7．工　　期

Lae は図－18に示すとおり年間を通じて月降雨量が 200㎜を越えており、特に４～９月の雨量が多くなっている。したがって、工事の適期は10月から翌年の３月までの期間となる。

Bululoは図－19に示すように降雨量パターンは Laeとは逆の傾向をもつが、月別雨量は Laeと比較して 200㎜以下と少ない。ゆえに、工事は Laeにおけるものと同じ期間に行って差し支えない。

以上により工期は平成２年10月から平成３年３月の約６ヶ月の予定である。

概 略 工 事 工 程 表

PROGRESS SCHEDULE 工 事 内 容		1990 OCT	NOV	DEC	1991 JAN	FEB	MAR
TENDER & CONTRACT 入札及び契約							
PROVISIONAL WORKS 仮 設 工 事							
F.R.I. SITE (LAE)	苗 畑 造 成						
EXPERIMENTAL AREA 実 験 苗 畑 区	Raised Bed, Timber Frame 苗床, 寒冷紗木枠						
INTENSIVE AREA 精 密 苗 畑 区	Raised Bed, Steel Frame 苗床, 寒冷紗鉄枠						
BUILDING WORKS 建 物	Garage, Working house Materials Store 車庫, 作業舎, 資機材倉庫						
EXTERNAL WORKS 給排水・電気施設	Drainage, Plumbing Electric Inst., Etc. 排水, 給水, 電気施設他						
EXPERIMENTAL PLANTATION AREA	試 験 林 造 成						
LAND PREPARATION 地 ご し ら え	Felling, Stumps 立木整理, 障害物撤去						
FENCE WORK フ ェ ン ス	Repairing, Removal New Construction 補修, 撤去, 新設						
EXPERIMENTAL PLOTS DIVISION WORK 区 画	Boundary Post Inst. 境界杭, 歩道, 案内板						
COMPLETION OF WORK 跡 片 付							

8．附属資料

8－1．気象データ

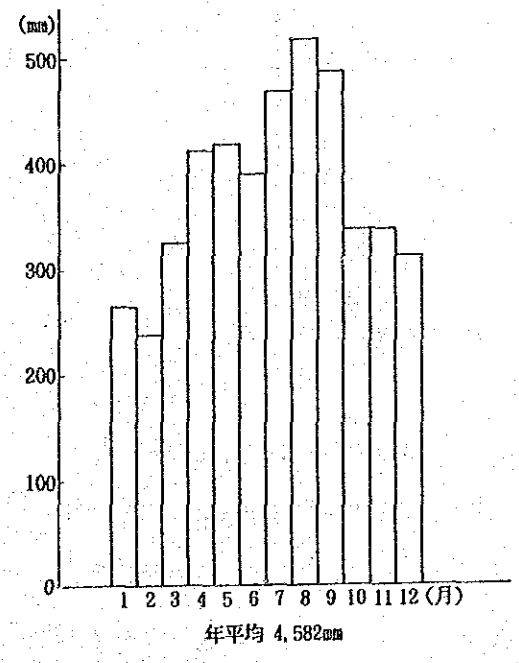
パプア・ニューギニアはアジアとオーストラリア大陸の間にはさまれた熱帯地域に位置する。気候は山岳の影響と季節風との位置関係により変化する。国土の大部分は年間を通じて高温多湿で、卓越風によって雨季と乾季に分けられる。

海岸地方の年平均最高気温は32℃、同最低気温は23℃、気温の日較差は6～8℃である。平均気温は標高とともに下降し、1,500mでは日中の気温は海岸地方よりも約6℃低く、夜間は約11℃低い。2,740m以上では降霜がある。Mt. Wilhelm をはじめ、3,960m以上の山頂では時折降雪を見る。

年平均降雨量は一般に2,030～3,050mmである。最小値はPort Moresbyで990mm、最大値は New Britain島南海岸及び Papua湾の内陸で7,620mmとなっている。降雨は季節性があり、熱帯速度収束帯に生まれ5～10月に卓越する南東風と、11～4月に吹く安定しない北西風の影響を受ける。乾燥、湿潤の指標は降雨量よりも降雨強度である。New Britain 島北海岸で24時間に760mmの最大降雨記録がある。しかし、一般には時雨量50mm程度である。

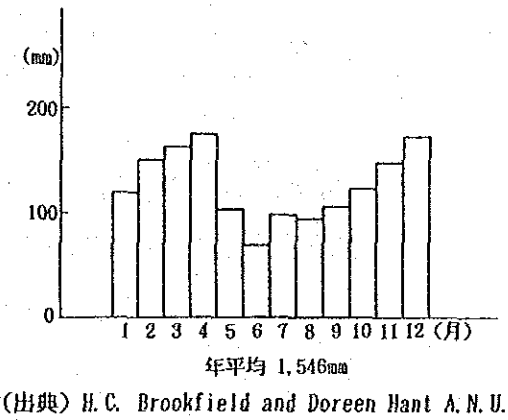
山岳地域では降雨パターンは地形によって左右される。11～4月には北西季節風の影響で午後25mm以下の降雨がある。

以下 Lae及びBulolo の降雨データを掲げる（図－18、19）。



(出典) H.C. Brookfield and Doreen Hant A.N.U. 1966

図－18　Laeの降雨量



(出典) H.C. Brookfield and Doreen Hant A.N.U. 1966

図－19　Bulolo の降雨量

Lae の平均最高気温は30.3℃、平均最低気温は22.7℃、熱帯湿潤気候を呈し年降雨量は 4,582㎜となっている。降雨は年間を通じて 200㎜以上あり７～９月にピークがある。

Wau-Bulolの年平均気温は19℃、降雨量は 1,500～ 2,000㎜で11～４月に若干降雨が多い。この地方の過去90年の記録によると最も雨の多かった年の雨量は 2,368㎜となっている。

8－2．地質・土壌

森林研究所の位置する Laeは Markham川による堆積によってできた第４期沖積物の上にある。土壌はＵＳＤＡの土壌区分によればButropepts又は Dystropeptsに相当する。これらは礫を含む排水良好な湿潤低地に一般的な土壌である。

天然林試験候補地のあるOomsis周辺の山は中生代白亜紀～ジュラ紀のOwen Stanley 変成岩を基岩とする地質で、片岩、粘板岩、千枚岩、変成グレーワッケ、礫岩、から成る。（図－20）

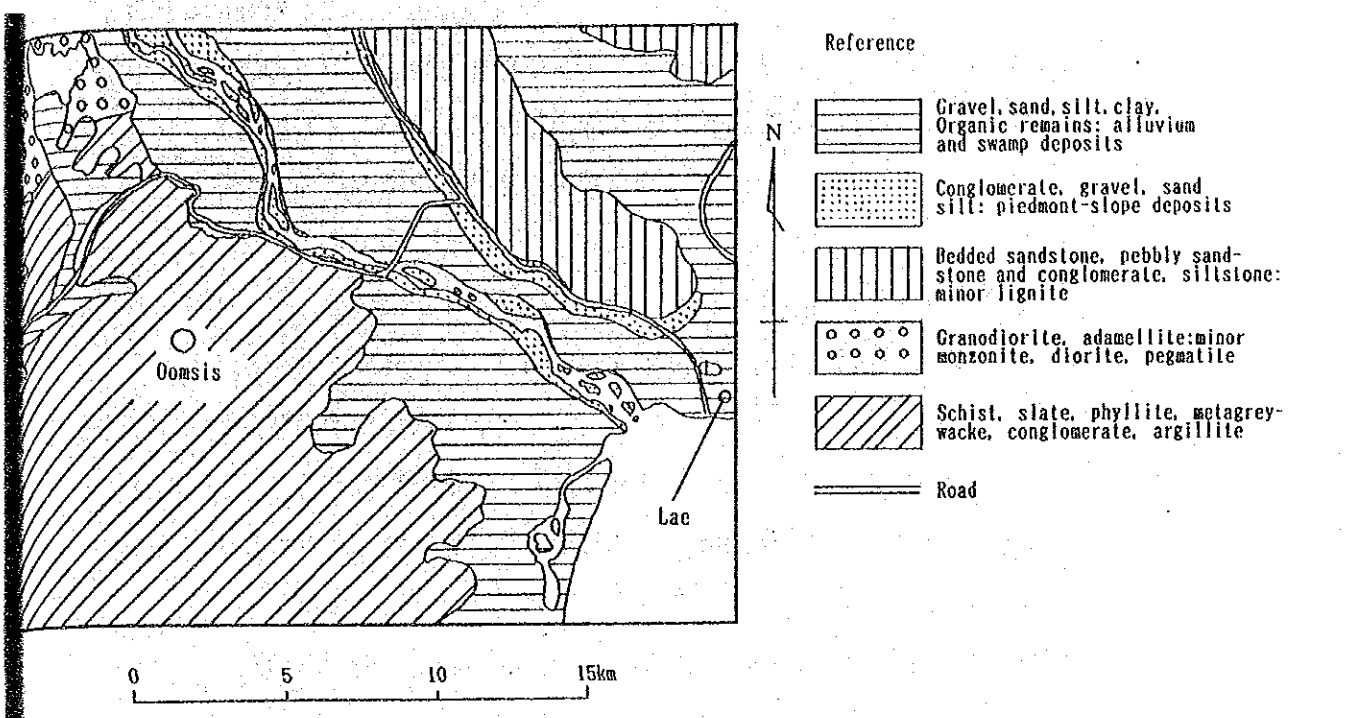
なお1958年より1976年までラエ市周辺でマグニチュード5.00～5.99の地震が19回、マグニチュード5.00以下のものは12回発生している。これらは震源の深さが70～299km のものが多い。

Lae周辺の地震発生数

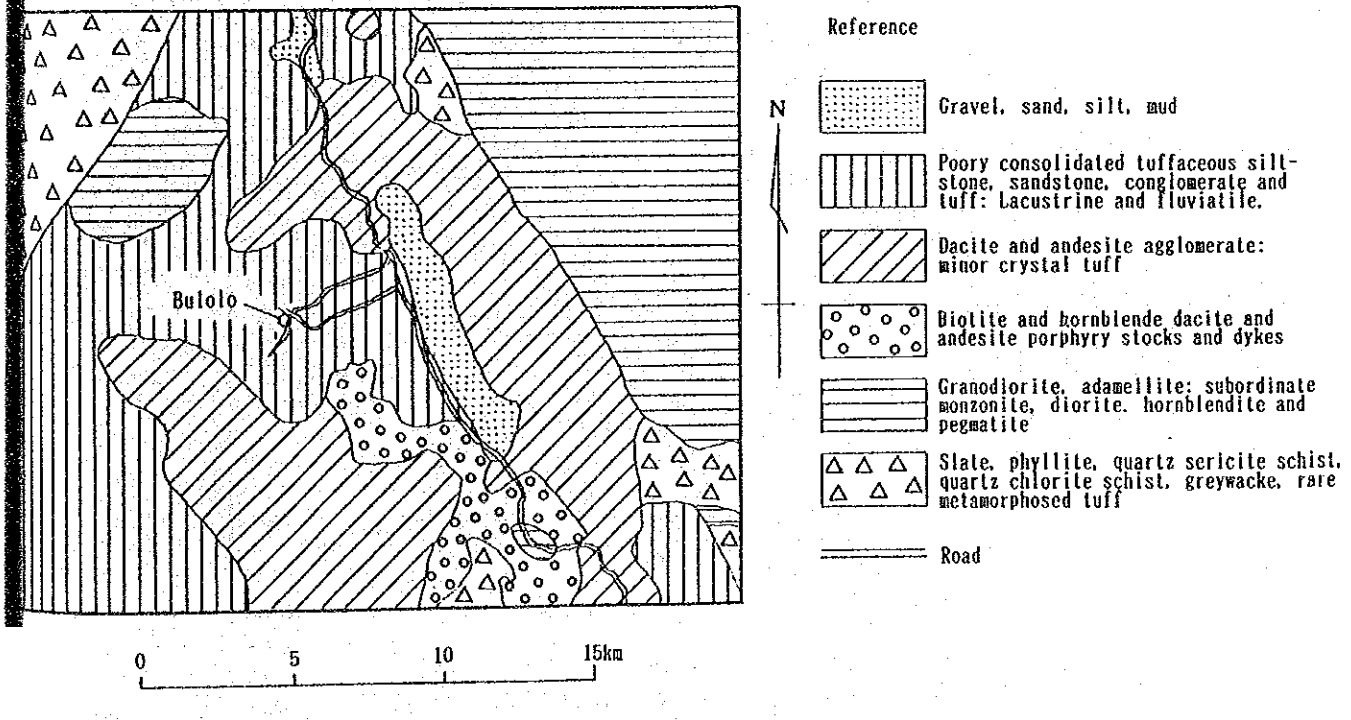
マグニチュード / 震源の深さ	＜5.00	5.00～5.99
0 － 69km	6	7
70－299km	6	12

期間：1958～1976年
区域：６° 00′ S ～７° 00′ S, 145° 30E～147 ° 00′ E
出典：Geological Series MARKHAM. Sheet SB/55-10. Anstralian Government Publishing Service. Canberra 1976.

人工林試験地の位置するBulolo国有林は新生代鮮新世Otibanda累層に属する弱度に固結した凝灰性シルト岩、砂岩、礫岩、凝灰岩からなりこれらは湖成及び河成堆積物である。（図－21）



図－20　Lae 及びOomsis周辺の地質



図－21　Bulolo周辺の地質

8－3．建設単価

平成2年5月時点のパプア・ニューギニアにおける建設工事及び資材単価を表－5に掲げる。なお、調査は Lae公共事業省地方事務所、 Lae及びPort Moresbyの建設資材販売店から聴き取りを行った。

(1) スプリンクラーについて

スプリンクラーは本文において説明したように取付けられるが、システムとしての概算価格は次のようになる。

アルミパイプ50m、スプリンクラー10個、同支持台10個、パイプ末端3個、フレキシブルパイプ 9.2mを必要とし、合計金額は984.00キナである。

Lae においてスプリンクラーを取扱っている代理店は次のとおりである。

South Pacific Machinery. P.O. Box 1904 Lae、PNG. Tel. 421966、Fax. 67542 5529。

(2) 寒冷紗について

寒冷紗は Laeにおいて調達可能であるが、ほとんどが輸入品である。希望する規格のものがない場合は、主にオーストラリアから取り寄せることになる。

平成2年5月現在、 Laeにおいて市販されていた規格は以下のとおりである。

遮光率（%）	サ　イ　ズ	価格（キナ）	販　売　店
50	1.83m×50m	89.00	Harcros Trading
70	1.84m×1m（単価）	5.32	Steamship Hardware
50, 70, 80, 90	1.80m×50m	在庫切れ	Transfield NGI
〃	1.83m×50m	〃	〃
〃	3.66m×50m	〃	〃
50	3.66m×50m	225.00	South Pacific Machinery
不　明	0.915m×50m	不　明	〃

なお、 Tranfield NGIで寒冷紗の接続、金具取付等を行っている。

オーストラリアの寒冷紗メーカーは次のとおりである。

a. Sarlon Industries Pty. LTD.
b. Rheem Australia Limited.

8－4．地方建設事務所による認可

ＰＮＧにおいては、施工主は契約に先立って州（本工事の場合はMorobe州）の建設事務所による建築工事の認可を受けなければならない。

この手続には図面のコピーが3部必要である。手数料は工事の規模・種類で異なっている。

同州の公共事業省地方事務所によると、手続には約2週間かかり、認可後6箇月以内に着工しなければならない。

8－5．施工業者選定の留意点

(1) 工事の特徴

本工事の特徴は次のように要約される。

a．工事は、天然林の伐採搬出、道路の作設、苗畑造成等に係る土木工事及び作業舎、資機材倉庫、車庫等の建設に係る建築工事を包含するが、土木工事のウエイトが大きい。

b．森林研究計画に関するモデルインフラ整備事業であることから、工事内容は小規模の工種と施工に分かれる。特に、次の工事については厳密に行うことが必要である。

(a) 苗床のコンクリート床盤の構造及び勾配の確保：特に実験苗畑区においては床盤のサイズが大きいので、硬化後のひび割れを防ぐためにコンクリートの水分管理及び打設後の養生に注意を要する。

(b) 灌水施設に係る管類の継手

(c) 排水施設のＵ字溝の勾配の確保

(d) 人工林試験地の各プロットの形とサイズの確保

(e) フェンスの支柱の保持

c．工事現場が LaeとBulooの相互に約 114km離れた2箇所に分かれる。また、これら両工事現場によって、工事内容及び工事環境は著しく異なる。したがって、資材及び労働者の調達及び工程管理については十分手落ちのないようにする必要がある。

(2) 契約方法の検討

本工事の発注は工事現場から約 300km離れ（陸路はない）た国際協力事業団パプア・ニューギニア事務所（在 Port Moresby)が行う。また、施工監理者を全工

期にわたって派遣できない事情にある。

現地の情報によれば、ＰＮＧにおける工事契約においてはペナルティ条項が設けられておらず、更に工事契約後の工事変更等が多いため、工事費については実際に工事が竣工するまでわからないという事情にある。

したがって、信用確実で十分な能力を持つ日系の業者に施工させることが望ましい。その場合、現地請負業者への部分的再委託という形となる。

また、日系業者に施工監理を委託し、現地請負業者に施工を発注する方法も考えられる。

(3) 現地日系企業

ＰＮＧに事務所を持つ日系企業は以下のとおりである。

a. NISSHO IWAI CORPORATION PORT MORESBY BRANCH

4th Levl Defence Force Building Corner Hunter St. Champion Pde.

P.O. Box 1493. Prot Moresby

Tel.214949. 214972

b. KUMAGAI GUMI CO., LTD.

Sonth Pacific office (Prot Moresby) Level 1, Suite 5B, Garden City

Angau Drive, Boroko, NCD. P.O.Box 873 Boroko

(4) 現地施工業者

Lae 及びPort Moresbyにおける著名な土木・建築業者を以下に示す。

① Lae

a. A. G. K. PACIFIC (N.G) PTY. LIMITED

P.O. Box 626 Lae

1967年設立、1985年から現在まで土木工事13件、建築工事30件の実績がある。土木工事は上下水道施設が主で、受注金額は10万～40万キナ、建築工事は学校・事務所・住宅・空港ビル・車庫等で、受注額は10万～20万キナのものが多い。これら受注工事のうち公共事業が半数以上を占めている。

b. LAE BUILDERS & CONTRACTORS PTY. LTD.

P.O. Box 1730, Montoro St. Lae

Lae市とMadang市に事務所を持つ建築設計・施工業者。商業用、工業用及び住宅建築工事の施工及び監理を行う。

c. NEIL-MOROBE PTY. LTD.

Cnr MulA & Abel Tasman Sts. Lae

d. THIESS WATKINS (PNG) LTD.

Saraga Street, 6-Mile Port Moresby

本社はPort Moresby市にあるが、 Lae市にも支社を持つ。THE THIESS WATKINS WHITB GROUP OF CO'Sのメンバーで、資産管理、事業管理、建築設計・施工、維持管理、販売、住宅建築、土木施工、高層ビル建築等を行う。

② Port Moresby

a. FLECHER MOROBE CONSTRUCTION PTY. LTD.

P.O.Box 848, Saraga Street 6-Mile Port Moresby

パプア・ニューギニアにおいて大手に入るニュージランドのゼネコンである。

b. BARCLAY BROS. (PNG) PTY. LTD.

3 Gabaka Street, Gordons, P.O. Box 1180 Boroko, Port Moresby

オーストラリアの土木・建築施工業者

c. KINAKON PNG PTY. LTD.

Sogeri Rd 12-Mile Port Moresby

オーストラリアの土木・建築施工業者。

d. HEBOU CONSTRUCTIONS (P.N.G.) PTY. LTD.

Saraga Street 6-Mile, P.O. Box 6207 Boroko

土木施工業者、造成工事を中心に行っている。

表５．建設物価（価格は平成２年５月のもの）

種　　別	仕　　様	単 位	価　格（キナ）		
			Lae公共事業省	Ｌａｅ市　場	Port Moresby市場
コンクリート工					
鉄筋コンクリート工		㎥	250.00		
コンクリートブロック	140㎜×190㎜×390㎜、２穴	100個			97.00
コンクリート杭	100㎜×100㎜×1,000㎜、無鉄筋	60本			¥360.00
レミコン	200kg/ ㎠	㎥	93.50		¥105.00
ポルトランドセメント	50kg入、マレーシア製	1袋		9.00	
川　砂		㎥	14.08		
砂　利	7～10㎜	㎥	17.60		
〃	30㎜	㎥	12.32		
〃	一　般	㎥			28.00~30.00
エラスタイト	3㎜厚×0.85m巾	m		5.00	
異形鉄筋	φ12㎜×10m（9.10kg）	1本	7.60	10.29	
〃	φ16㎜×10m（16.18kg）	〃	8.40	18.39	
〃	φ20㎜×10m（25.28kg）	〃	9.40	28.86	
配筋工		ton			900.00
ワイヤーメッシュ	2.4m×6m、62㎜　スパン（36.00kg）	1枚		42.31	
〃	4m×8m（F72）	〃	42.00		
フェンス工					
フェンス工		㎡	47.00		
金網（亜鉛引きﾁｪｰﾝﾒｯｼｭ）	1,800㎜×15m（44.00kg）、50㎜×2.5㎜	1巻		79.56	
〃	苗床用、1,200㎜×15m（25.00kg）、65㎜×2.5㎜	〃		41.44	
コーナーポスト（鋼）	50㎜（14.00kg）	1本		30.58	

種　　別	仕　　様	単　位	価　格（キナ）		
			Lae公共事業省	Ｌａｅ市　場	Port Moresby市場
中間ポスト（鋼）	40mm(10.00kg)	1本		21.73	
星型支柱（鋼）	穴付き、1,800mm(3.6kg)	10本		44.89	
針　金	亜鉛引き、1.25mm×50m/kg	kg		2.60	
有刺鉄線	亜鉛引き、２mm×400m（32kg）	1巻		60.29	
配管資材					
亜鉛メッキ鋼管	20mm×6.5m	1本		15.00	
〃	25mm×6.5m	〃		21.00	21.75
〃	32mm×6.5m	〃			28.00
〃	50mm×6.5m	〃			43.70
〃	100mm×6.5mm	〃			109.11
ＰＶＣ圧力パイプ	25mm×5.85m	〃		6.90	
〃	50mm×5.85m	〃		19.00	
蛇　口	外径20mm	1個		10.80	
屋根・貯水資材					
屋根工	亜鉛引きコルゲート鉄板、木造	㎡			18.00
亜鉛引きコルゲート鉄板	760mm×26ゲージ	m			4.85
屋根用釘	130本/ kg	25kg		78.50	55.00
断熱材	1.37m×54m	1巻			71.50
亜鉛引きU型雨樋	125mm×1,800mm×26ゲージ	1個		3.70	
〃	125mm×2,400mm×26ゲージ	〃		5.00	
亜鉛引き円筒雨樋	φ100mm×1,800mm×26ゲージ	〃		4.40	
貯水タンク	亜鉛引きコルゲート鉄板、13,500ℓ(3,000gal.)	〃		506.00	

種　　別	仕　　様	単 位	価　格（キナ）		
			Lae公共事業省	Ｌａｅ市　場	Port Moresby市場
木材・シート					
製材品	一　般	㎥	275.00		
〃	あらびき、防腐加工なし	〃			360.00
〃	表面加工、防腐加工済	〃			399.00
〃	規格品	〃			325.00
ビニールシート	1.55m×50m	1巻		75.00	
〃	3.00m×50m	〃		87.36	
〃	（5m×100m、6m×100m）			在庫切れ	
農業用シート	2.42m×50m	1巻		102.00	
電気資材					
電　線	2コア	m		0.98	
〃	照明用	〃		0.99	
〃	パワーポイント用	〃		1.14	
切替盤	単相、ブレーカー4 個＋カバー	一式		47.21	
防水コンセント	単　相	1個		10.26	
蛍光灯	2本付	〃		18.66	
コンセント	2箇所付	〃		8.78	
地下ケーブル（電線管）	φ20mm	m		2.75	
〃	φ25mm	〃		4.14	
スイッチ		1個		3.18	
アース		一式		8.86	

種　　別	仕　　様	単　位	価　格（キナ）		
			Lae公共事業省	Ｌａｅ市　場	Port Moresby市場
燃　料					
ガソリン	レギュラー	ℓ		0.516	
軽　油		〃		0.371	
潤滑油		〃		3.30	
重機リース					
ブルドーザー	D－4	時間		49.00	
〃	D－6	〃		71.00	
バックホー		〃		66.00	
ロードローラ		〃		33.00	
ショベルローダ		〃		49.00	
スプリンクラー					
アルミパイプ		m		12.00	
スプリンクラー		1個		15.00	
スプリンクラー支持台		〃		12.00	
パイプ末端		〃		15.00	
フレキシブルパイプ		m		7.50	
その他資材					
釘		0.5kg		0.80	
防犯用窓枠	亜鉛メッキ溶接メッシュ、3m×2.3m×5㎜（36kg）	1枚		55.04	
シャッター	亜鉛引き鋼製、手動式、3.00m高×5m幅	2ｾｯﾄ			※5,850.85
賃　金					
一般作業員		2週	105.00	110.00	
熟練工		〃	145.00		

注 1. ＊　は1年後の見積価格。
2. ※　は平成2年5月21日現在で、1箇月間有効。

8－6．工事契約書案

CONTRACT

For Construction of _____
_____
_____

This contract is executed on the ____ day of _____ at the JICA Papua New Guinea Office between _____

Japan International Cooperation Agency, Pupua New Guinea Office as authorized representative of the Japan International Cooperation Agnecy, hereinafter called "the JICA", and Mr. _____ of _____
_____
TEL. _____ Represented by _____ Nationality _____ Title _____ hereinafter called "the Contractor".

Both parties mutually agree under the terms of this Contract as follows;

ARTICLE 1 PURPOSE OF THE CONTRACT AND CONTRACT COST

The JICA agrees to employ the Contractor and the Contractor agrees to perform the Works for the construction of Model Infrastructure on Forest Research Project Located at Lae and Bululo, Morobe Province for the total amount of Kina. _____(_____
_____)
hereinafter called "contract Cost".

The following documents shall form integral part of this Contract;-

Terms and conditions of this contract
Specifications
Bill of Quantities
Drawings

Article 2 PERFORMANCE BOND

As a security for the faithful performance of the Works under this Contract, the Contractor has on the execution of this Contract deposited a performance bond with the JICA _____ Kina (_____ _____) in a Bank Guarantee issued by the _____ bearing the number _____ and date _____ which represents five (5) percent of the Contract Price. The name of the issuing bank and the form of the bank guarantee are to be approved by the JICA.

The JICA will return the performance Bond in cash or the Bank Guarantee to the Contractor as the case may be at the end of the twelve (12) months after final acceptance of the Works by the JICA as stipulated in Article 15 of this Contract, provided that the completed Works shall not show any defect or damage caused through the fault of the Contractor, or through the fault of any new Contractor in the case of termination of Contract by the JICA under Article 4.

Should the Contractor be in default,the JICA shall have the right to demand payment from all or any part of the performance Bond. In addition, the Contractor shall remain liable for the full loss sustained by the JICA.

Article 3 PAYMENT

The JICA agrees to effect payments for the Works to the Contractor in the following manner;-

a. Advance Payment to be effected upon the bringing of equipment and materials required for the Works and properly stored at the job site by the Contractor and of value estimated by the supervisor. Kina _____ (_____) which corresponds to Thirty (30) percent of the Contract Price shall be paid upon signing of this Contract.

b. Interim Payment to be effected according to the progress of the Works satisfactorily executed by the Contractor and accepted by the supervisor. Kina _____ (_____) which corresponds to Thirty (30) percent of the Contract Price shall be requested for payment at the middle of the construction term. In case that value of the executed construction works estimated by the supervisor is less than fifty (50) percent of the Contract Price, Interim payment shall be deducted by the full amount of advance payment, balance of which correspond to value of the executed construction works.

c. Final Payment, to be effected upon the satisfactory completion of the Works by the Contractor and accepted by the supervisor.

The remainder of Kina _____ (_____) which corresponds to Forty (40) percent of the Contract Price, or the remaining amount of Contract Price shall be paid after the Final Certificate by the JICA for payment to the Contract.

Payment under (b) and (c) shall be effected within ten (10) days after the respective acceptance of the Works by the supervisor.

Taxes payable by the Contractor, if any, shall be deducted at source by the JICA on each payment.

It is expressly understood that payments by the JICA do not mean acceptance responsibilities under this Contract.

Article 4 COMPLETION TIME

The Contractor agrees to commence the Works at the site within ten (10) days from the date of signing of this Contract (commencement date) and the Contractor agrees to satisfactorily complete the Works within _____ days (completion time) after the date hereof which will become due on _____ (completion date)

If the Contractor fails to commence the Works by the above commencement date, or should in the course of the construction any event occur which may reasonably cause the JICA to believe that the Contractor will not be able to complete the Works on the completion date, or should the Contractor fail to meet any of the Contract requirements, the JICA shall have the right to terminate this Contract by giving written notice to the Contractor.

However, in case that the Contractor fails to complete the Works by the completion date, or to meet any of the Contract requirements, if the supervisor thinks that the Contractor has the ability for completion of the Works within reasonably extended period, the Contractor may be permitted by the JICA to continue the Works beyond the completion date.

Article 5 PENALTY

In case that the Contractor is in default as mentioned in Article 4, the Contractor agrees to be responsible to the JICA as follows;-

5.1 In case of the termination by the default of commencement for the Works, the Contractor shall pay a penalty of (Kina) per day counting from the commencement date until the new Contract is completely executed with a new Contractor for this Works.

The period of which is included the time spent for finding the new Contractor and executing the new Contract etc.

5.2 In case the JICA thinks that the Contractor will not be able to complete the Works within the completion time and thereby terminates this Contract, the Contractor shall pay a penalty of (Kina) per day counting the number of days in the same manner as prescribed in 5.1 above. However, the JICA may reduce such number of days according to the ratio between the completed Works and the total Works as may be decided by the supervisor.

5.3 In case the Contractor fails to complete the Works by the completion date or to meet any Contract requirement, the Contractor shall pay a penalty of (Kina) per day counting from the date following the completion date until the Works satisfactorily completed and accepted by the supervisor.

Article 6 COMPENSATION

If the JICA sustains any losses as direct or indirect damages caused by the Contractor's failure, the Contractor shall compensate the JICA for such losses. The parties agree that time is essential for the completion of the Works.

Article 7 THE JICA'S RIGHT FOR DEFAULT

The JICA has the sole and absolute right to decide whether to terminate the Contract, to impose only the penalty on the Contractor or to claim the compensation for the damage as stated in Article 5 or Article 6. The money due to the JICA exercising its right under this article shall be retained and deducted from any money due to the Contractor but yet unpaid, including from the performance bond. If the total amount of the loss is larger than the money above-mentioned, the Contractor agrees that the JICA has the right to retain the construction equipment; materials and supplies etc. and demand payment of the balance from such equipment etc. or proceeds of sale thereof.

Article 8 CONTRACTOR'S RESPONSIBILITY ON TERMINATION OF THIS CONTRACT

After the Contract has been terminated in accordance with the foregoing Article 4, the JICA shall have the right to employ another Contractor (hereinafter called the "New Contractor") to carry on the remaining parts of the Works, and the payment for the Contractor which fails to complete the work shall be made out of the necessary Contract Price for the remaining Works. Should the remaining amount after payment of the advance and interim payment from the Contract Price, be

insufficient to effect payment to the new Contractor, the difference between such remaining amount and actual cost estimated by the JICA for the satisfactory completion Works carried out by the JICA, and the Contractor shall pay such difference to the JICA within ten (10) days from the date of request by the JICA, failing which interest at the rate of eighteen (18) percent per annum shall be charged thereon.

Article 9 SUPERVISOR

The supervisor, authorized to act on behalf of the JICA will be appointed by the JICA and the supervisor is entitled to do all things that the JICA may do so. The supervisor shall control and supervise the Works all the times whether it is in the preparation or implementation of the Works and the Contractor shall promptly furnish all necessary facilities for proper inspections of the Works in accordance with the supervisor's request. At any moment the supervisor can request the Contractor to stop the Works, if necessary and the Contractor shall have no claim on the JICA for extension of the completion time due to such suspension of the Works under this Article.

The Inspection will not be deemed as the acceptance of the Works, and the Contractor shall not be relieved from his responsibility to meet the Contract requirements by the fact that the Supervisor exercise their duties. Should it be found that the Works have not been satisfactorily performed in the faithful manner, the Contractor shall correct any part of the Works indicated by the supervisor within the period specified by the supervisor.

Article 10 PROHIBITION FOR THE EQUIPMENT REMOVAL

Should the Contractor fail to complete the Works during the completion time or the supervisor thinks that the contractor will not be able to satisfactorily complete the Works, any equipment and materials brought to the site for use on the Works shall not be removed without the prior approval of the supervisor in writing.

Article 11 RECTIFICATION OF THE DEFECTIVE CONSTRUCTION

For a further period of One (1) year after satisfactory completion and final acceptance of the Works by the JICA, whether completed by the Contractor or by the new Contractor in case of termination of Contract under Article 4, any damage to the Works which is caused by the Contractor's fault, either because of defective workmanship or the use of inferior materials or any other cause, shall be made good as necessary by the Contractor to the satisfaction of the JICA at no extra cost.

In case of the termination of the Contract, the JICA may decide which part of the Works should come under the Contractor's responsibility, and requests the Contractor to make good of the damaged Works. Should the Contractor fail to do so within period specified after receipt of written request to do so from the JICA, the JICA shall have the right to employ another Contractor to carry out such work and the Contractor agrees to bear all expenses incurred.

Article 12 DISCREPANCIES AMONG THE CONTRACT DOCUMENTS

Of, prior to or during the course of the Works, any discrepancies found in the drawing and/or the Specifications etc. attached to this Contract, the Contractor shall follow the ruling given by the supervisor at no additional cost to the JICA.

Article 13 CONSTRUCTION METHOD AND TEMPORARY WORKS

The construction method including implementation schedule and plan of the temporary works such as installation of temporary facilities, offices, warehouse, construction roads, electric wiring, etc. shall be submitted by the Contractor and approved by the supervisor at least ten (10) days in advance of the commencement of the Works.

Should the cost the above temporary works be estimated in the unit cost of each work items of Bill of Quantities in this Contract, and the Contractor is not entitled to claim any amount of charges for the temporary works.

Article 14 MODIFICATION OF PLAN

If the Supervisor finds it necessary to make modification of construction design, quantities and/or materials and so forth during the course of construction, the JICA has the right to order the modification of the Works to the Contractor, and such order shall be made in writing from the supervisor to the Contractor.

The JICA agrees to adjust upwards or downwards the necessary expense for such modification to the Contractor, which will be estimated by unit price in the bill of quantities of this Contract in case of modification of quantities of construction works. In the case of additional works which are not quoted by unit price in the bill of quantities of this Contract, the supervisor will make estimation thereof and the JICA will pay to the Contractor for such additional works accordingly. But if the Contractor does not agree to such estimation, the Contractor is then entitled to negotiate with the JICA. Also the extension of the completion time due to the modification shall be given by the JICA who

shall have the sole right to decide the number of days of such extension.

Article 15 ACCEPTANCE OF THE WORKS

When the entire Works have been completed, the Contractor shall submit the invoice in written form indicating the Work actually completed to the supervisor. If there are compliance with drawings or Technical Specifications, the JICA shall accept the Works as the final acceptance of satisfactory completion Works within ten (10) days after the receipt of the written form and it shall be deemed that the final acceptance has been made on such date of the receipt of the written form.

On the other hand, should non-compliance with drawings or General Specifications or defects be found in the Works executed by the Contractor, the supervisor will have the right not to accept the Works and to order the rectification of the Works. If the required period for the rectification of the Works is beyond the completion date, the Contractor shall not be relieved from its responsibility to pay the penalty as stipulated under clause 5.3, and after the completion of rectification of the Works, then the final acceptance will be made in the same manner as described in the first paragraph of this Article.

During the course of construction, whether in the completion time or of extended time specified in the last paragraph of Article 4, the JICA has the right to accept a part of the Works already completed in the written form which shall be considered as a part of final acceptance. However, both parties shall negotiate with each other for the maintenance and usage of the accepted part of the Works the contractor is not entitled to request the extension of the completion time due to any interruption caused by the use of such accepted Works by the JICA, the supervisor or the officers of Papua New Guinea Government authorities, or any delay in repairing such accepted Works.

Article 16 CONSTRUCTION ENGINEER

The Constractor shall appoint a construction engineer at his own expense for the supervisor of the Works performance, who shall be authorized to act on behalf of the Contractor, and the instructions given to him shall be deemed as given to the Contractor. Such construction engineer shall be a good speaker of English and accepted by the JICA, who shall stay at the job site all the time and shall not leave without obtaining the prior approval from the supervisor. If the Contractor replaces the construction engineer, the Contractor shall obtain the prior approval from the supervisor in writing.

Article 17 REPLACEMENT OF LABOUR, ENGINEER AND FOREMAN

The supervisor may request the Contractor to remove any of the Contractor's labours, foremen or engineers if it appears to the supervisor that such labour, foreman or engineer is incompetent for his job or is not suitable or is not capable of handling his workmen or staff, and the Contractor shall promptly replace any such labour, foreman or engineer. No extra cost or claim for extension of time will be allowed because of such replacement.

Article 18 SUB-CONTRACTOR

The Contractor shall not sub-contract or assign any portion of the Works under this Contract without obtaining the prior approval of the JICA who has the sole right to decide which portion of the Works may be sub-contracted or assigned to the Sub-Contractor. However, the Contractor shall be fully responsible for the Works done by the sub-contractor.

Article 19 FORCE MAJEURE

If either party temporary unable by reason of force majeure or the law regulation of the Papua New Guinea to meet any of its obligations under the Agreement, and if such party gives to the other party written notice of the event within seven (7) days after its occurrence, such obligations of the party as it is unable to perform by reason of the event shall be suspended as long as the inability continues.

The term "Force Majeure" as employed herein shall mean Act of God, strikes, lock-outs, or other industrial disturbances, acts of the public enemy, wars, blockades, earthquakes, storm, lightning, floods, washouts, civil disturbances, explosions, and any other similar events beyond the control of either party and which by the exercise of due diligence neither party is able to overcome.

Article 20 NOTICE

All Notices required by this Contract shall be effective only at the time of receipt thereof, and only when received by the parties concerned at following address;-

The JICA
Papua New Guinea Office
G.F. Pacific View Apartment
Lot 1, Section 84, Matirogo
N.C.D.
P.O.Box 6639, Boroko

The Contractor _____

_____

_____

_____

All Notices required by the terms of this Contract shall be made in writing in English Language, and delivered by registered mail or hand delivery.

Article 21 DISPUTE

In the event of any dispute arising from the interpretation and performance of the terms of this contract, both parties agree to make the best attempt with sincerity and in good faith to negotiate and amicably settle such dispute. When failed to do so, the parties agree to refer such dispute to arbitration under Papua New Guinea Commercial Arbitration Rules and Regulation, Port Moresby, by 2 arbitrators, each of which is to be appointed by each party. The decision of the arbitrators shall be final and hinding upon both parties, to appoint its arbitration within seven (7) days or should be arbitrators fail, within fifteen (15) days after their appointment, to agree upon the decision of the dispute or on decision is reached on the appointment of an umpire, then the dispute shall be brought before the court in Papua New Guinea for decision under the laws and procedures of the Papua New Guinea.

This Contract is executed in duplicate of the same tenor, one of the original copy to be kept by JICA and the other original copy to be kept by the Contractor. Both the JICA and the Contractor have set their signatures and affixed the seals thereto in the presence of the witnesses.

Matters that are not mentioned in this Contract but are related directory or indirectory to any aspect(s) of the construction, which is the topic of this Contract, shall be dealt with in accordance with the items of Australian Standard, General Conditions of Contract.

General Specification

1. Scope of the application of this specification

   a. The specifications described below are applied by the priority over other specifications on each construction item.

   b. The specifications of each construction item describe the general specification of the construction.

      If there was some scarce abbreviation in the drawing or some other additional works which should be done due to the technical common sense on the structure, appearance and function comparing with the drawing, the contractor should implement in the work within the contract price according to the order of the supervisor.

   c. If there are better materials and methods to present the content of drawings, the contractor may do the better way of construction with in his responsibility after submitting the designs, plans and proposals to the supervisor to get the acceptance of the supervisor.

2. Doubt about the plan and its alternation

   The contractor should ask the supervisor immediately when he find out any of the cases mentioned below:

   a. Mismatching between drawings and description

   b. Unclear explanation or the occurrence of some doubt on drawing and/or description

   c. Mismatching between drawing and/or description on the site condition concerned

   d. Occurrence of unexpected situations which prevent the contractor from fulfilling the assigned condition of the drawings and descriptions.

3. If there are some needs on the slight alternations described below, the alternation should be done with the order of the supervisor.

   a. Slight alternation for fixing or matching:
      size of the materials
      specification
      construction method
      setting location

   b. Slight alternation of quantities of the materials

   In this case, the amount of contract price will not be changed.

4. Alternation of the plan

   In case of requisition form the supervisor to alternate the plan partially or to construct the additional items and/or quantities, the contractor should submit the relative document of the materials and the cost description to the supervisor. The alternative construction should be implemented after the acceptance of the document and reception of the order from the supervisor with the document.

5. Procedure for the government organizations concerned

   If legal documents are necessary to implement the construction work, the contractor should prepare the documents by his own expense and should go through the procedure without delay.

6. Delivery of the constructed facilities

   When the construction work was finished, the contractor should deliver the constructed facilities together with the compiled document to the orderer with the presence of the supervisor according to the order of the supervisor.

7. Certificate

a. In case, if the defect of the constructed facilities was found out, the contractor should survey the cause of the defect together with the supervisor.

And if the defect is caused by the materials or methods of the construction, the contractor should repair it soon, according to the contract, following with the permission of the orderer and the supervisor.

b. If the defect was caused by the materials or the methods which are already permitted by the supervisor and/or are already passed the inspection, the contractor can not escape from the defect security responsibility.

8. After delivery inspection

a. The after delivery inspection of the constructed facilities shall be done after 1 year.

b. The inspections mentioned above shall be done by the supervisor accompanied with the contractor.

c. If the defect caused by the materials and/or the methods was found out, the contractor, in principle, will repair the defect by his own expense soon.

d. If there was an argument on the responsibility of the repairment, the discussion should be held to determine the method of the repairment and the cost of the payment.

9. Scope of the construction and the expense which shall be included in the construction cost

a. The scope of the construction work shall be determined by drawings and specific description. But if there were no description on the related drawings and/or specific description, the construction work, raw materials and the manufactured materials which are necessary to finish the work should be included in the construction work.

b. The construction work and/or the expense mentioned below are included in the construction cost except that there exist in the special description.

1. Expenses of the experimentation and inspection of the construction work, the raw materials and the manufactured materials.

2. The scaffoldings, the transportation facilities and the construction work for its reinforcement, tentative electricity supply, tentative water supply, drainage, material storage and tentative workshop.

3. Destruction of tentative construction which suffer the construction work.

4. Construction and clearance of entrance and pass way for the transportation of construction machinery and materials.

5. Display plate for the construction work.

10. The representative of the contractor

a. If the contractor needs to appoint a representative person for the construction work, according to the contract and the laws of the construction concerned, the contractor has to apply the matter to the orderer and the supervisor to get an approval with the personal history of the representative person. The contractor should select the person who has much experience for the construction work. Superior technology, fine character and the qualification of the construction work is required.

b. If the orderer or the supervisor recognized that the representative person is not appropriate for the work and requested to change the person with clear reason, the contractor should change the representative person.

c. The representative should deal with all of the construction work and paper work at the construction site in his responsibility.

11. The safety and sanitation

a. According to the laws and regulations of the construction work concerned, the safety and sanitation management in the construction site should be implemented by the contractor with his own responsibility.

b. The construction site should always be arranged and cleaned.

c. If there is dangerous thing in the site, careful inspection should be done to prevent the accident, fire and robbery.

d. The neibouring structure should be prevented from damage. If there is any damage caused by the construction work, the contractor should recover them by his own expenses.

12. The cleaning and the recovery from the damage

a. When the construction work is finished, the contractor should take off the tentative structure and should clean the facilities and its surroundings.

b. If the 3rd party has got the damage caused by the construction work the contractor should recover and/or compensate for this by his own expenses.

c. If the facilities or any parts of it were used for the construction work with the permission of the supervisor, the contractor should recover it according with the condition of the drawings and description.

13. Working plan

a. Before the beginning of each construction items, the contractor should draw the construction plan and/or manufacturing plan and the contractor should get the permission from the supervisor on it.

14. The Work Schedule

a. The work schedule should be planned by the contractor and it should be permitted by the supervisor before the beginning of the construction work.

b. The total work schedule should be drawn with the method of bar chart or network schedule chart which include all of the construction items.

c. Detailed work schedules should be drawn for each construction items.

15. Progress control

The contractor should be careful on the progress of the construction. If there is any order from the supervisor, the contractor should survey the point and rearrange the schedule to keep the appointed date of delivery.

16. Presence of the supervisor

The contractor should request the presence of the supervisor in the cases mentioned below:

1. Ordered construction items in the plan
2. If there are impossible or difficult items to inspect the construction work after the completion.

17. The care

The part of the constructed facilities, materials expected to use or part of present facilities which are possible to the polluted or damaged should be cared by some appropriate methods.

18. The obstacles

The obstacles which cause difficulties against the construction work should be disposed with the consultation and the permission of supervisor.

19. The sub-constructor

In case if the special technical operator or the cooperative operator are required the sub-contractor, the contractor should submit the list of them and should get the acceptance from the supervisor.

20. The sample

If it is assigned by the specification, description or by the order of the supervisor, the samples of the materials and the manufactural materials should be shown to the supervisor and should be got the permission for using on its texture, finishing grade, colores etc.

21. Progress report of the construction work

The contractor should submit monthly report which contains on the progress of the construction work, date and contents of field meeting between the contractor and supervisor, order from the supervisor, date and quantity of the transported materials together with the progressed quantity chart, progress drawings and the photographs described below.

22. Important document at the end of the construction work

The application documents for the government organization concerned, permitted document from them, the document which should be reserved by the orderer etc. should be compiled with its catalogue by the contractor and it should be reported to the orderer through the supervisor when the construction work is finished.

23. Submission of drawings

After the final inspection, drawings which are drawn for the construction should be rearranged according to the order of the supervisor and should be submitted to the supervisor.

24. Submission of real work schedule

The total work schedule and work schedule of each construction item should be revised according to the real progress of the construction work and should be submitted to the supervisorly the contractor.

25. The photographs

According to the description or the order of the supervisor, the contractor should take the photographs of the construction items under the construction and after the completion and submit them to the supervisor.

26. The keys

The keys should be checked the adaptation to each lock with the presence of the contractor. If they are adaptable, the numbered tag should be attached to the keys. The allocation drawing of the key and the catalogue should be submitted to the supervisor. The number of the key should be three in each lock.

8－8．ミニッツ

THE MINUTES OF DISCUSSIONS ON THE FOREST RESEARCH PROJECT IN PAPUA NEW GUINEA

The Japanese Consultation Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency and headed by Mr. Jun-ichi KONUMA, visited Papua New Guinea from April 9 to April 21 for the purpose of reviewing past activities and working out the details of implementation plan of the above-mentioned Project.

During its stay in Papua New Guinea, the Team has carried out a field survey and held a series of discussions with the authorities concerned of the Government of Papua New Guinea.

As the result of the survey and discussions, the Team and the Papua New Guinea authorities concerned agreed to recommend to their respective Governments the matters referred to in the document attached hereto.

Port Moresby, Papua New Guinea

April 20, 1990

Mr. Jun-ichi Konuma
Leader,
Consultation Team,
Japan International Cooperation
Agency, JAPAN

Mr. Christopher Mero
Assistant Director,
Office of International Development
Assistance,
Department of Finance & Planning,
Papua New Guinea

Witnessed by

Mr. Michael Komtagarea
Secretary,
Department of Forests,
Papua New Guinea

1. Research activities

Item \ Japan Fiscal Year	1st 1989	2nd 1990	3rd 1991	4th 1992	5th 1993
I Forest Research					
1 Nursery practice, planting and tending					
1) Improvement and enrichment of forest stands					
2) Tree breeding and progeny testing					
3) Mycorrhiza inoculation and Acacia Rhizobium introduction					
2 Seed technology of major species					
Seed technology of main plantation and natural forest species					
3 Soil classification and soil fertility					
Genesis and characteristics of forest soil in PNG					
4 Forest entomology and insect control method					
Impact of insects on main tree species					
5 Forest pathology					
Root and heart rot of commercial tree species					

Item \ Japan Fiscal Year	1st 1989	2nd 1990	3rd 1991	4th 1992	5th 1993
II Forest Products Research					
1 Wood preservation					
1) Treatability studies of lesser used species					
2) Performance of CCA pressure treated timbers in marine environment and inspection of waterfront structures					
2 Chemical properties of major and lesser-known species					
1) Fundamental procedure for wood chemistry					
2) Wood extractives					
3 Physical and mechanical properties of tree species					
1) Physical properties of lesser used species					
2) Mechanical properties of lesser used species					
4 Wood seasoning and sawmilling techniques					
1) Assessments of sawmilling practices and their efficiency					
2) Assessments of seasoning practices and their efficiency					
3) Wood machining properties					

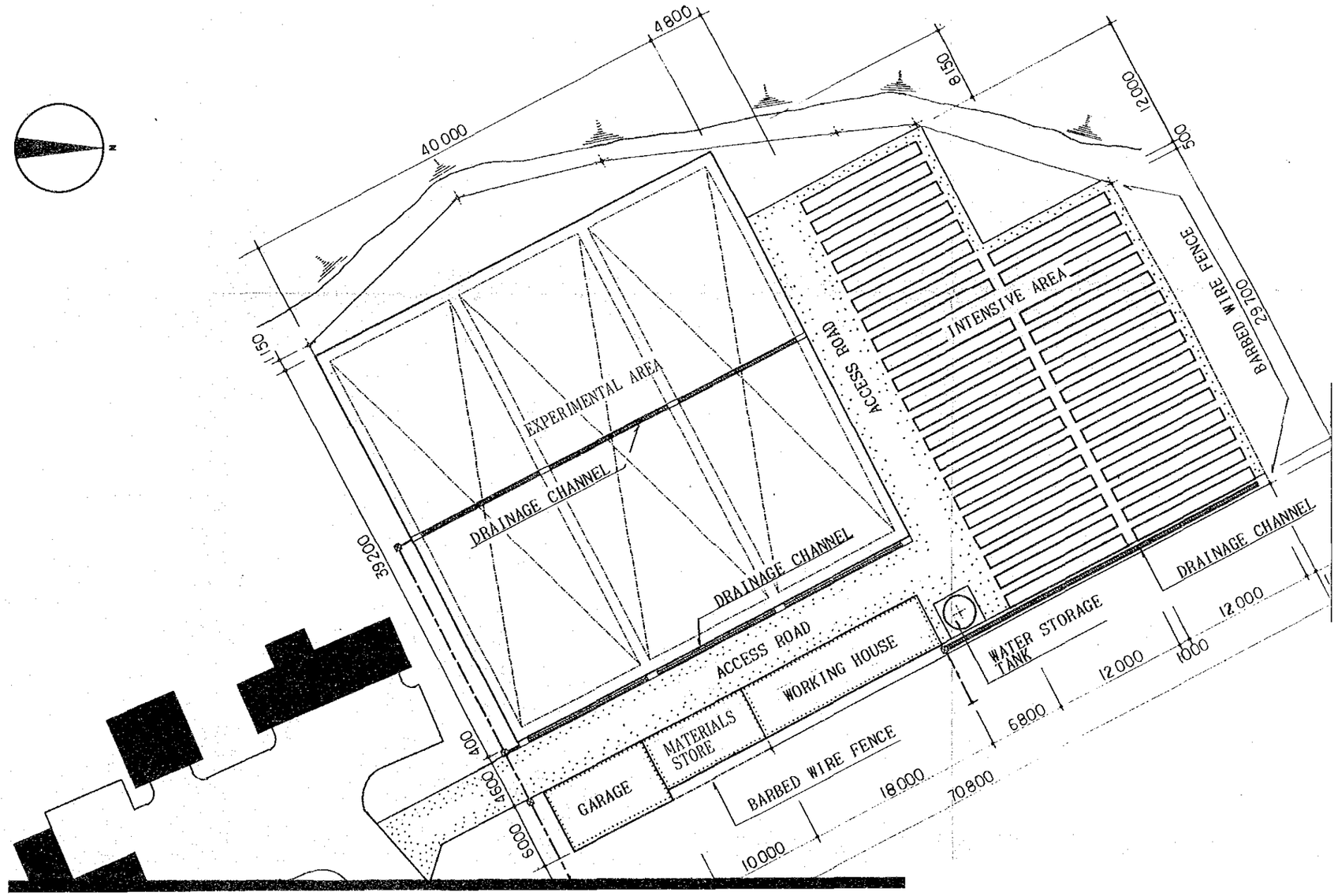
2. The Papua New Guinea side strongly requested the research on natural forest dynamics.

In response, the Team resolved to consider the request as a topic of examination and to convey the fact of the request to the Japanese Government.

3. The Papua New Guinea side will secure land for nursery on the premises of Forest Research Institute, Lae, and for experimental forests at Bulolo Forest Research Station by June 30, 1990.

LIST OF ATTACHMENTS

Sheet No.	Title
MK－01	Site Plan
〃－02	Experimental Area (Floor Plan)
〃－03	〃 (Timber Frame Plan)
〃－04	Garage, Materials Store, Working House (Floor Plan, Foundation Plan, Roof Plan, Illumination Plan)
〃－05	Garage, Materials Store, Working House (Elevation, Section)
〃－06	Garage (Detail Section)
〃－07	Experimental Plantation (Site Plan)
〃－08	〃 (Gate, Barbed wire Fence, Location Board)
〃－09	Intensive Area (Raised Bed Plan, Steel Frame Plan)
〃－10	Water Storage Tank (Foundation Plan, Frame Plan, Elevation, Detail)
〃－11	Water Storage Tank (Elevation, Section)
〃－12	Site Plan (Electric Installation, Water Supply & Drainage Plumbing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EXPERIMENTAL AREA
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DRAINAGE CHANNEL
ACCESS ROAD
INTENSIVE AREA
BARBED WIRE FENCE
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ACCESS ROAD
WORKING HOUSE
WATER STORAGE TANK
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MATERIALS STORE
GARAGE
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4000
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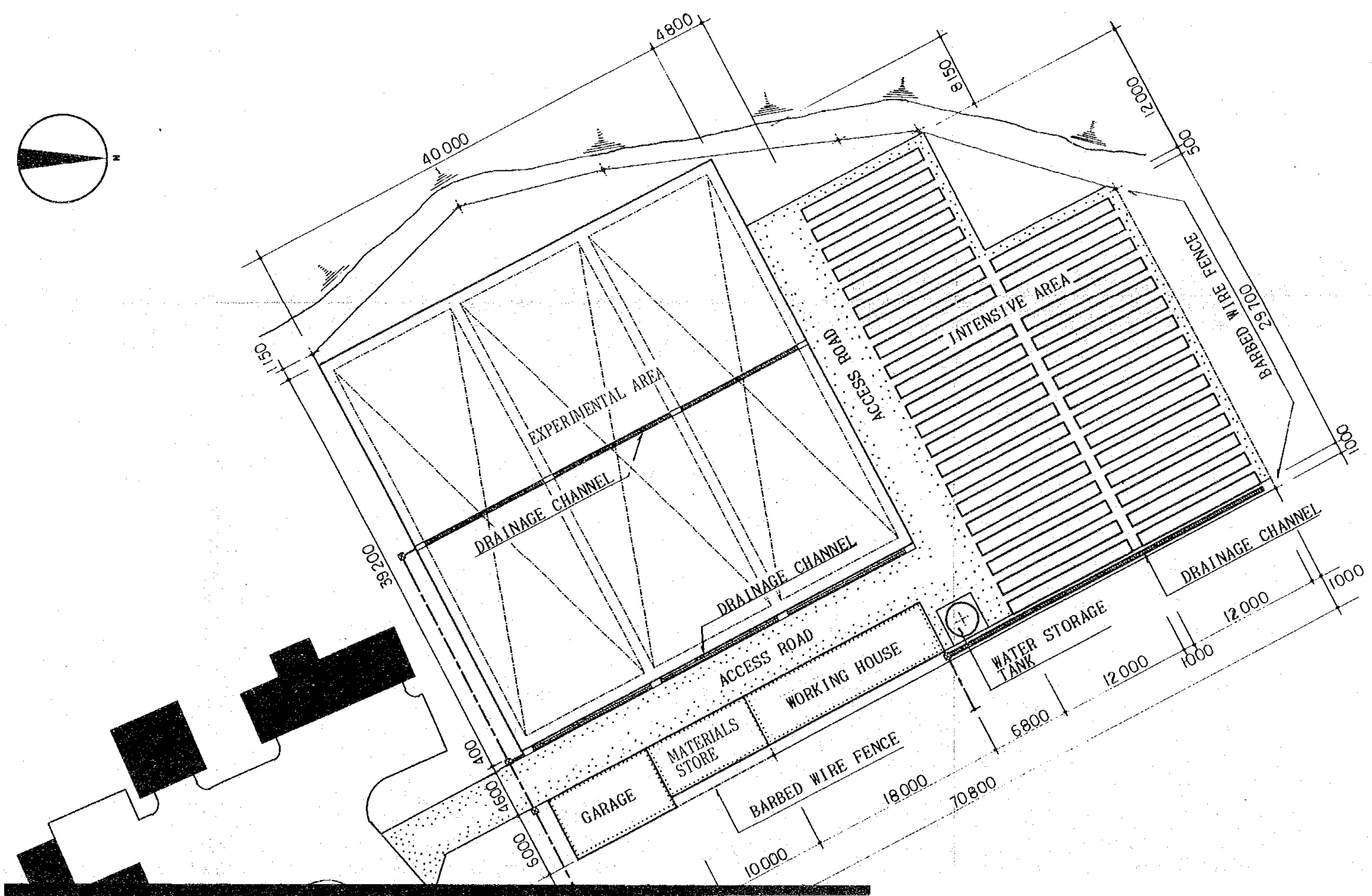

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ACCESS ROAD
INTENSIVE AREA
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DRAINAGE CHANNEL
WATER STORAGE TANK
ACCESS ROAD
WORKING HOUSE
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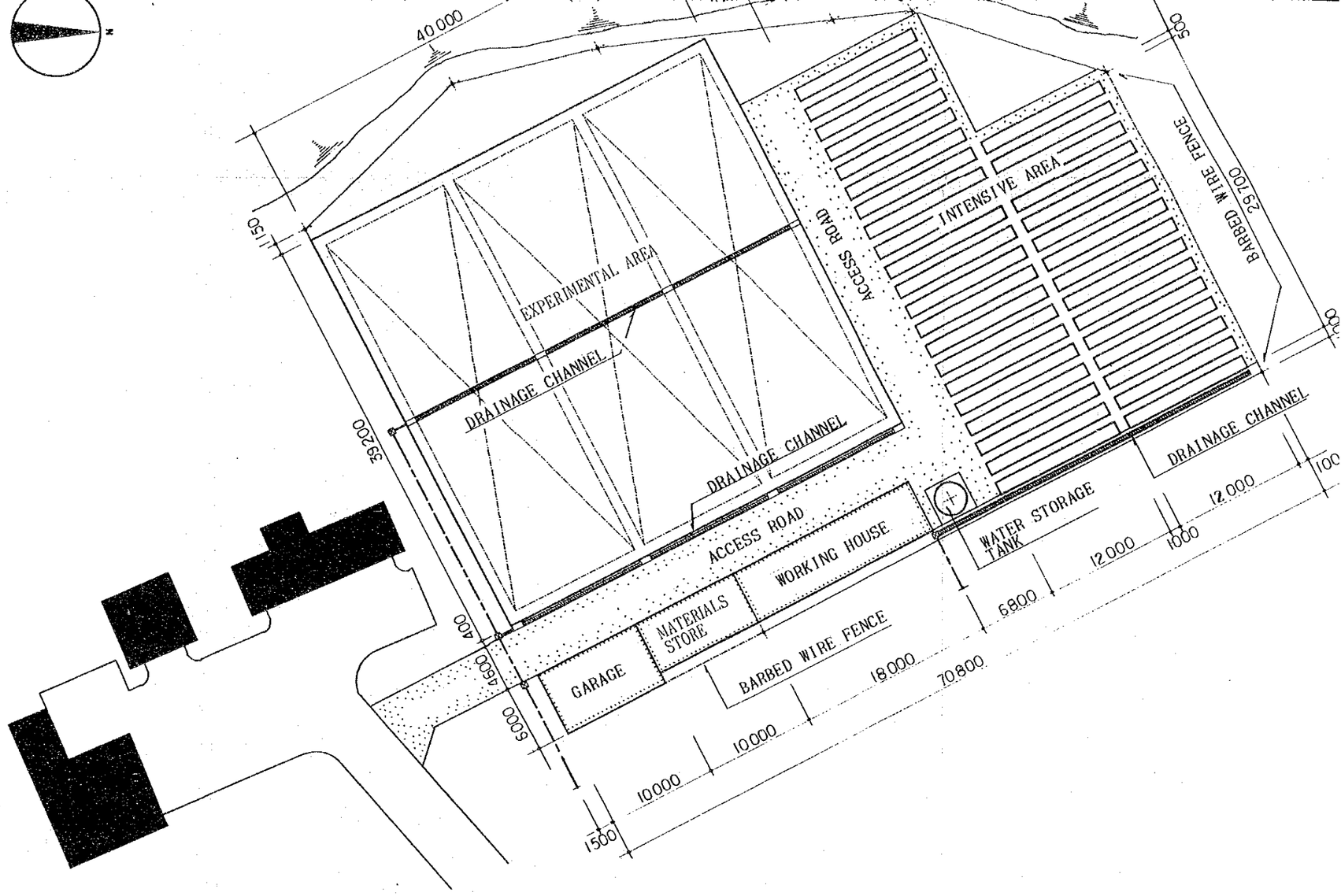
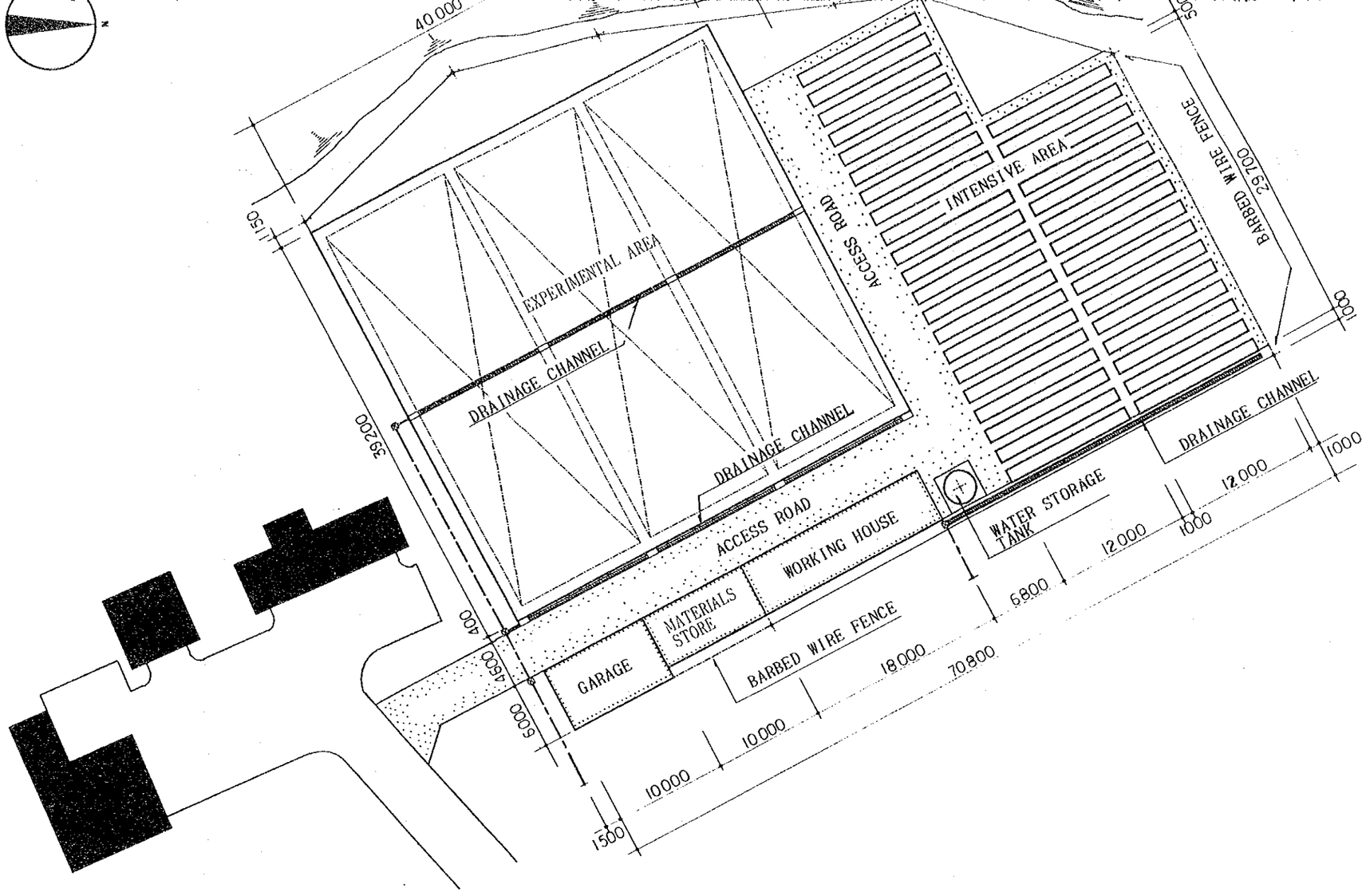
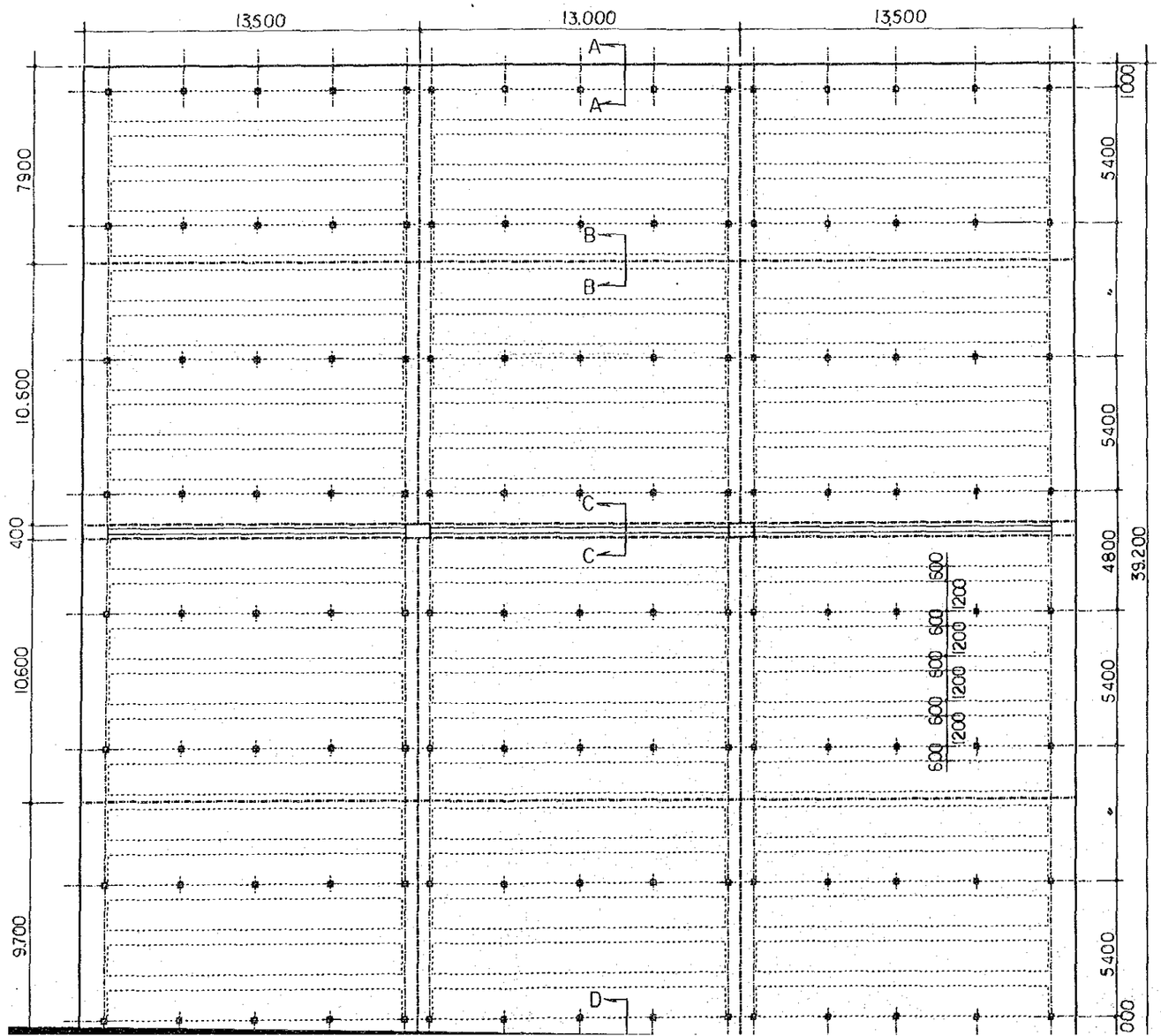


THE MODEL INFRASTRUCTURE WORK FOR THE FOREST RESEARCH PROJECT IN PAPUA NEW GUINEA	SITE PLAN	S = 1 /
		MK-(



MODEL INFRASTRUCTURE WORK FOR THE FOREST RESEARCH PROJECT IN PAPUA NEW GUINEA	SITE PLAN	S=1/400
		MK-01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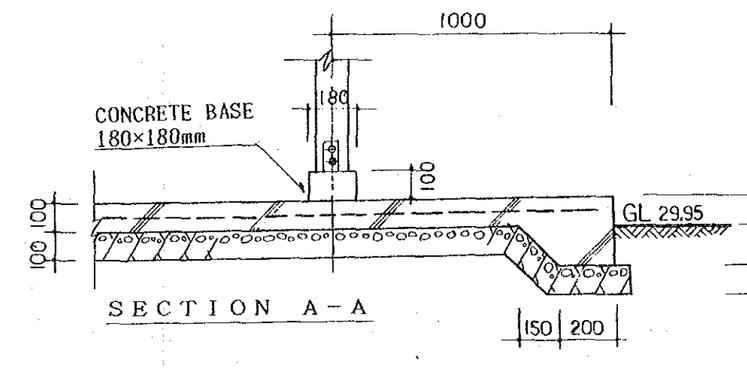
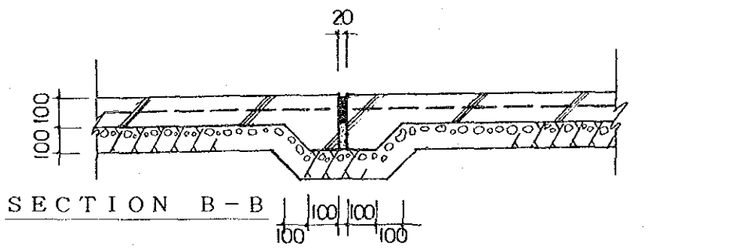
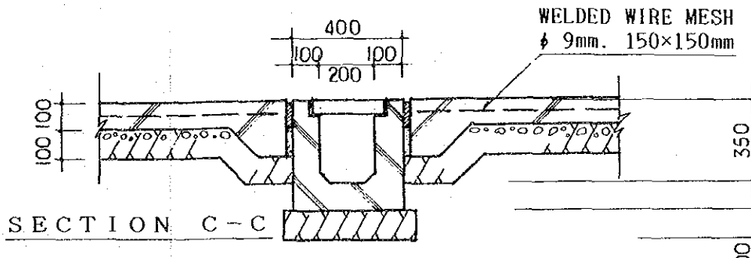
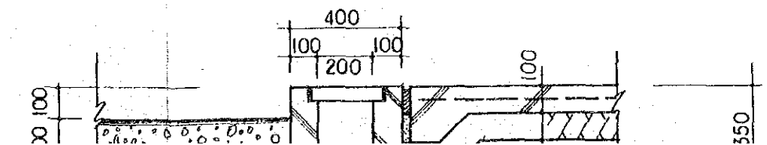
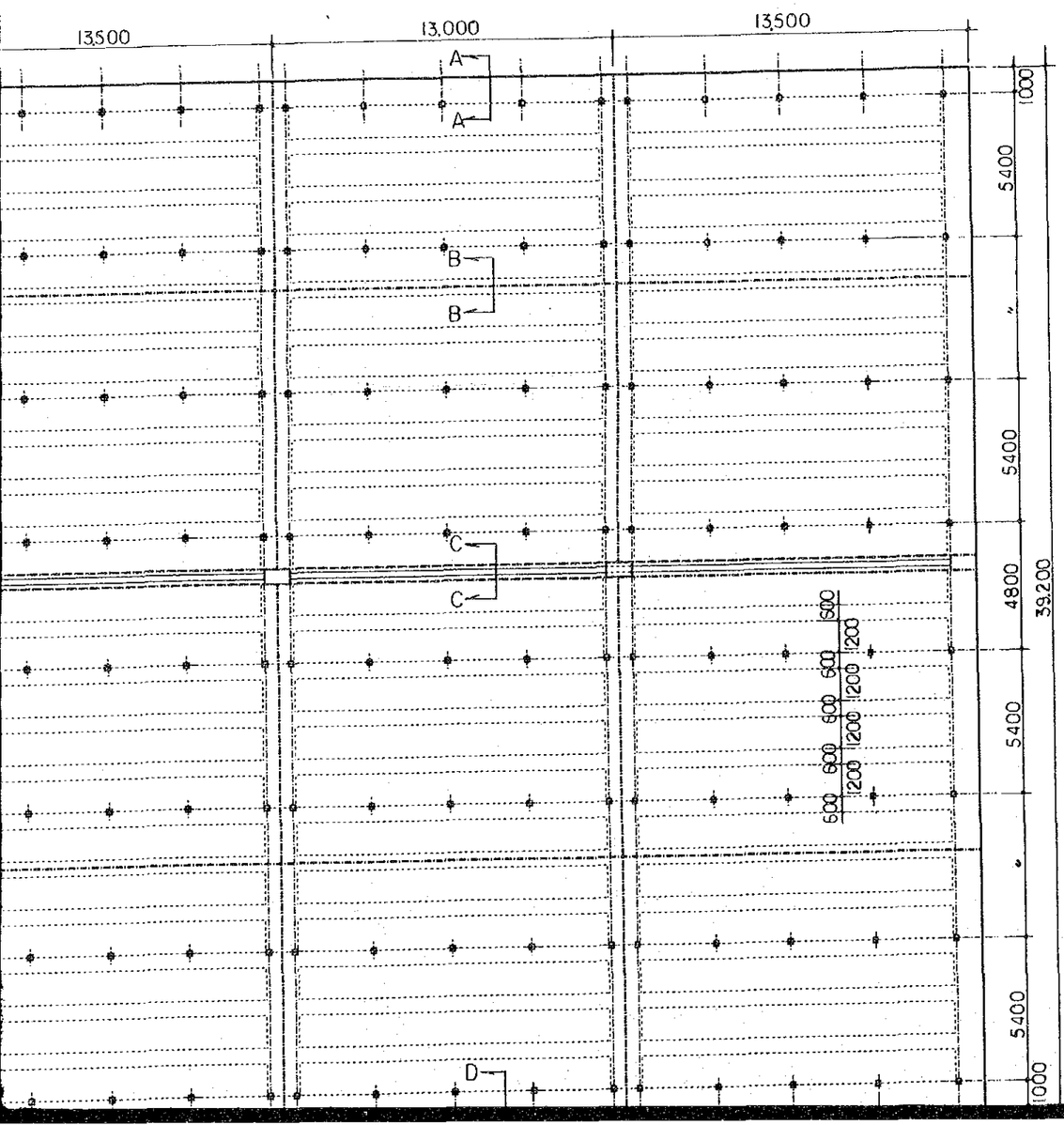
10600
9700
5400
1000
39200
A
A
B
B
C
C
D
500
1200
600
1200
800
1200
600
1200
600

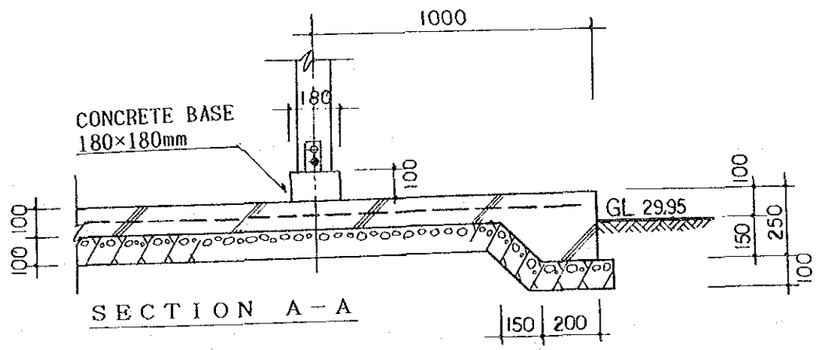

1000
180
CONCRETE BASE
180×180mm
100
GL 29.95
100
100
150
150
200
SECTION A-A


20
100
100
SECTION B-B
100
100
100
100

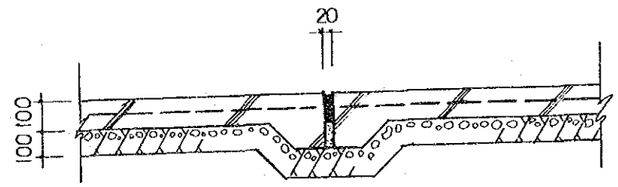

WELDED WIRE MESH
φ 9mm. 150×150mm
400
100
100
200
100
100
350
100
SECTION C-C


400
100
100
200
100
100
350

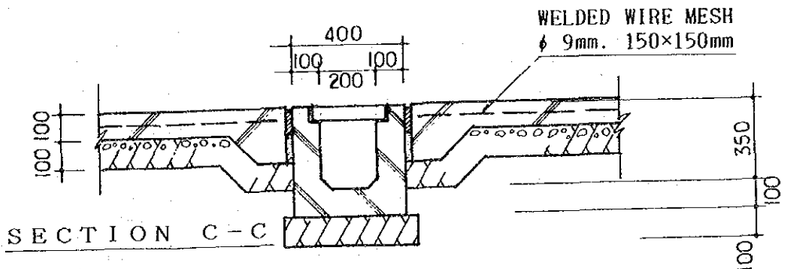




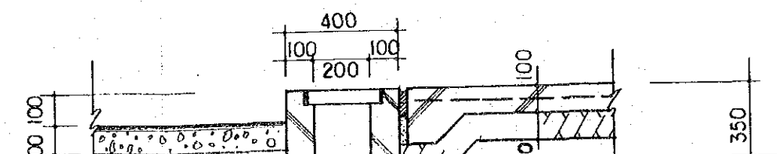
SECTION A－A

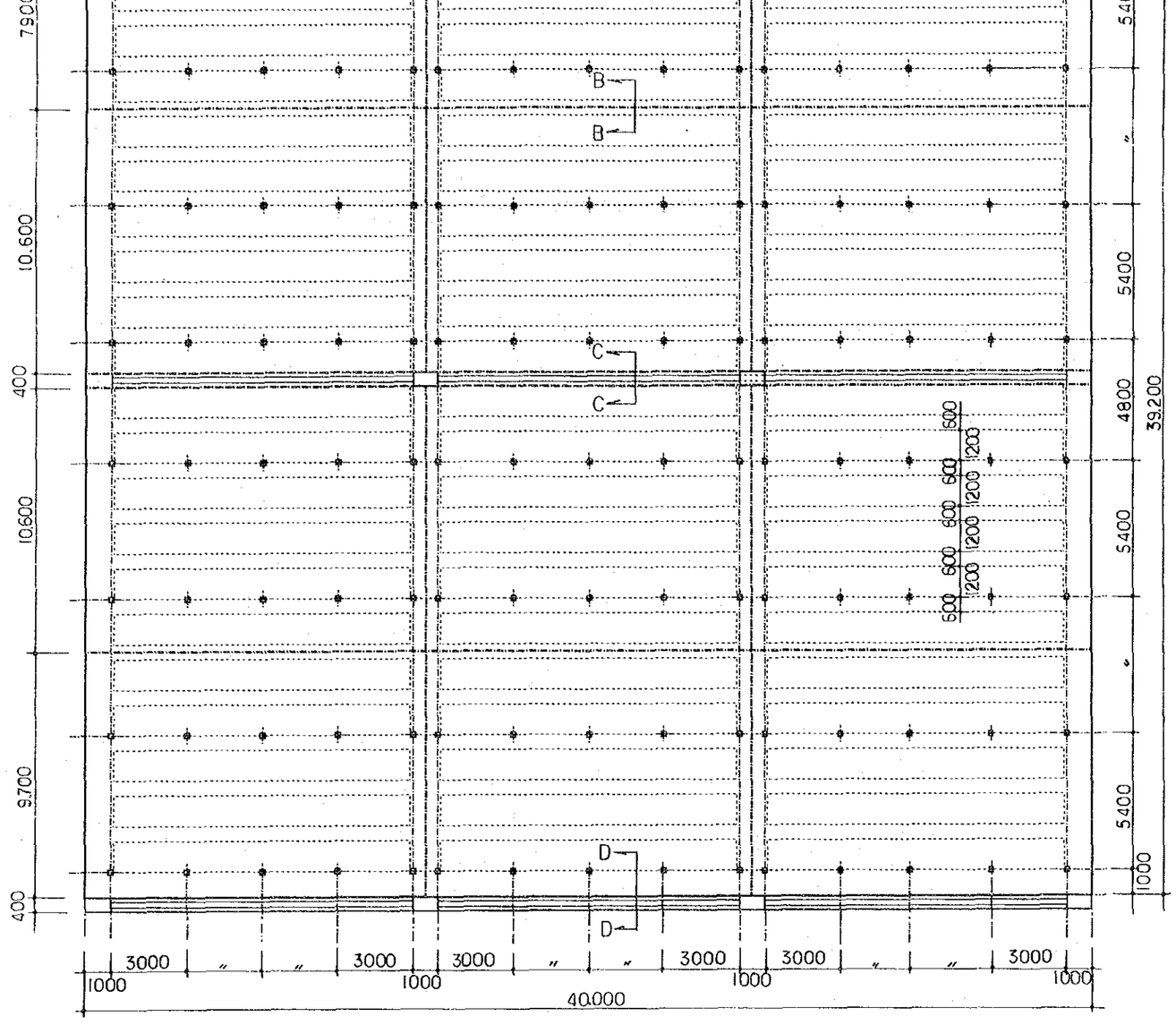


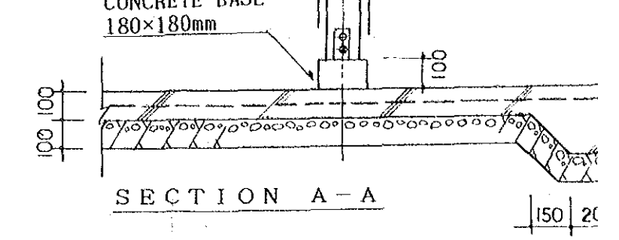
SECTION B－B

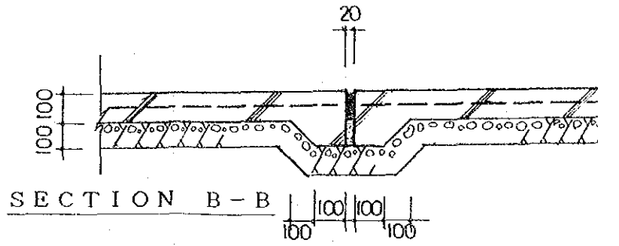


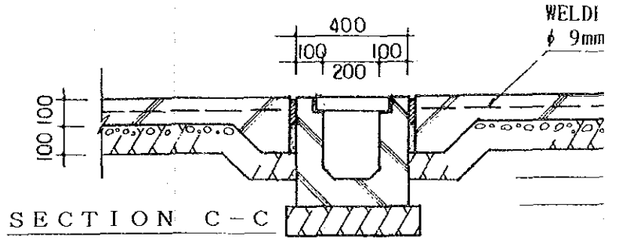
SECTION C－C

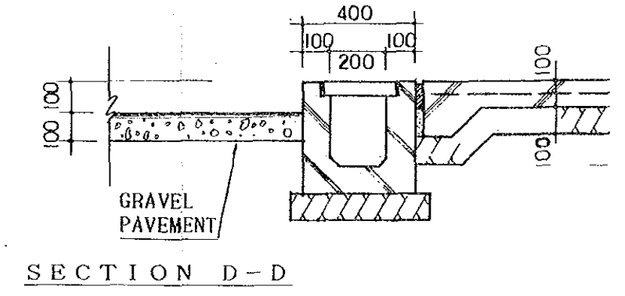




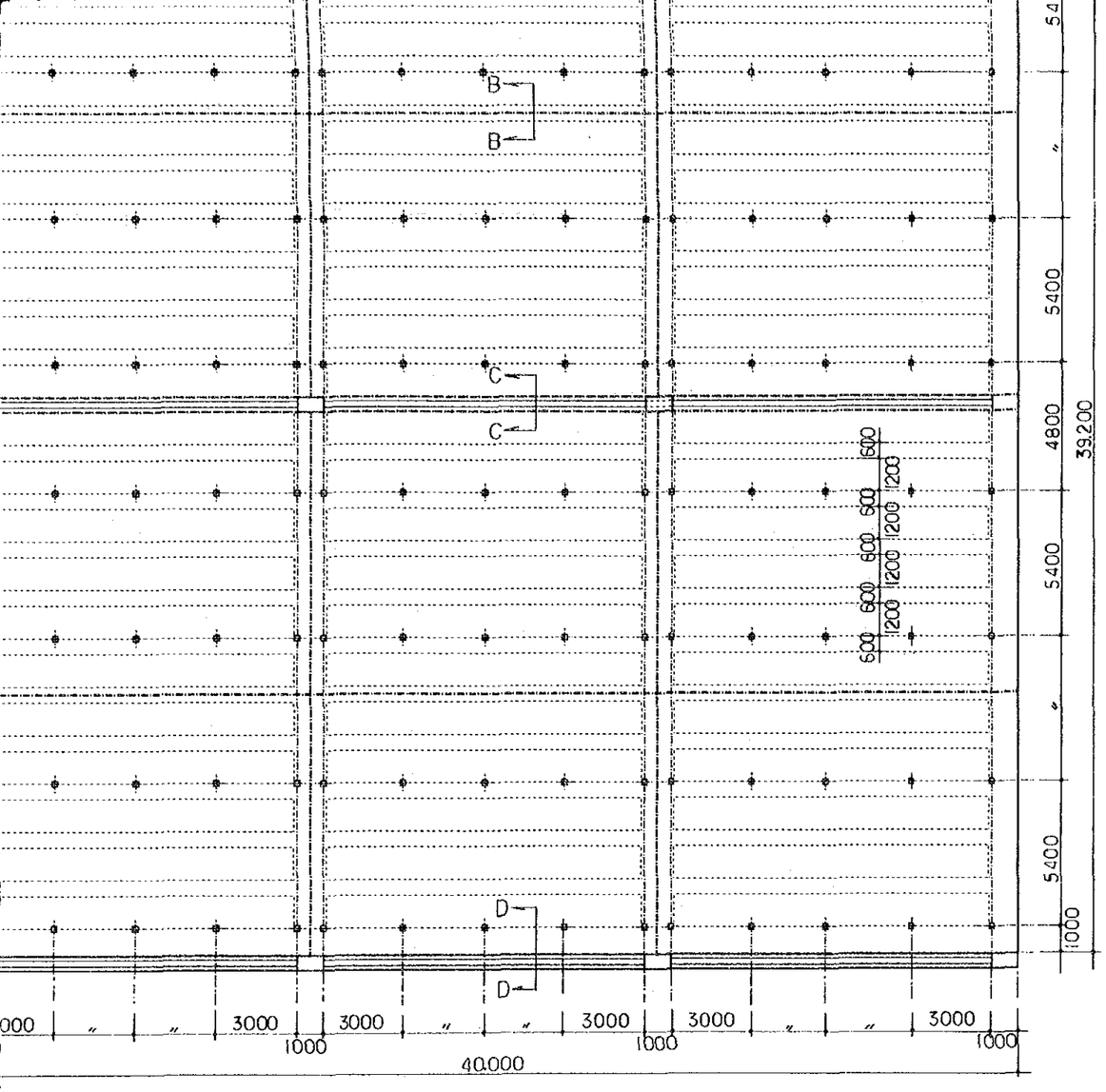


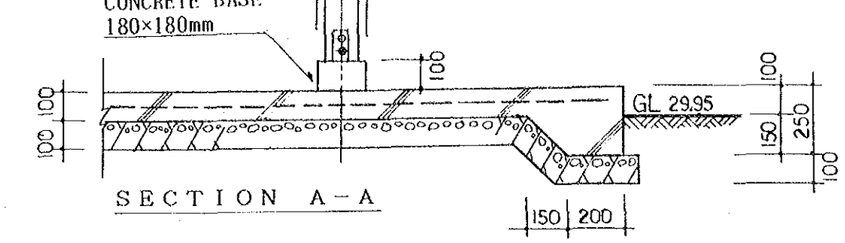




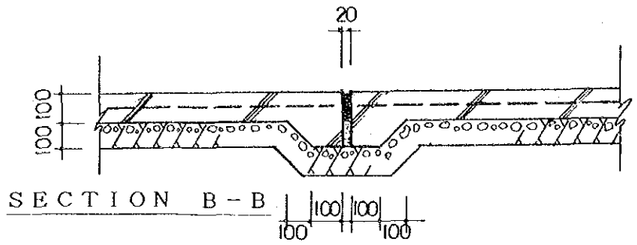


THE MODEL INFRASTRUCTURE WORK FOR THE FOREST RESEARCH PROJECT IN PAPUA NEW GUINEA	EXPERIMENTAL AREA
	FLOOR PLAN

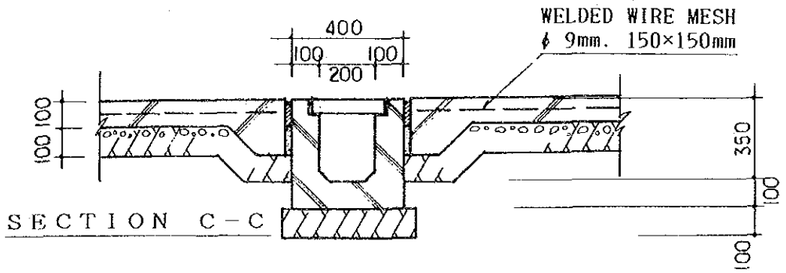




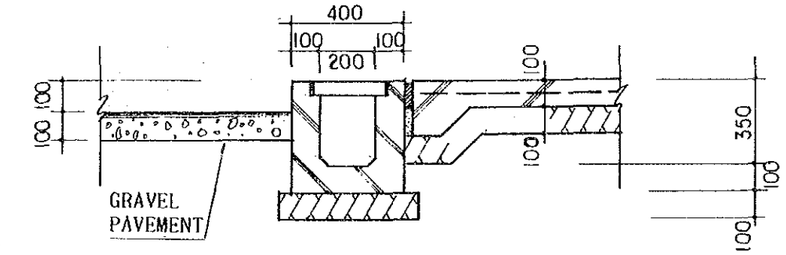
SECTION A－A



SECTION B－B

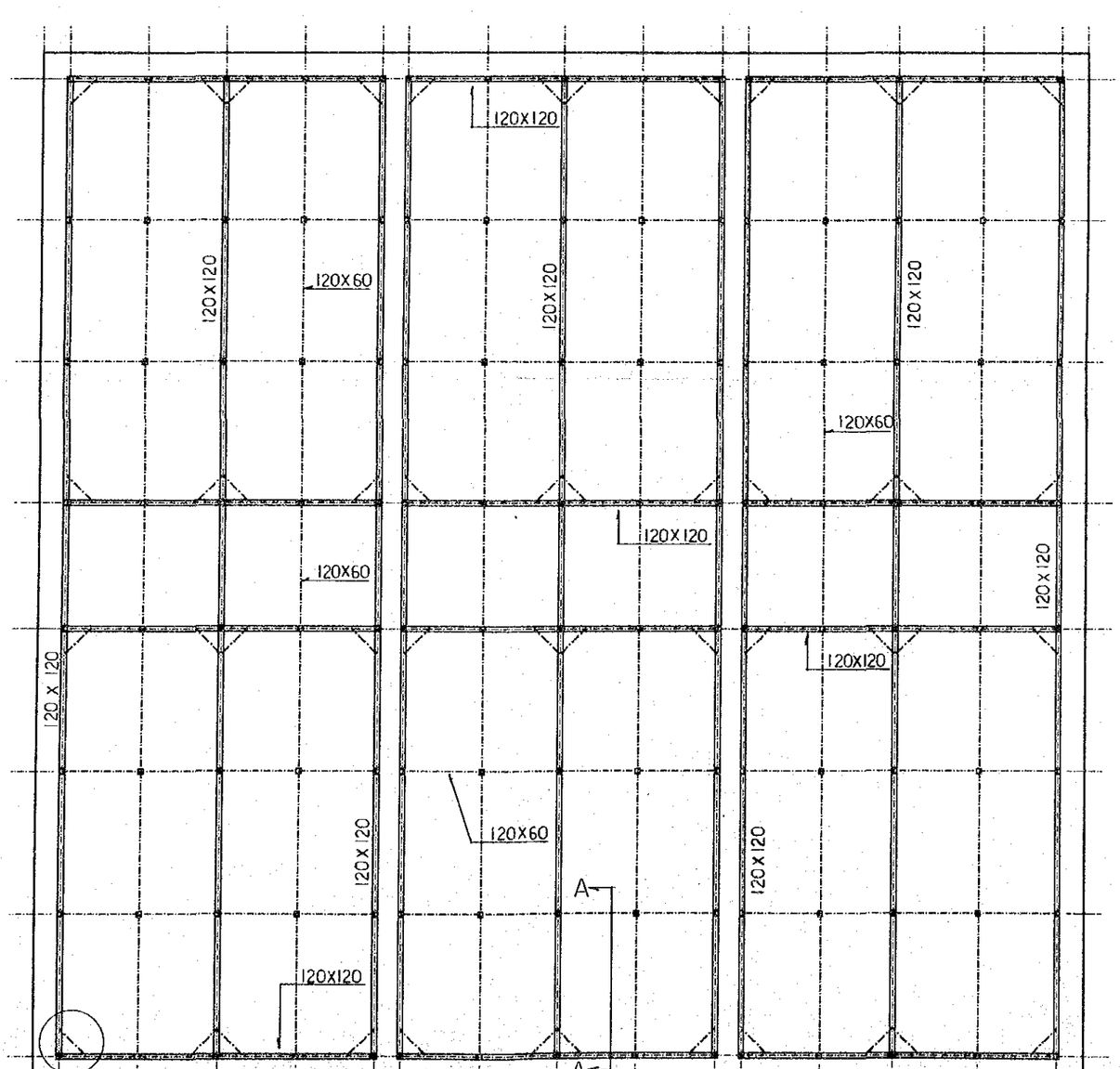


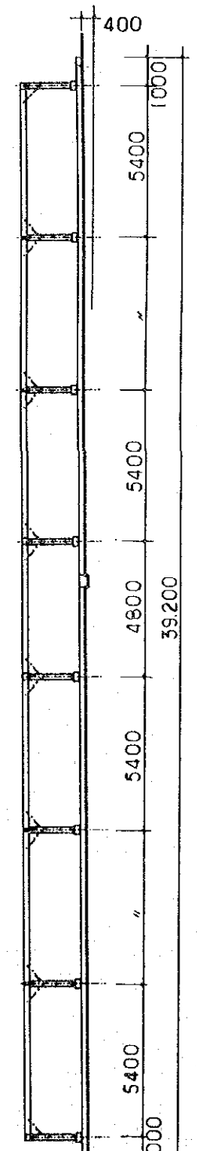
SECTION C－C

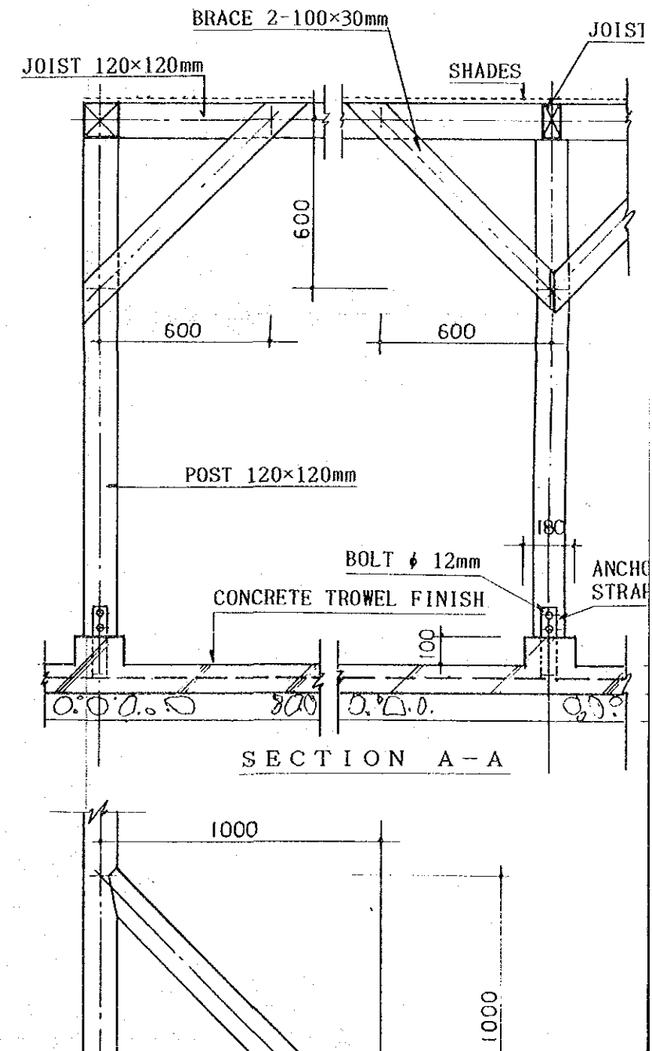


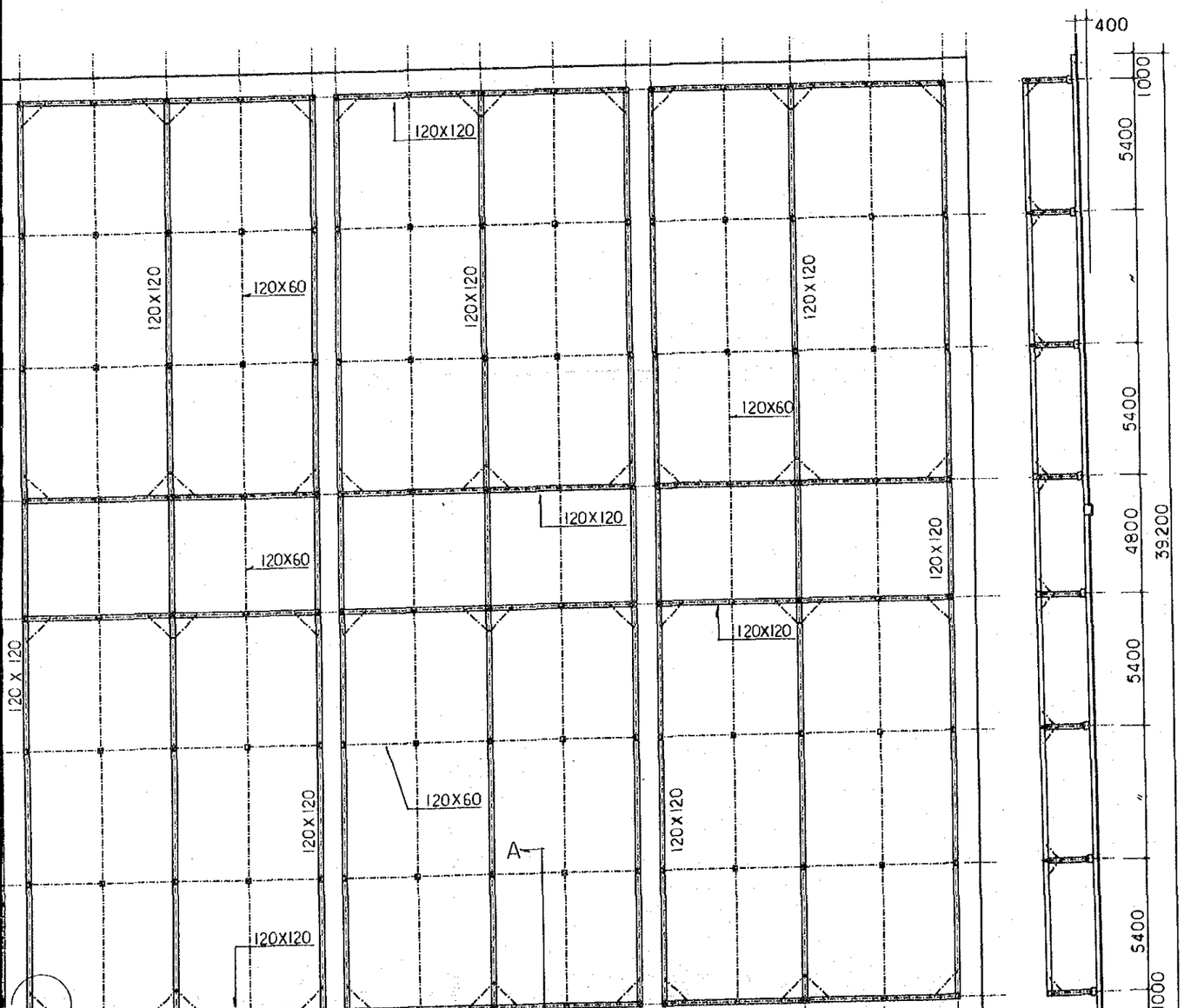
SECTION D－D

ODEL INFRASTRUCTURE WORK FOR THE FOREST RESEARCH PROJECT IN PAPUA NEW GUINEA	EXPERIMENTAL AREA	S＝1／20 S＝1／200
	FLOOR PLAN	MK-02


120X120
120X120
120X60
120X120
120X120
120X60
120X120
120X120
120X60
120X120
120X120
120X120
120X60
120X120
A
A


400
1000
5400
5400
4800
5400
5400
1000
39,200


BRACE 2-100×30mm
JOIST 120×120mm
SHADES
600
600
600
POST 120×120mm
180
BOLT ϕ 12mm
CONCRETE TROWEL FINISH
100
300
SECTION A-A
1000
1000

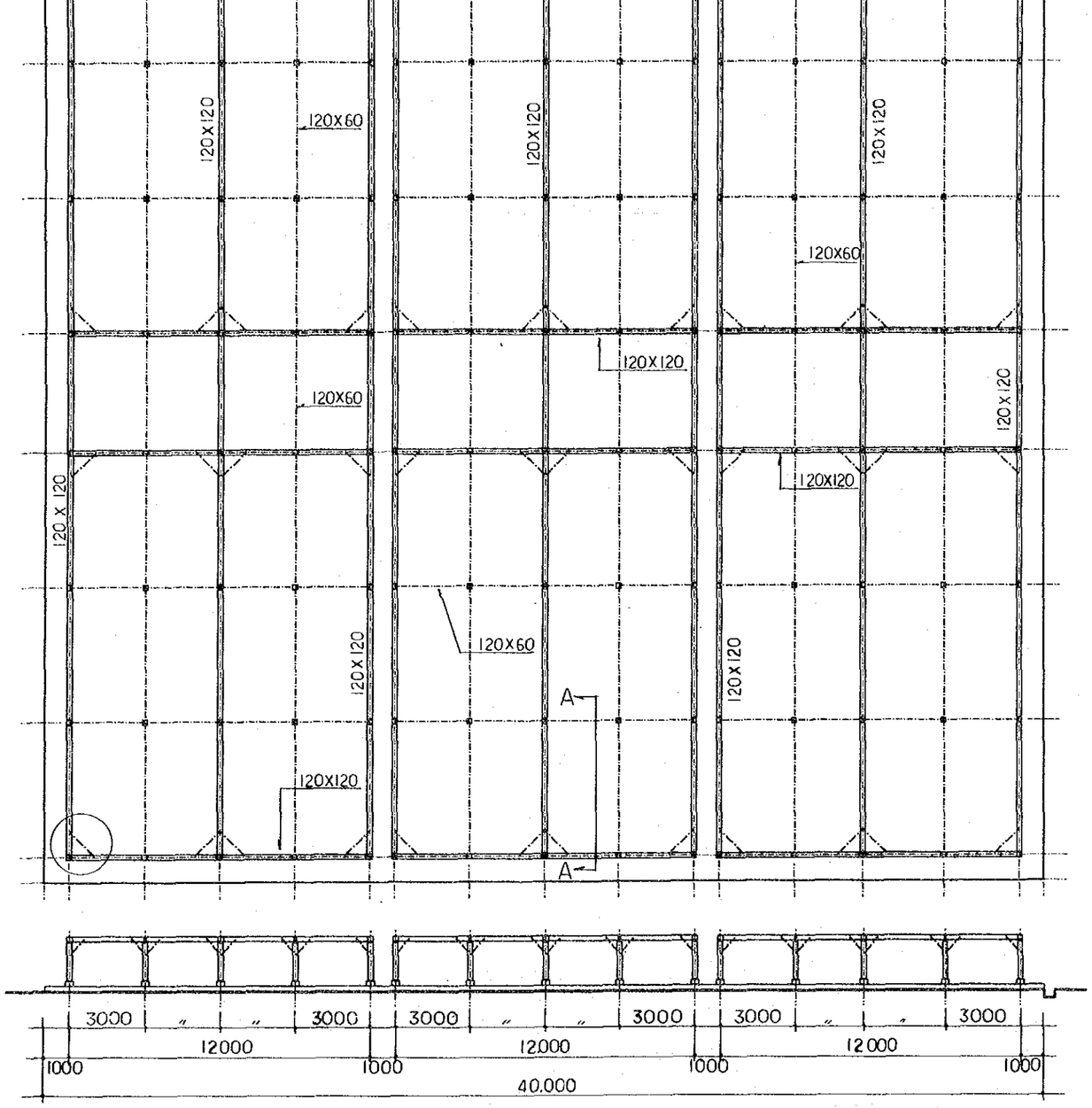


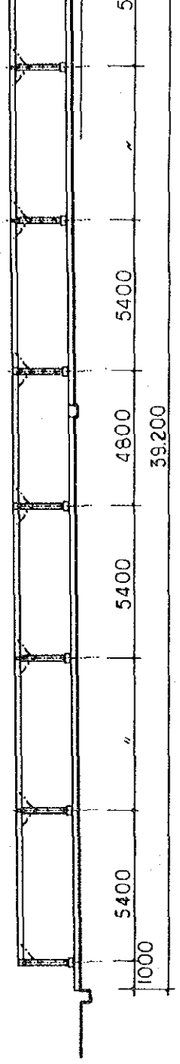
400
1000
5400
5400
4800
39.200
5400
5400
1000
120X120
120X120
120X60
120X120
120X60
120X120
120X60
120X120
120X120
120X120
120X60
120X120
120 X 120
120X60
120X120
120X120
A

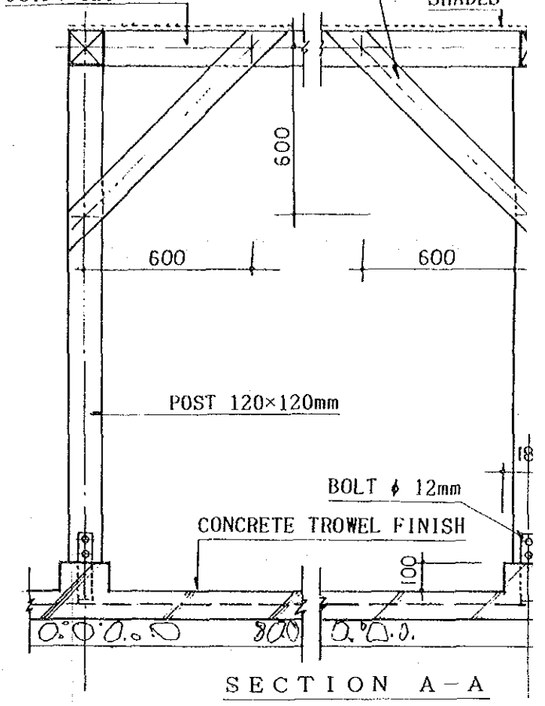
BRACE 2-100×30mm
JOIST 120×60mm
JOIST 120×120mm
SHADES
600
600
600
2000
POST 120×120mm
180
BOLT ϕ 12mm
ANCHOR
STRAP
CONCRETE TROWEL FINISH
100
100
100

SECTION A-A

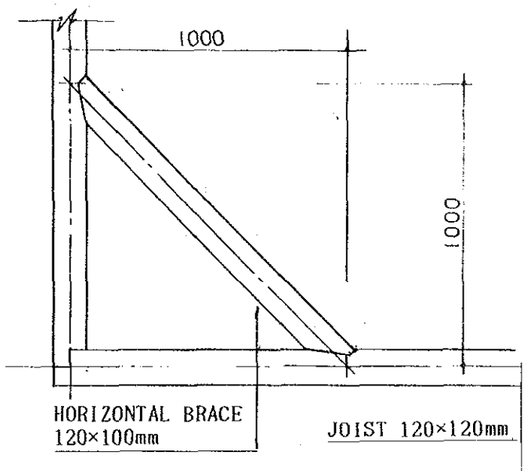
1000
1000







SECTION A－A



DETAIL " B"

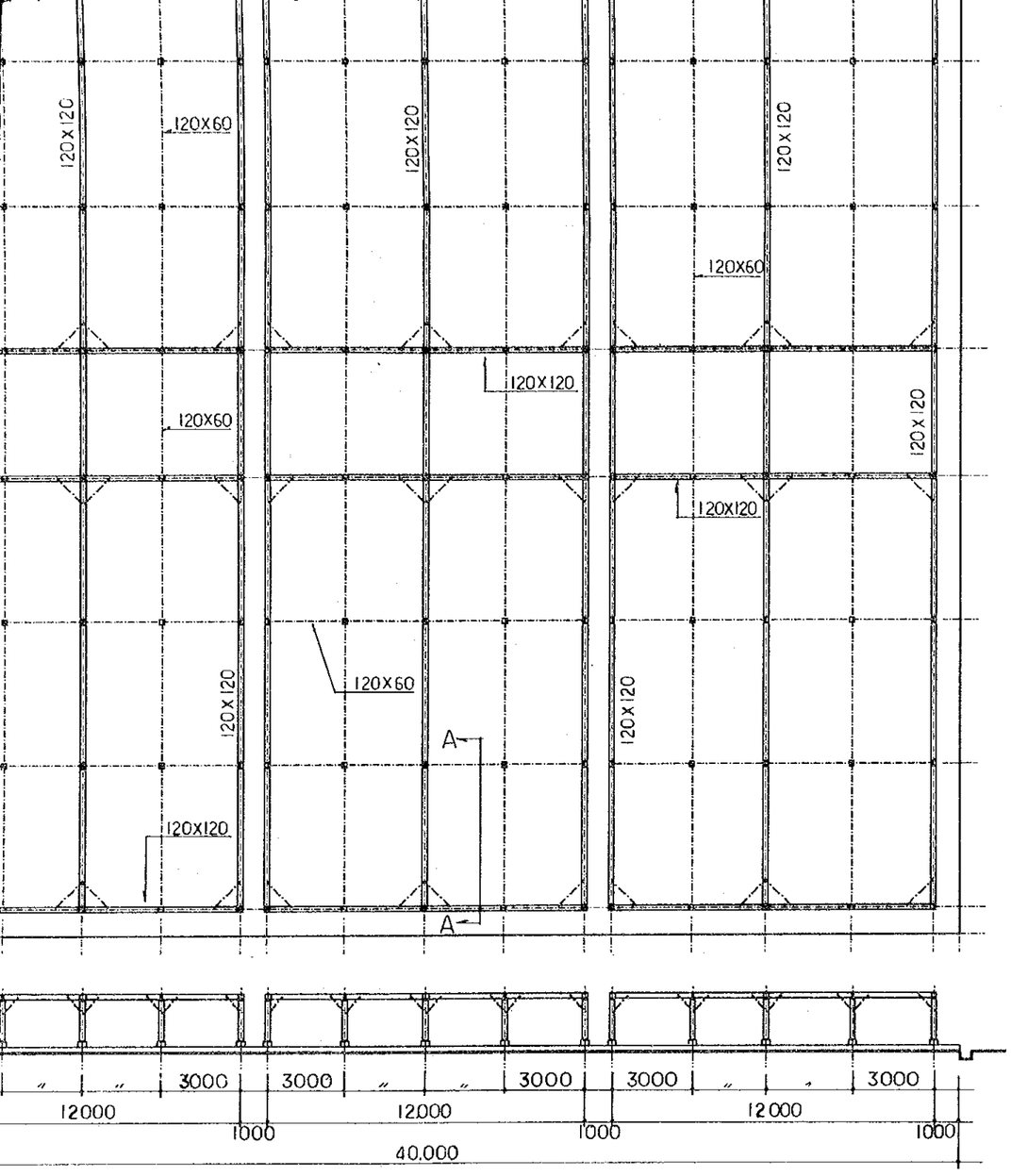
THE MODEL INFRASTRUCTURE WORK FOR
THE FOREST RESEARCH PROJECT
IN PAPUA NEW GUINEA

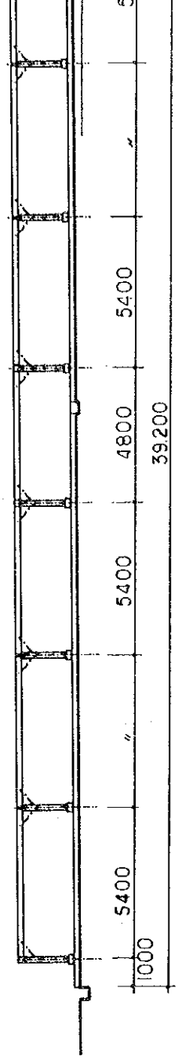
EXPERIMENTAL AREA

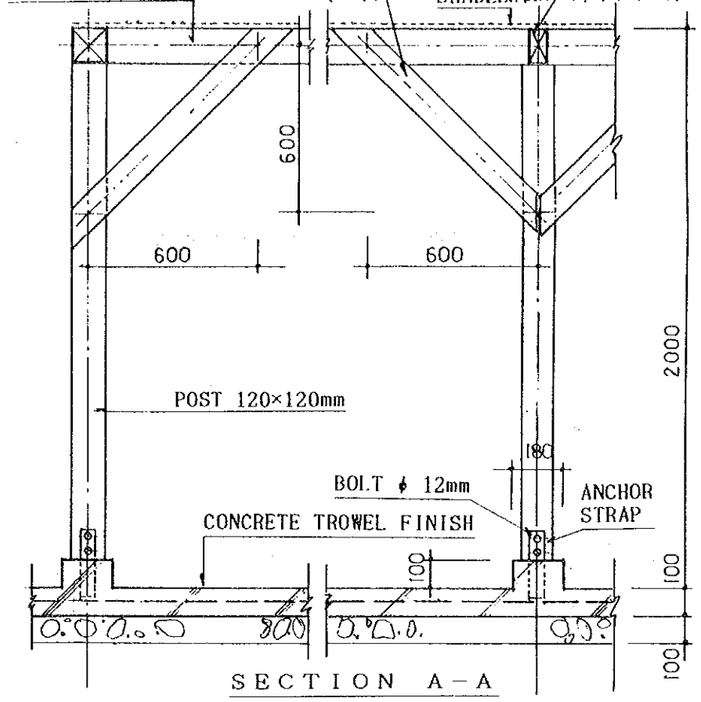
"TIMBER FRAME PLAN

S =
S =

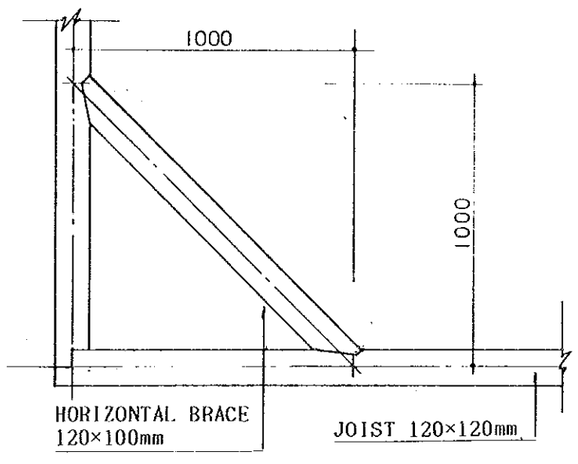
MK





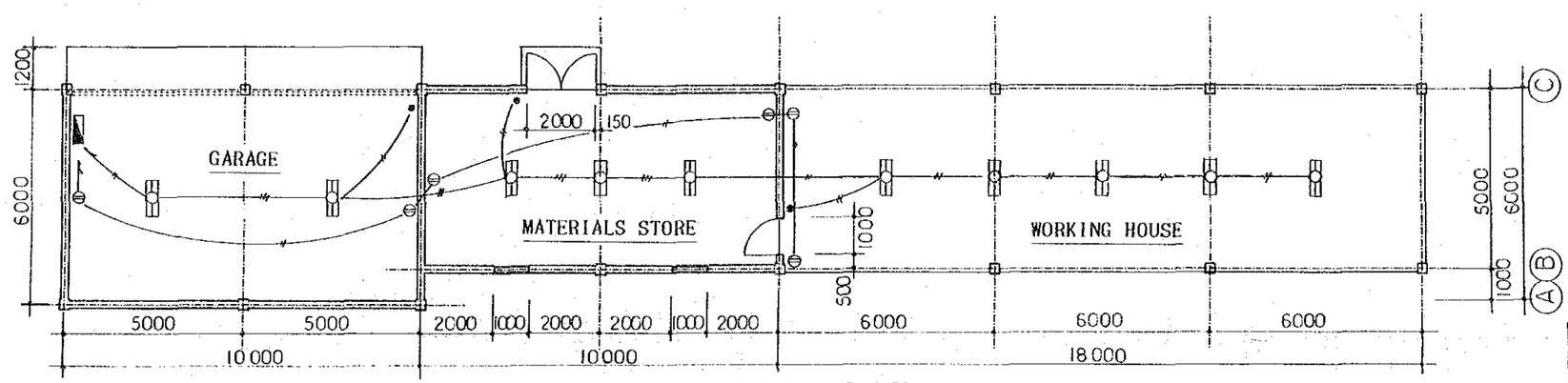


SECTION A－A



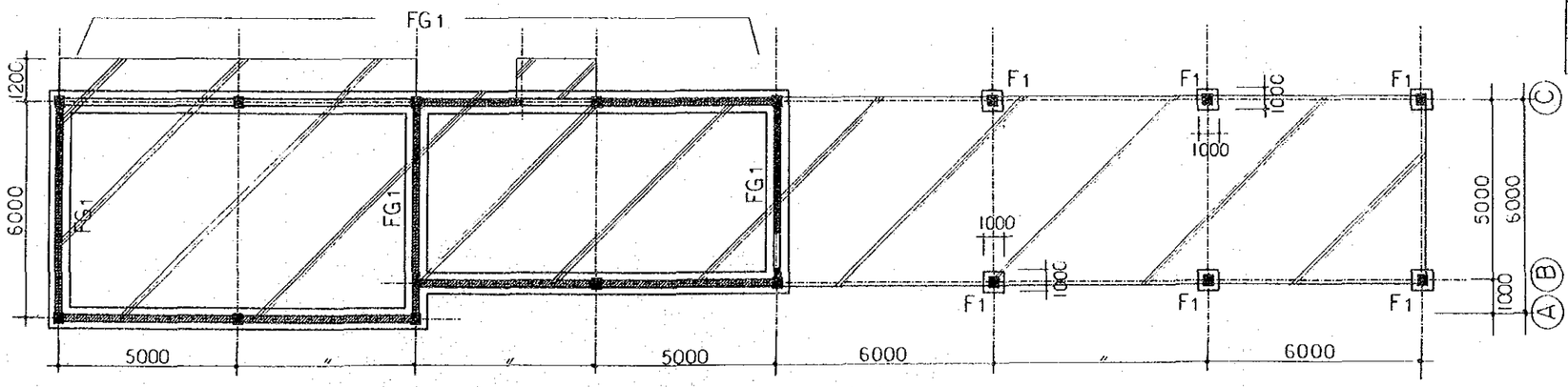
DETAIL " B"

L INFRASTRUCTURE WORK FOR E FOREST RESEARCH PROJECT IN PAPUA NEW GUINEA	EXPERIMENTAL AREA	S＝1／20 S＝1／200
	TIMBER FRAME PLAN	MK-03

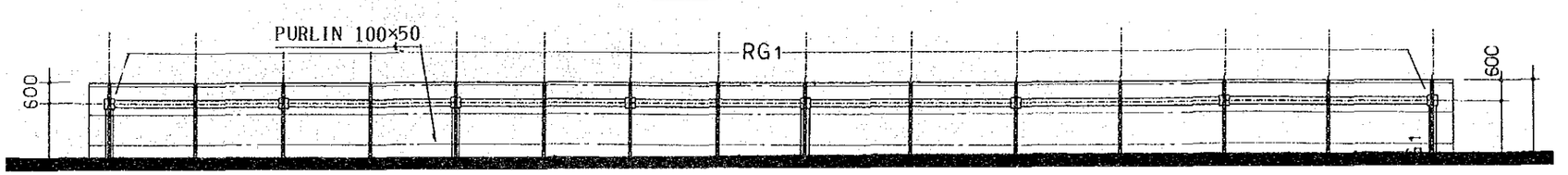


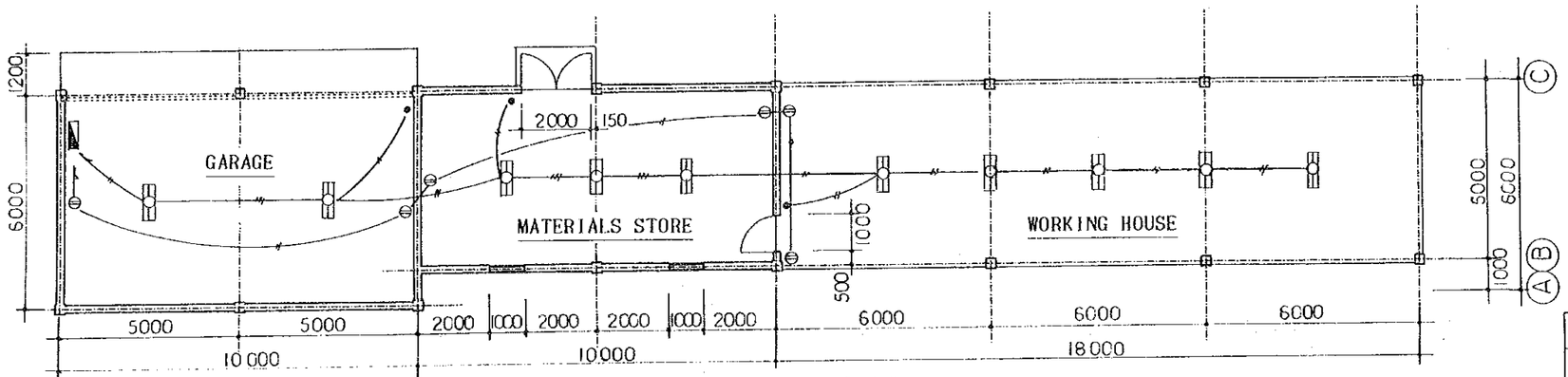
FLOOR PLAN

	FLUORESCENT
	RECEPTACLE
	SINGLE-POLE
	DISTRIBUTION



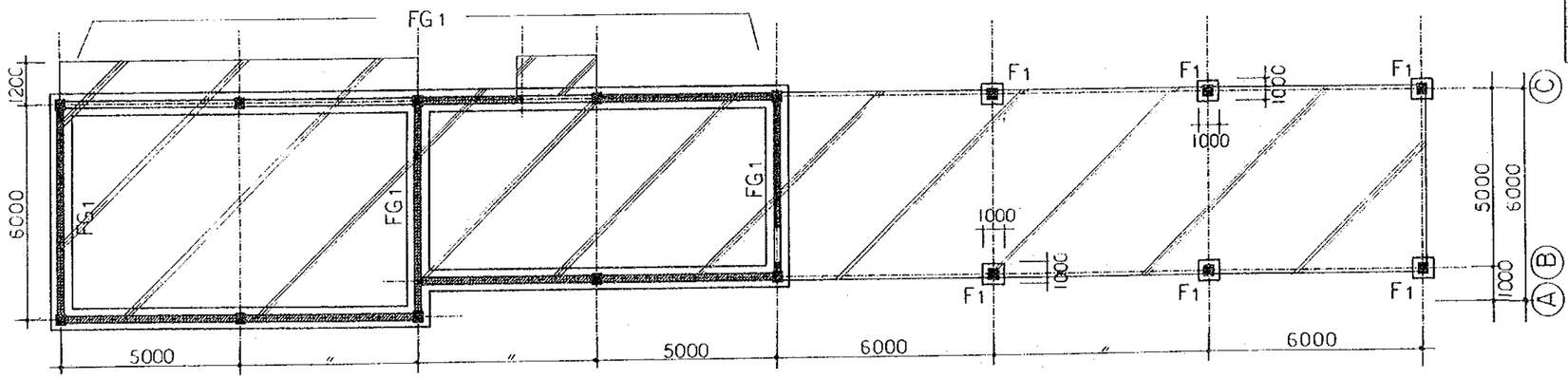
FOUNDATION PLAN



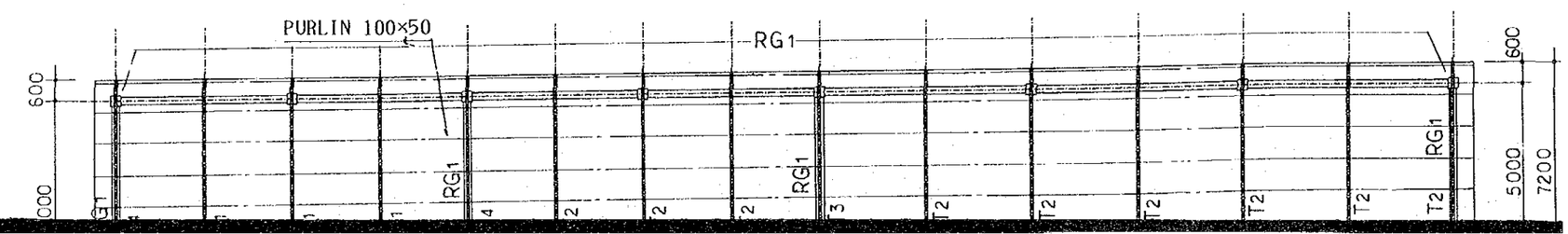


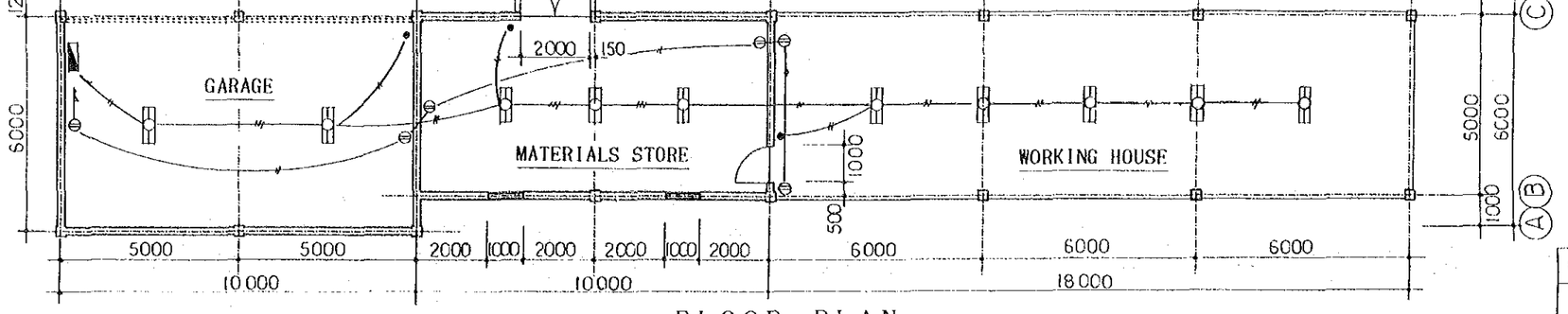
FLOOR PLAN

	FLUORESCENT FL-2×36W
⊖	RECEPTACLE 10A
•	SINGLE-POLE SWITCH
	DISTRIBUTION BOARD

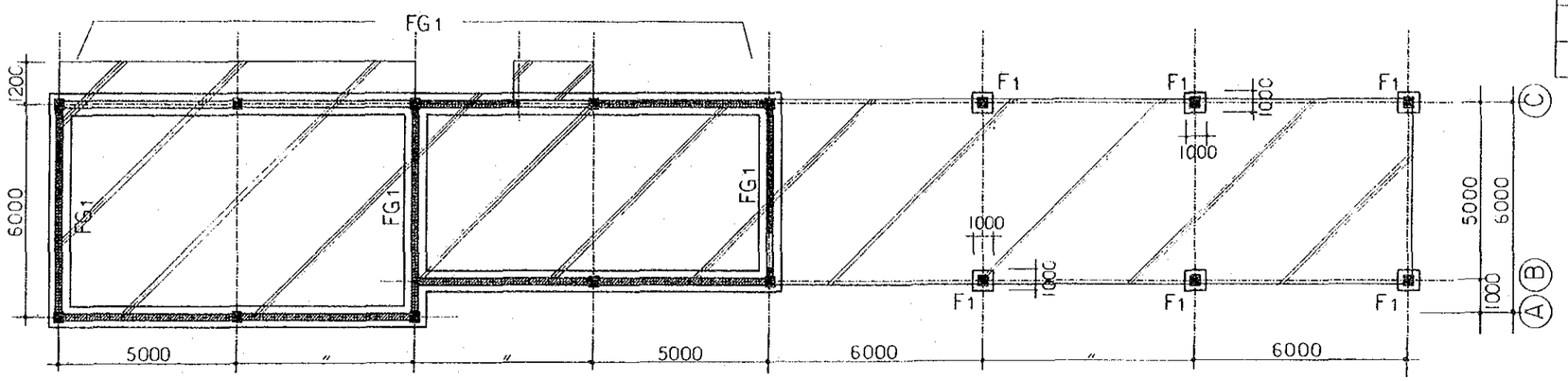


FOUNDATION PLAN

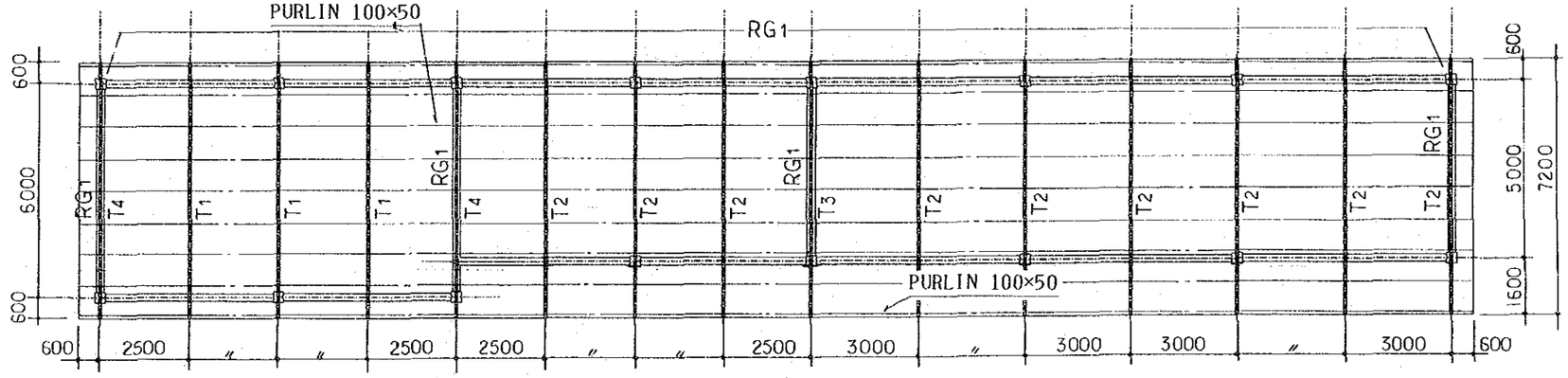




FLOOR PLAN



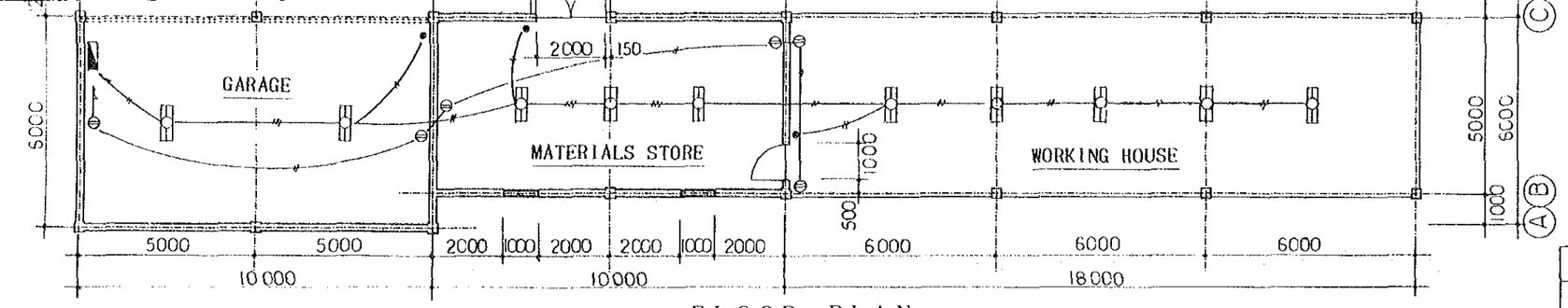
FOUNDATION PLAN



ROOF PLAN

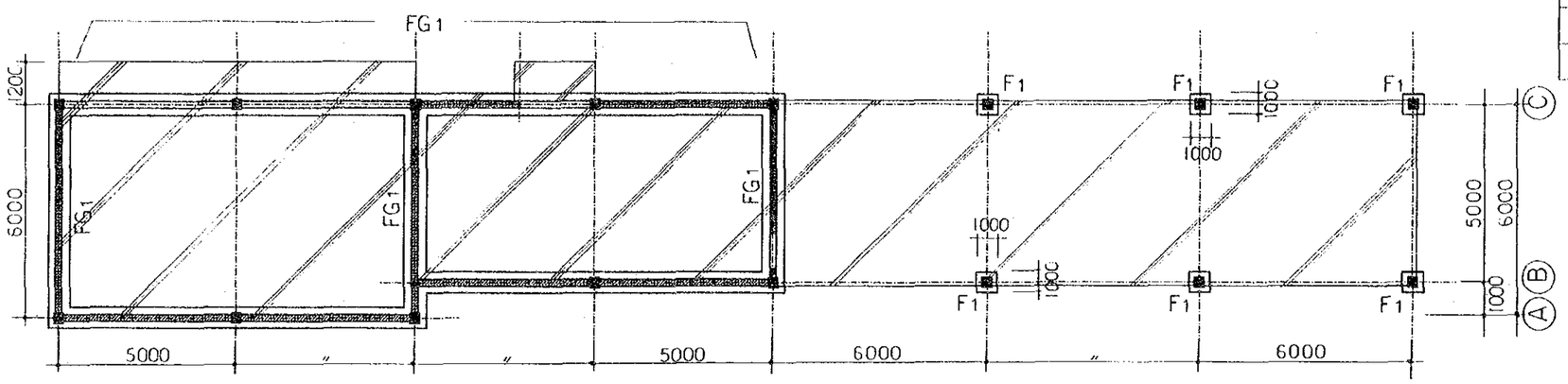
THE MODEL INFRASTRUCTURE WORK FOR THE FOREST RESEARCH PROJECT IN PAPUA NEW GUINEA	GARAGE, MATERIALS STORE, WORKING HOUSE	S = 1
	FLOOR PLAN, FOUNDATION PLAN, ROOF PLAN ILLUMINATION PLAN	MK-

	FLUO
	RECE
	SING
	DIST

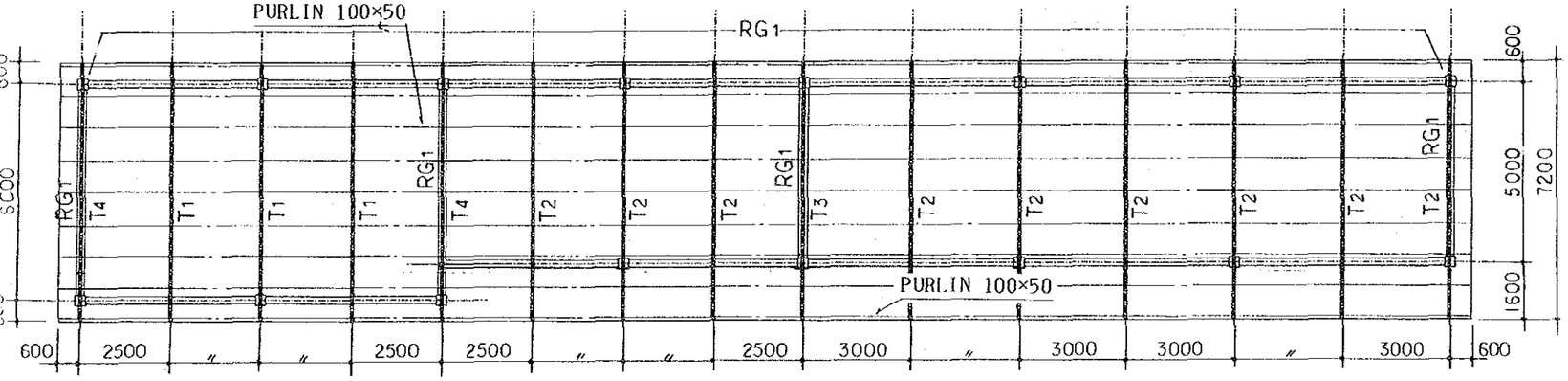


FLOOR PLAN

	FLUORESCENT FL-2×36W
⊖	RECEPTACLE 10A
•	SINGLE-POLE SWITCH
	DISTRIBUTION BOARD

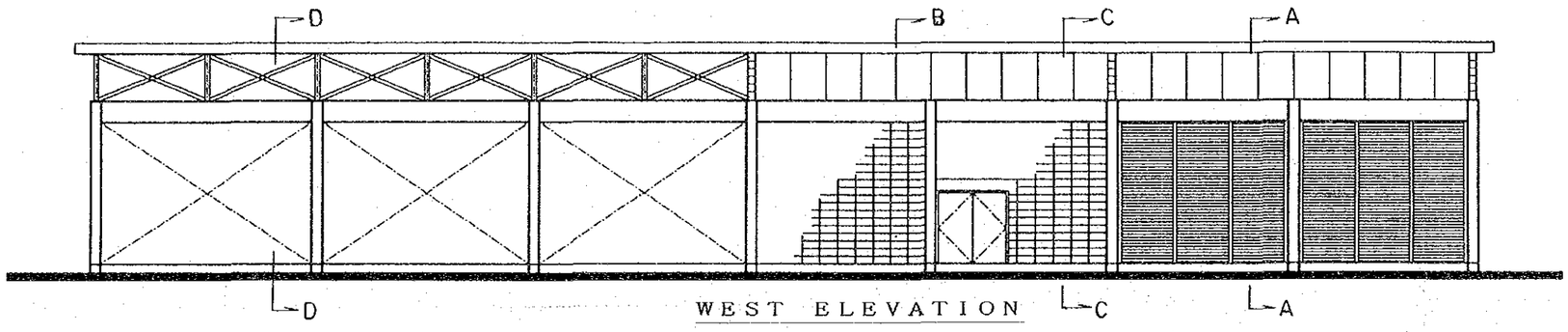


FOUNDATION PLAN

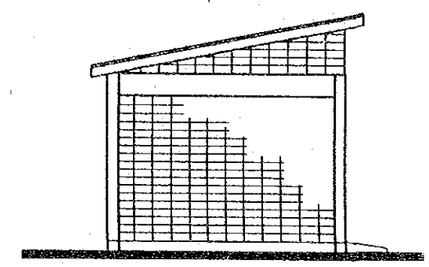


ROOF PLAN

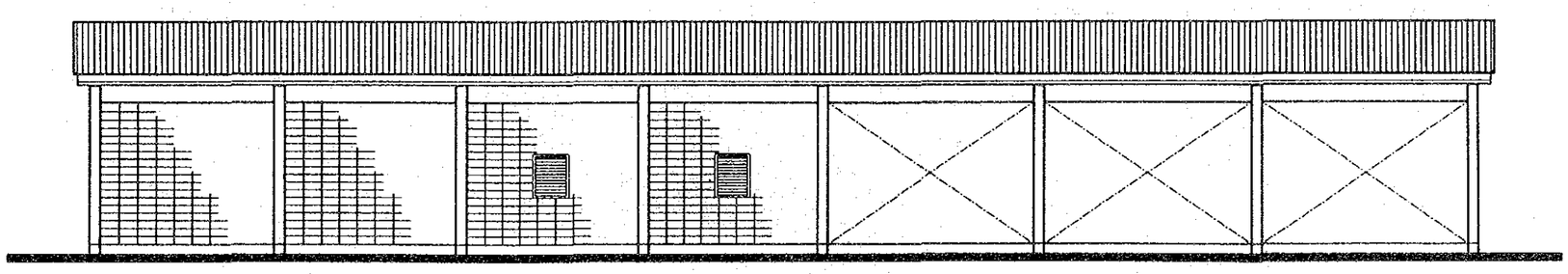
INFRASTRUCTURE WORK FOR FOREST RESEARCH PROJECT IN PAPUA NEW GUINEA	GARAGE, MATERIALS STORE, WORKING HOUSE	S=1/150
	FLOOR PLAN, FOUNDATION PLAN, ROOF PLAN ILLUMINATION PLAN	MK-04



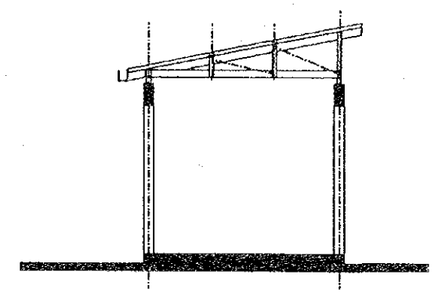
WEST ELEVATION



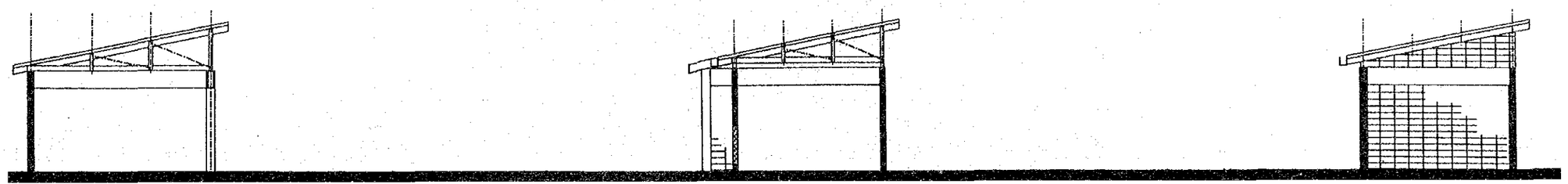
SOUTH ELEVATION

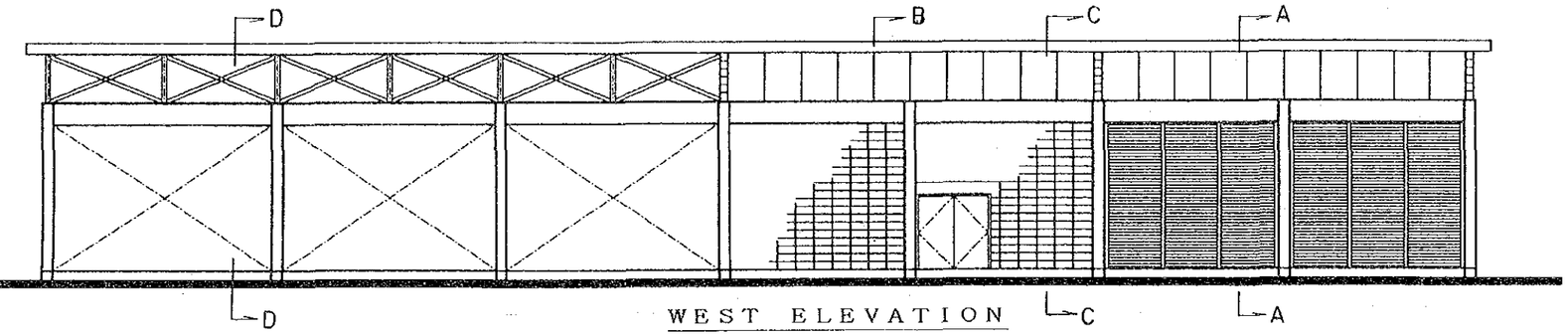


EAST ELEVATION

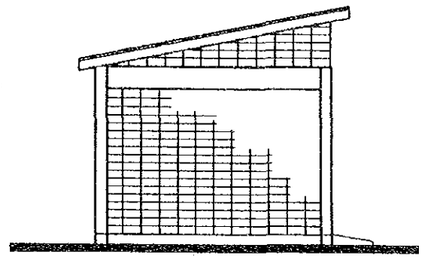


SECTION D-D

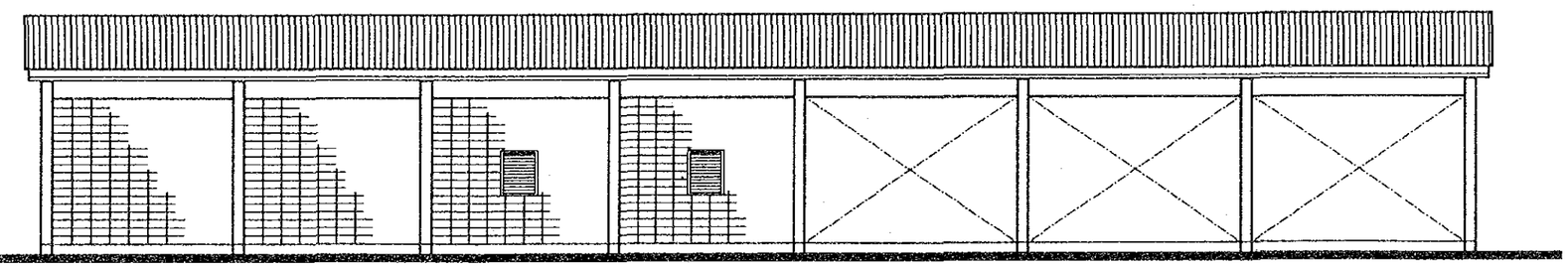




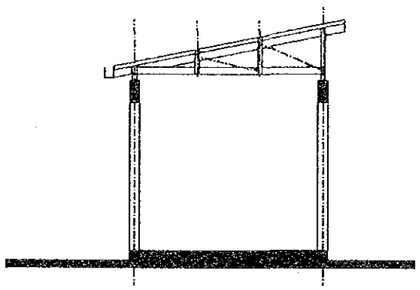
WEST ELEVATION



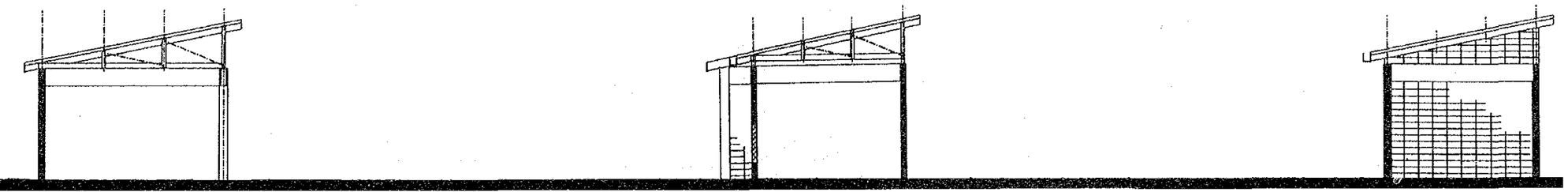
SOUTH ELEVATION

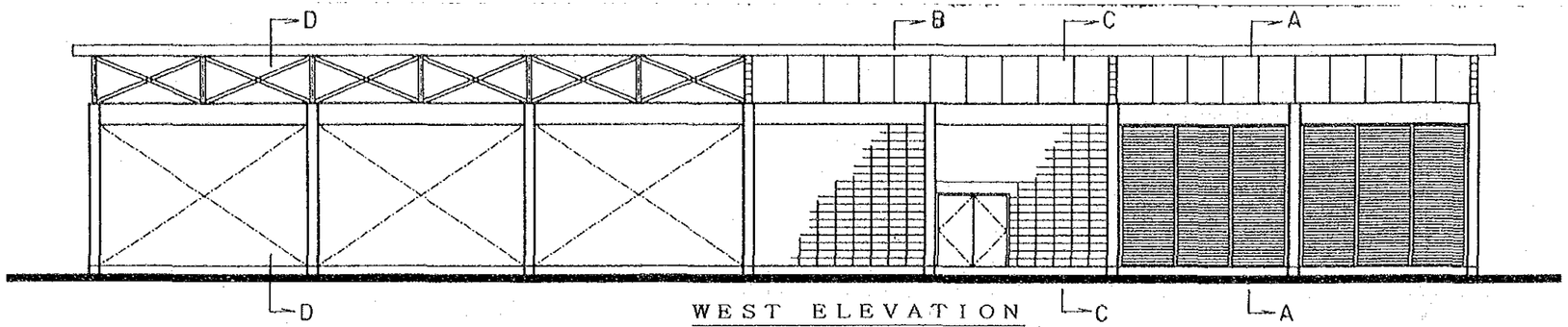


EAST ELEVATION

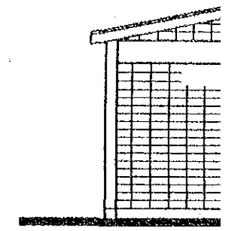


SECTION D-D

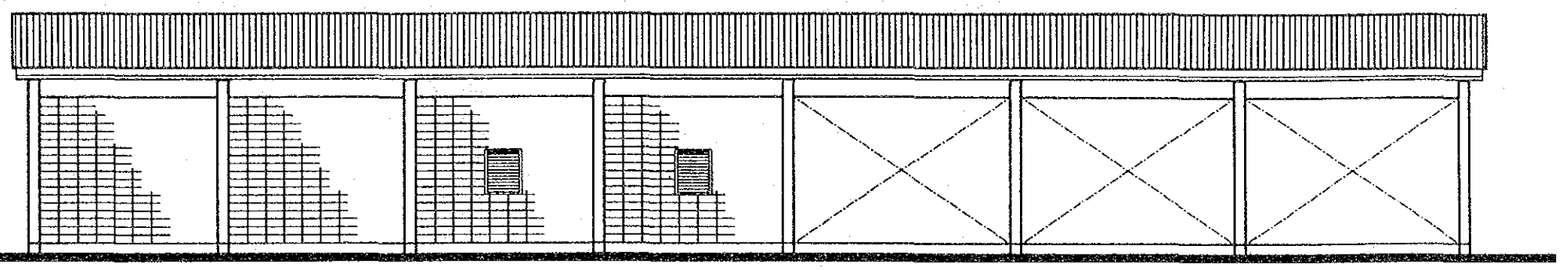




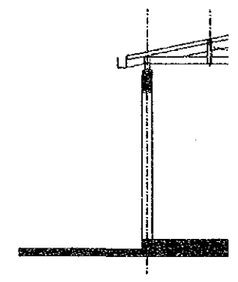
WEST ELEVATION



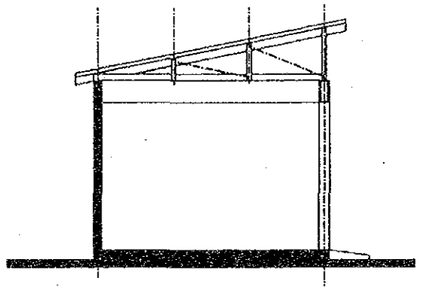
SOUTH E



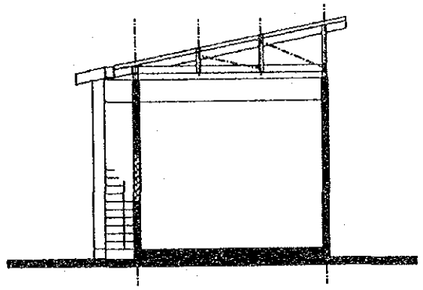
EAST ELEVATION



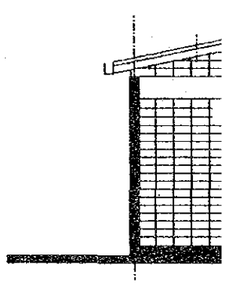
SECTI



SECTION A-A

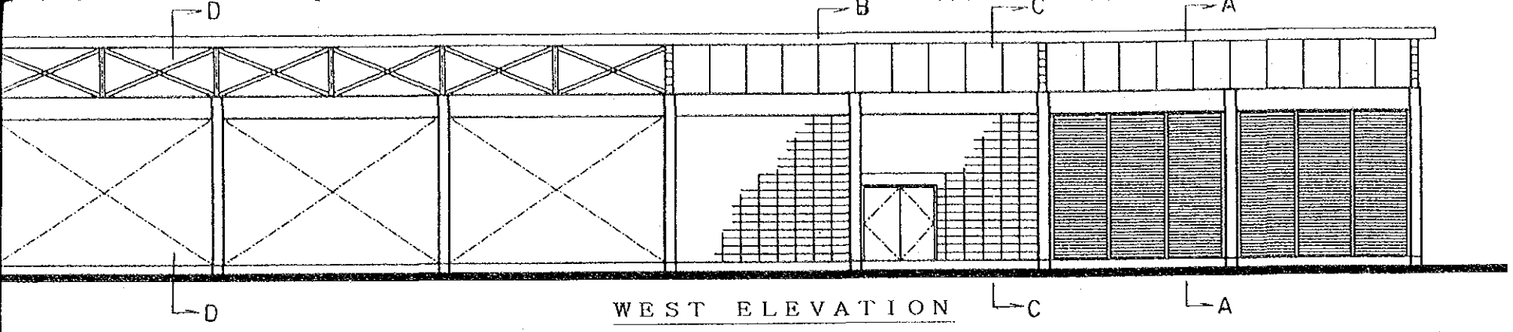


SECTION B-B

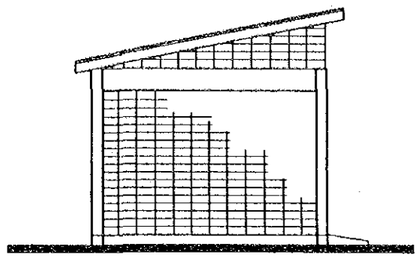


SECTI

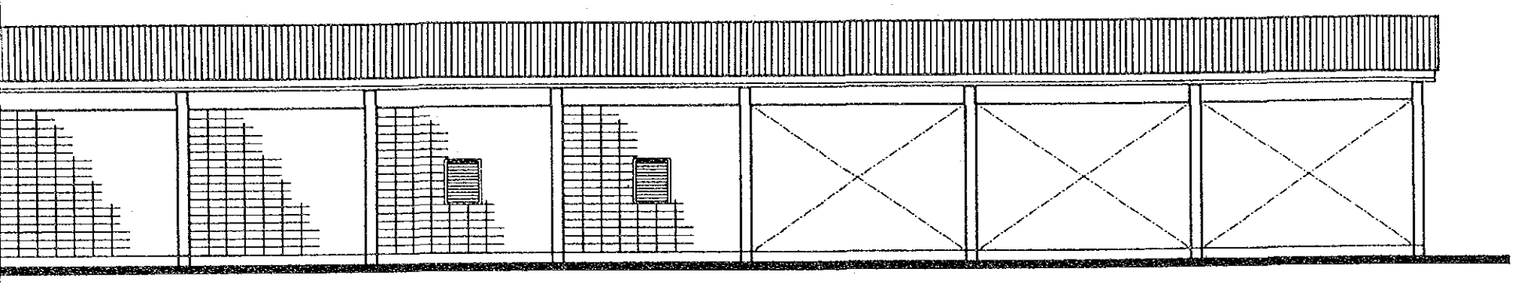
THE MODEL INFRASTRUCTURE WORK FOR THE FOREST RESEARCH PROJECT IN PAPUA NEW GUINEA	GARAGE, MATERIALS STORE, WORKING HOUSE
	ELEVATION, SECTION



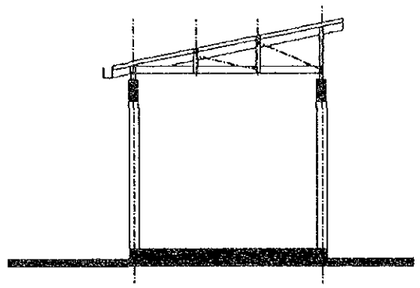
WEST ELEVATION



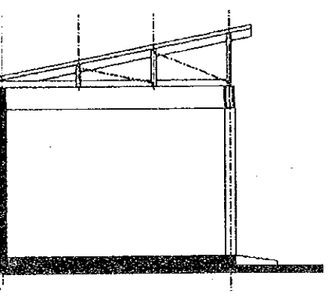
SOUTH ELEVATION



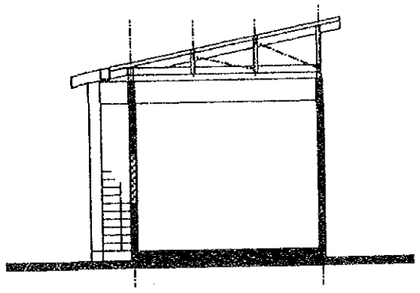
EAST ELEVATION



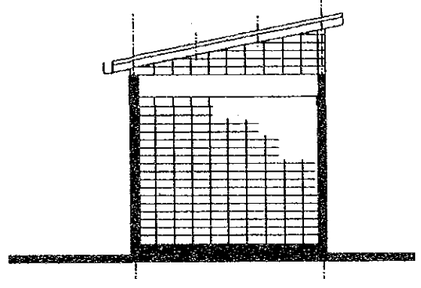
SECTION D-D



ECTION A-A



SECTION B-B



SECTION C-C

DEL INFRASTRUCTURE WORK FOR THE FOREST RESEARCH PROJECT IN PAPUA NEW GUINEA	GARAGE, MATERIALS STORE, WORKING HOUSE	S=1/150
	ELEVATION, SECTION	MK-05