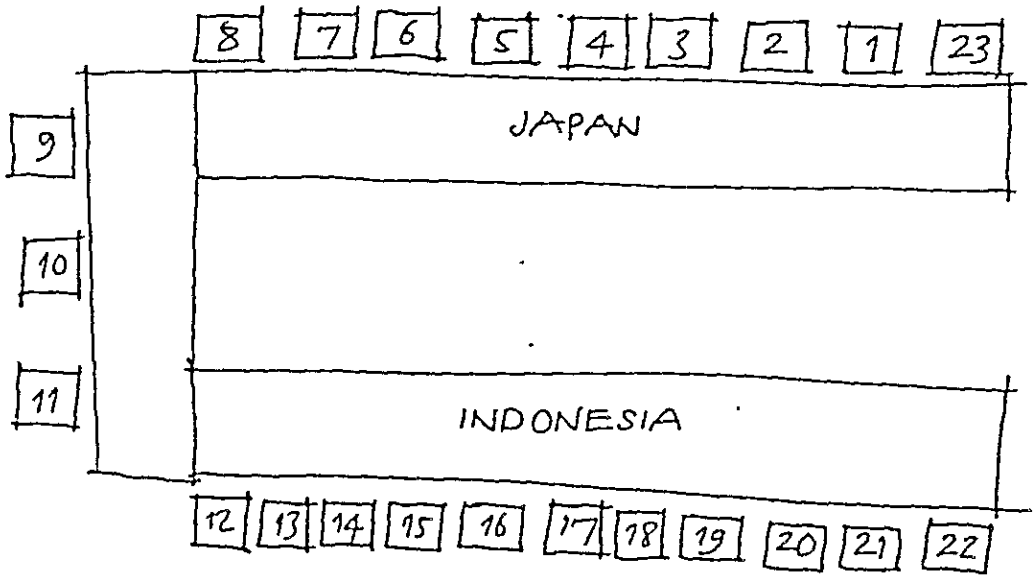
1.	Ir. Duddy Soegoto	- Kepala Bagian Perencanaan Feasibility PERUM PERUMNAS
2.	Ir. Aziz Dahlan	- Kasubag. Kerjasama Luar Negeri PERUM PERUMNAS
3.	Ir. Herry Purnomo	- Staf Perencanaan Feasibility PERUM PERUMNAS
4.	Ir. Paryatno Parno	- Staf Perencanaan Feasibility PERUM PERUMNAS
5.	Ir. Rai Pratadaya	- Ka. Ur. Pengarahan Perencanaan Lingkungan D.K.I.
6.	Ir. Ny. Rosita Saputro	- Kepala Distrik Perencanaan I Wilayah Jawa Barat.

STEERING COMMITTEE
meeting, 12. , July 24, 1980

● ATTENDANCE LIST

NO	NAME	POSITION	SIGNATURE
1.	Hajime YOKOBORI.	Directrate Perumahan Japan Housing Expert	
2.	ONOE MASANORI	JICA mission	
3	MICHIKO INAGAKI	JICA study team	
4.	Hajime SABO	〃	Hajime Sabo
5.	HITONORI. ONO	JICA HDQ	
6	RYONOSUKE GOTO	Assistant Resident Representative, JICA JAKARTA	R Goto
7	Yuji ISHIYAMA	Japanese Advisory Committee Ministry of Construction	
8	Takeo Yamazaki	First Secretary Embassy of Japan	
9	JIRO SUZUKI	LEADER OF JAPANESE STUDY TEAM	
10	Radinal Moochtar	Dir Gen Cipta Karya	
11	Soenanjono	DIRJEN PERUMNAS	
12	Suyono	Dis Perumnaha	
13	Sukanto	Dir. Teknik Pengembangan	
14	Sunarno	Dir Can. Perumnas	
15.	NOER SAIJIDI	DIR. BANG. Perumnas	
16.	Duddy Soegato	Perumnas	
17.	Rai Pratadraja	DKI	
18.	Marwan Affandy.	Perumnas	
19	Iman Surario	DKI	

NO	NAME	POSITION	SIGNATURE
20	Shinsaku Kanetaki	Cipta Karya Expert	
21	AZIZ DAHLAN	PERUM PERUMNAS	
22.	Paryatno Parno	PERUM PERUMNAS	
23	Toshio UETAMA	Perumahan Expert	



MINUTES OF THE DISCUSSION

ON

THE PROGRESS REPORT

FOR

THE LOW COST HOUSING PROJECT IN CENGKARENG (KTA - 20)

(PHASE II)

The Progress Report for the project submitted by the Japanese Study Team was discussed by the participants (see attachment) of the steering committee meeting on the 4 th of November 1980, and the following items were confirmed.

1). The General Plan for the planning area (± 370 Ha) and the Master Plan for the project area (± 110 Ha) were approved.

2). Alternatives on the major infrastructures which are indispensable for this housing project were evaluated and selected as follow :

a). DRAINAGE - Direct discharge system to the Java Sea (ALT 1).

b). WATER SUPPLY -60l/dc from PAM-JAYA with setting up the booster pumping station at Grogol (ALT 1A).

c). SEWERAGE - Combined system with kitchen and toilet (ALT 3).

3). The development cost of the off-site infrastructures is not included into the selling price.

4). The target income group is within 20 - 70 of the percentile of the income distribution in 1984.

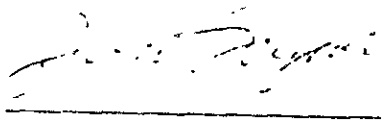
5). The proportion of the empty and commercial lots if necessary can be increased more than 30% of the productive area.

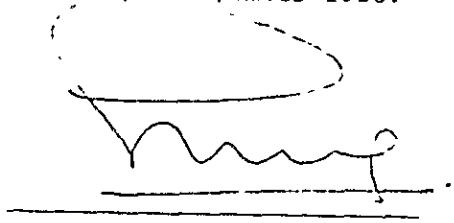
6). The low rise housing type (R.15 and D.15) is not recommendable for the lowest income group of the target group.

7). The high .....

7). The high density housing was recommend·d.
The distribution of mainsonette, walk up flat and empty lot should be studied further.

Jakarta, 7 November 1980.





MR. JIRO SUZUKI
Team Leader of JICA
Low Cost Housing Project
Study Team

IR. SUWARNO PRAWIRASUMANTRI
Director of Planning
PERUM PERUMNAS

HS/sd.

ATTENDANTS OF STEERING COMMITTEE

ON

THE DRAFT FINAL REPORT ON THE LOW COST HOUSING PROJECT

IN CENGKARENG, JAKARTA (KTA-20)

12 MARCH, 1981

1. STEERING COMMITTEE

Ir. Radinal Moochtar	:	Dit. Jen. Cipta Karya
Ir. Suyono M Sc	:	Direktur Perumahan Rakyat
Ir. Susanto	:	Direktur Direktorat Teknik Penyehatan
Ir. Soenarjono Danoeje	:	Direktur Utama PERUM PERUMNAS
Ir. Suwarno Prawirasumantri	:	Direktur Perencanaan PERUM PERUMNAS
Ir. Nursalimdi M.K.	:	Direktur Pembangunan PERUM PERUMNAS
Ir. Herbowo	:	Ketua BAPPEDA D.K.I.
Ir. Iman Sunaryo	:	Ketua Team Perencanaan Perumahan D.K.I.

2. JAPANESE EMBASSY,JICA

Mr. K. Teshima	:	First Secretary,Embassy of Japan
Mr. Ryonosuke Goto	:	Assistant Resident Representative of JICA

3. JAPANESE ADVISORY COMMITTEE

Mr. Toshio Ishiguro	:	Advisor, Japanese Advisory Committee KTA 20 Cengkareng Project

4. JAPANESE HOUSING EXPERTS

Mr. Shinsaku Kanetaki	:	Japanese Housing Expert
Mr. Hajime Obata	:	Japanese Housing Expert
Mr. Hajime Yokobori	:	Japanese Housing Expert

5. JAPANESE STUDY TEAM

Mr. Jiro Suzuki	:	Leader. Japanese Study Team KTA 20 Cengkareng
Mr. Hajime Sabo	:	Japanese Study Team
Mrs. Michiko Inagaki	:	Japanese Study Team
Mr. Motohide Nishio	:	Japanese Study Team

6. COUNTERPARTS

Ir. Duddy Soegoto	:	Kepala Bagian Perencanaan Feasibility PERUM PERUMNAS
Ir Aziz Dahlan	:	Kasubag. Kerjasama Luar Negeri PERUM PERUMNAS
Ir. Rai Pratadaya	:	Ka Ur. Pengarahan Perencanaan Lingkungan DKI

7. PROYEK BANJIR JAKARTA, DEP. P.U.

Ir. Wartsanto Ds	:	Pemimpin Proyek Banjir Jaya

8. DIT. JEN. BINA MARGA DEP. P.U.

Ir. Wiyoto Wiyono	:	Kasubit. Perencanaan Jalan Kota

9. KTA 7/8 REVIEW MISSION (OBSERVER)

Mr. Makoto Tateishi	:	Ministry of Construction, Japan
Mr. Shigetada Utsumi	:	Ministry of Construction, Japan
Mr. Shunichi Hokura	:	Ministry of Construction, Japan

10. CIPTA KARYA

Ir. Hendro Pranoto	:	Dit. Jen. Cipta Karya

11. PERUM PERUMNAS

Ir. Didi Suwandhi	:	Kepala Kabag Perencanaan Umum PERUM PERUMNAS
Ir. Marwan Affandi	:	Kepala Kabag Perencanaan Teknis PERUM PERUMNAS
Ir. Moegijono Bae	:	Kepala Kabag Persiapan Pembangunan PERUM PERUMNAS

DAFTAR UNDANGAN

RAPAT BERSAMA STEERING COMMITTE KTA-20 CENGKARENG, 4 NOV 1980.

			TANDA TANGAN / SIGNATU
1	STEERING COMMITTEE		
1.1	Ir. Radinal Moochtar	- Dir Jen Cipta Karya	1.1.
1.2.	Ir. Suyono M Sc	- Direktur Perumahan Rakyat	1.2.
1.3.	Ir. Susanto	- Direktur Direktorat Teknik Penyehatan	1.3.
1.4.	Ir. Soenarjono Danoedjo	- Direktur Utama PERUM PERUMNAS	1.4.
1.5.	Ir. Suwarno Prawirasumantri	- Direktur Perencanaan PERUM PERUMNAS	1.5.
1.6.	Ir. Nursaijidi M.K.	- Direktur Pembangunan PERUM PERUMNAS	1.6.
1.7.	Ir. Herbowo	- Ketua BAPPEDA D.K.I	1.7
1.8.	Ir. Imam Sunarjo	- Ketua Team Perencanaan Perumahan D.K.I	1.8.
2	JAPAN EMBASSY & JICA		
2.1	Mr. Takeo Yamazaki	- First Secretary, Embassy of Japan	2.1.
2.2.	Mr. Moriya Miyamoto	- Resident Representative of JICA	2.2.
2.3.	Mr. Ryonosuke Goto,	- Assitant Resident Representative of JICA	2.3.
3.	JAPANESE ADVISORY COMMITTEE		
3.1.	Mr. ~~Syunichi Hokura~~ Yagi	- Advisor, Japanese Advisory Committee KTA 20 Cengkareng Project	3.1.
4.	JAPANESE HOUSING EXPERTS		
4.1.	Mr. Shinsaku Kanetaki	- Japanese Housing Expert	4.1
4.2.	Mr Toshio Uetana	- Japanese Housing Expert	4.2.
4.3.	Mr. Hajime Obata	- Japanese Housing Expert	4.3.
4.4.	Mr. Hajime Yokobori	- Japnese Housing Expert	4.4.
5.	JAPANESE STUDY TEAM		
5.1.	Mr. Jiro Suzuki	- Leader, Japanese Study Team KTA 20 Cengkareng	5.1
5.2	Mr. Hajime Sabo	- Japanese Study Team	5.2.
5.3.	Mr. Michio Inagaki	- Japanese Study Team	5.3
5.4.	Mr. Yutaka Saito	- Japanese Study Team	5.4.
5.5.	Mr. Mikio Tanemura	- Japanese Study Team	5.5.
5.6	Mr. Motohide Nishio	- Japanese Study Team	5.6.
5.7	Mr Sunji Kawada	- Japanese Study Team	5.6
6	COUNTERPARTS		
6.1.	Ir. Duddy Soegoto	- Kepala Bagian Perencanaan Feasibility PERUM PERUMNAS	6.1
6.2.	Ir Azis Dahlan	- Kasubag Kerjasama Luar Negeri PERUM PERUMNAS	6.2.
6.3	Ir Puryatno Parno	- Kasubag Pengukuran & Pemetaan PERUM PERUMNAS	6.3.
6.4	Ir Herry Purnomo	- Staf Perenc Feasibility PERUM PERUMNAS	6.4
6.5	Ir Rai Pratadaya	- Ka Ur Pengarahan Perencanaan Lingkungan DKI	6.5.
6.6	Ir Ny Rosita Saputro	- Kepala Distrik Perencanaan I Wilayah Jakarta Barat	6.6.
7	PROYEK BANJIR JAKARTA, DEP. P.U		
7.1	Ir Achmad Lanti Dipl H.E	- Kepala Staf Proyek Banjir Jaya	7.1.
8	DITJEN BINA MARGA DEP P.U		
8.1.	Ir. Wiyoto Wiyono	- Kasubdit. Perencanaan Jalan Kota	8.1. (Budiea
9	PERUSAHAAN AIR MINUM. PEMDA D.K.I		
9.1.	Ir Budi Rahardjo	- Direktur PAM D.K.I	9.1.

sd/sd

MINUTES OF DISCUSSION

ON

THE DRAFT FINAL REPORT ON THE LOW COST HOUSING PROJECT IN CENGKARENG, JAKARTA (KTA-20)

1. The draft final report was submitted and explained by the Japanese Study Team, and discussed by the participants (see Attach) of the Steering Committee Meeting in Jakarta on the 12th of March, 1981.

2. The report was discussed by the Steering Committee, and the Steering Committee agrees that the draft final report be processed and printed as final report.

Note : the following expressions were made by the Steering Committee :

a) PERUM PERUMNAS and the Local Government will continue the land acquisition process and it should be finished at latest in December 1981.

b) In parallel with the land equisition, PERUM PERUMNAS is going to proceed the review of the feasibility study then to start the detailed design in the fiscal year of 1981/1982.

c) In relation with the above mentioned process, a request for Japanese loan including the detailed design will be submitted.

Signed at Jakarta, March 12, 1981.

Ir. Radinal Moochtar	Jiro Suzuki
Director General	Team Leader
of	of
CIPTA KARYA	JAPANESE STUDY TEAM

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TYTLE(題名)	TYTLE IN JAPANESE(和文)	AUTHOR OR PUBLISHER(著者または発行所)	
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BIAYA PELAKSANAAN PEMBANGUNAN PEKERJAAN JALAN KONSTRUKSI BAJA	BINA MARGAの道路・鉄筋建設コスト歩掛表	BINA MARGA	I
PELAKSANAAN PEKERJAAN PEMBUATAN LAND-DEVELOPMENT DI LOKASI, KLENDER	クレンダープロジェクト宅造工事契約書	PERUM PERUMNAS	I
GEDUNG KANTOR PUSAT PERUM PERUMNAS VOL. 1, 2	プルムナス本社ビル仕様・積算資料	"	I
PELAKSANAAN PEKERJAAN PEMBUATAN JALAN BARU PRIMER DAN TERTIER DI LOKASI PROJEK CIREBON	チレボン新線道路工事契約書	"	I
PELAKSANAAN PEKERJAAN LAND DEVELOPMENT (PEKERJAAN JALAN, KANALAIR, AIR MINUM) DI LOKASI PROJEK CIREBON	チレボン宅造工事契約書		I
INFORMASI POTENSI INDUSTRI	工場生産能力データ	ASSOCIATION OF MATERIAL OF INDONESIA	I
PELAKSANAAN PEKERJAAN UP GRADING KALI DAN PINTU PENGENDALI BANJIR PADA KALI CIKALONG DI LOKASI PROJEK CIREBON	チレボン治水工事契約書	PERUM PERUMNAS	I
PELAKSANAAN PEKERJAAN PEMBUATAN INSPEKTION DAN PENGATUR DAN TUTUP-TUTUP BESI BAR METER AIR PIT SERTA PER-BAIKAN SALURAN AIR KOTOR DI LOKASI PROJEK CIREBON	チレボン排水・飲料水工事契約書		
PELAKSANAAN PEKERJAAN PEMASANGAN PIPA AIR KOTOR DAN AIR MINUM FOOT PATH BERIKUT GUTTERNYA DI LOKASI PROJEK CIREBON	チレボン給・排水、道路工事契約書	"	I

TYTLE(題名)	TYPE IN JAPANESE(和文)	AUTHOR OR PUBLISHER(著者または発行所)	
Others			
GEOLOGICAL MAP (JAKARTA)	ジャカルタ地質図	DIRECTORAT GEOLOGI	I.E
SOIL INVESTIGATION DATA SHEET	土質データ	PBJR	I
BERTANAN POHON BUAH-BUAHAN 2	果樹の植栽について	GNUNG AGUN	I
TANAMAN HIAS	インドネシアの庭木	〃	I
TUMBUHAN LIAR	インドネシアの草花	〃	I
TANAMAN PERINPUNG	インドネシアの樹木	〃	I