

タイ国天然ゴム開発技術協力 実施調査団報告書

昭和52年3月

国際協力事業団

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タイ国天然ゴム開発技術協力 実施調査団報告書

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国際協力事業団

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| 国際協力事業団 | |
| 受入 月日 '84. 4. 23 | 122 |
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ま え が き

日本国政府は、アセアン5ヶ国より要請のあった天然ゴムに関する技術協力を行なうこととなり、昭和51年1月19日より30日間にわたり事前調査を実施した。

当事業団は、この事前調査団の報告と勧告にもとづき、タイ国に対してプロジェクト方式による協力を実施することとなり、本年3月20日より4月6日まで5名からなる実施調査団をタイ国に派遣した。調査団はタイ国農業協同組合省農業局をはじめとする相手側関係当局と討議を重ねた結果、その討議事項を「合意議事録」として、又むこう3年間にわたる技術協力実施計画を「TENTATIVE IMPLEMENTATION PROGRAMME」として農業国との間でとりまとめることができ、同4月1日、技術経済協力庁次長及びタイ外務省事務局長の立ち合いのもとに、調査団長と農業局長との間で、合意議事録に署名交換を行った。後者については調査団長のみ署名した。

本報告書は、実施調査団がタイ国において討議した内容と、プロジェクト実施に必要な技術的事項について調査した結果をとりまとめたものである。

調査団の構成は、次のとおりである。

| | (氏名) | (担当) | (所属機関名) |
|-----|-------|---------|-----------------|
| 団長 | 太田 耕二 | 総 括 | 国際協力事業団鉱工業開発協力部 |
| 団員 | 井村 雄次 | 品質管理 | 横浜ゴム㈱ |
| " | 岡戸 洋祐 | 品質管理 | ブリヂストンタイヤ㈱ |
| " | 林 由紀夫 | 協力企画 | 通商産業省化学製品課 |
| " | 大久保宏明 | 業務調整 | 国際協力事業団鉱工業開発技術課 |
| 同行者 | 平野 稔 | R/D討議立合 | 外務省技術協力才二課 |

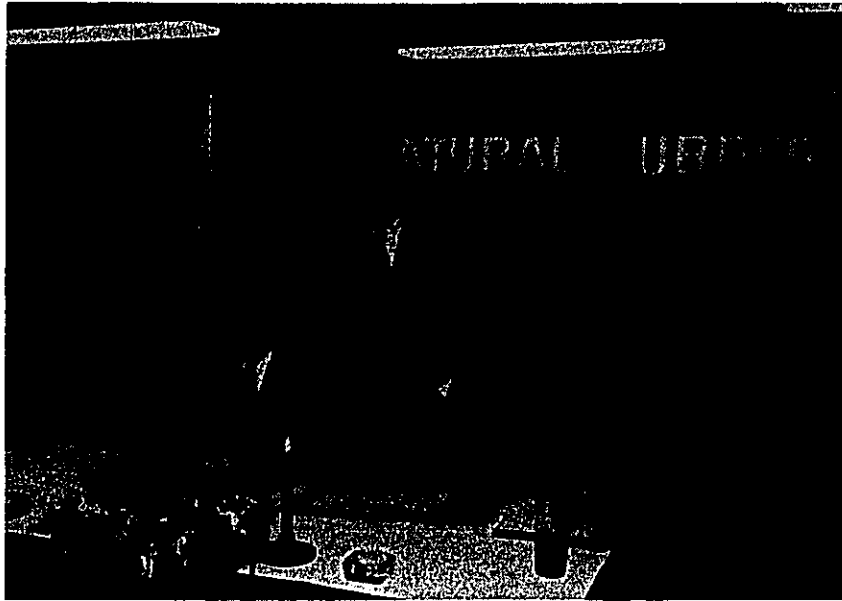
本事業もいよいよ具体的な実施段階を迎えたわけであるが、本事業が円滑に推移し、その成果が日タイ両国親善の一助となること切に希って止まない次第である。

本調査の実施に際しては、タイ国政府及び関係機関の支援並びにわが国の外務省・通産省・関係業界の指導を受けた。ここに厚くお礼を申し上げる。

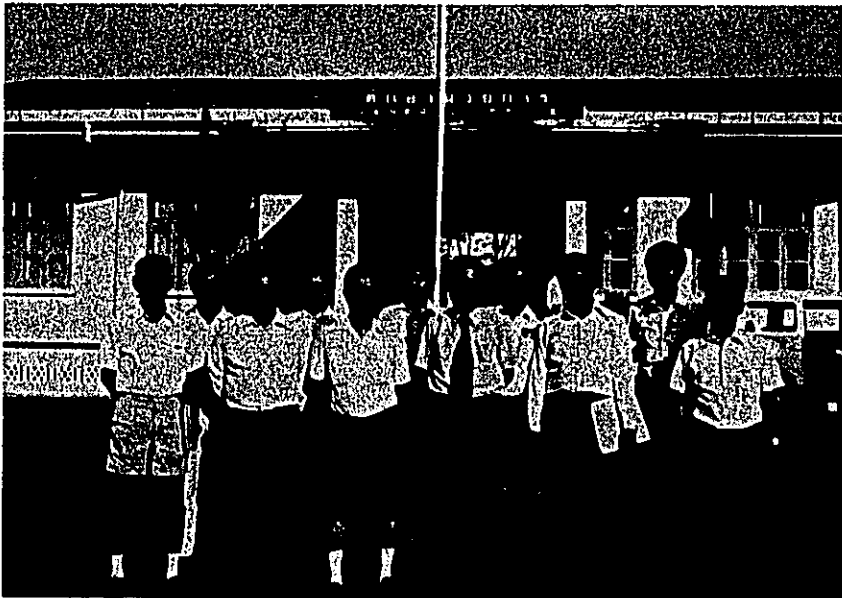
昭和52年3月

国際協力事業団

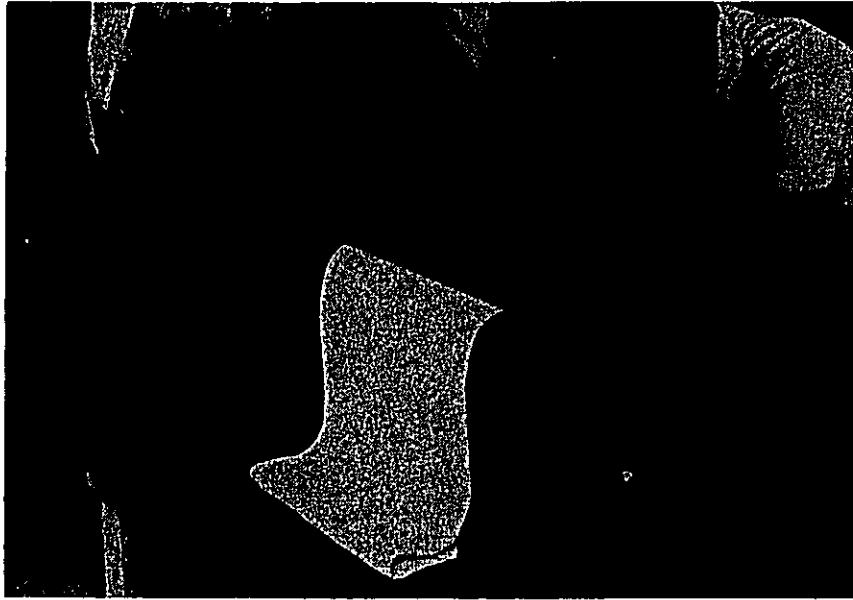
総裁 法 眼 晋 作



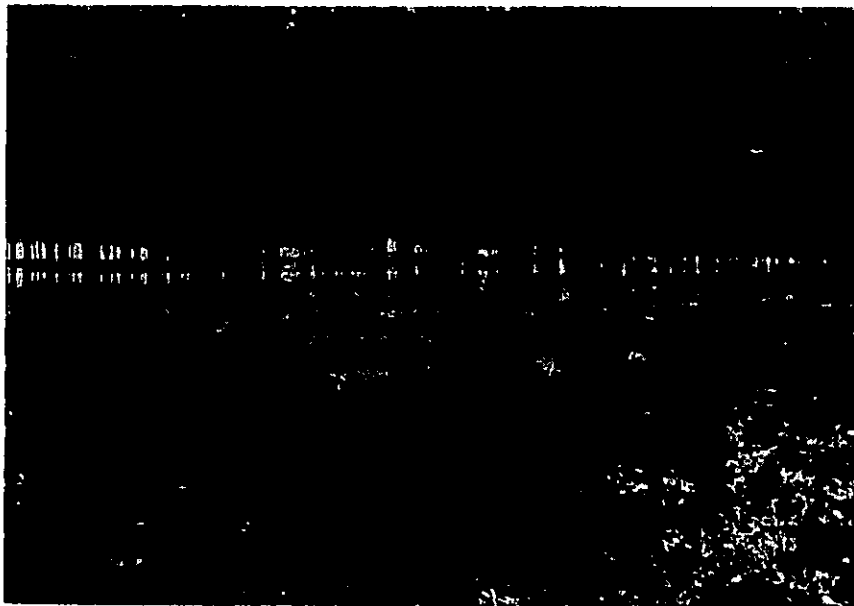
署名風景



RRCの Central Office



ラテックスよりシートラバーの作成



実験ゴム園



討 議 風 景



Rubber Band 工 場

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1. 実施調査団派遣の経緯と目的

「タイ国天然ゴム開発技術協力事業」は、同国において重要な役割を担うゴム産業の技術水準を向上させることを目的としたG-Gベースによる技術協力である。

今回の実施調査は、事業の遂行過程からいって、準備段階から実施段階への橋渡しの役割をするものであっていよいよ事業が具体化することとなった。

1.1 派遣に至る経緯

1.1.1 実施調査前の経緯は、次の通りである。

a) 日本・アセアン合成ゴム・フォーラム才3回事務レベル会合。(昭和50年7月)田

(注) 議題3. バイロット・タイヤ・プラントの建設

議題4. アセアン諸国の既存のゴム研究所拡大に対する協力

b) 事前調査団をアセアン五ヶ国に派遣(昭和51年1月)

(注) 詳細は、事前調査団の報告書を参照

c) 日本・アセアン合成ゴム・フォーラム才4回事務レベル会合(昭和51年11月)

1.1.2 実施調査団の派遣に際しての経緯は、次の通りである。

a) 事前調査団調査内容及び才4回会議のアセアンプロポーザルの検討

b) 日本側技術協力実施案の策定(注)

c) R/D(案)の策定

を官民一致協力のもとに進めた。

(注)

1) 民間企業の保有する技術を移転する場合は、対価を伴うノウ・ハウ及び特許に係る技術に抵触・競合しない範囲(いわゆる“公知技術”)をG-Gベース技術協力の枠組限界とする。

2) 技術移転の対象範囲は「天然ゴム品質管理」(機材の操作を含む)とする。

3) 技術協力形態は、いわゆるプロジェクト・ベースにより、専門家の派遣、研修生の受入、機材の供与の複合実施(開発技術協力事業)とする。

4) 協力期間は、本協力(技術移転)期間3ヶ年とする。

5) 協力過程は、TENTATIVE IMPLEMENTATION PROGRAMMEに基づき実施する。

6) 協力の目的は、Rubber Research Centreの機能強化を図り、もってタイ国ゴム産業の技術水準を向上せしめて、産業の振興に資する。

1.2 目 的

実施調査団は、出発前各省会議等において検討、準備したDISCUSSION PAPER, RECORD OF DISCUSSIONS(案)に基づき

- a) O/Pに基づく日本側協力実施案の呈示と関連討議
- b) R/D(案)の呈示と関連討議
- c) 実施調査

を行ない、タイ国側との協同作業による

- a) TENTATIVE IMPLEMENTATION PROGRAMME の作成
- b) R/Dをとりまとめて相互署名することが目的であった。

そして、関係者協力のもと、これらの目的を達成した。

1.3 調査団の行程

| 日順 | 月 日 | 曜日 | 行 程 | 調 査 内 容 |
|----|------|----|------------|--|
| 1 | 3/20 | 日 | 東 京→バンコック | 〔移動〕 JICAバンコック事務所打ち合せ |
| 2 | 3/21 | 月 | バンコック | (外務省・タイ・ASEAN・事務局), DTEC, 日本大使館と個別打ち合せ |
| 3 | 3/22 | 火 | バンコック | 農業・共同組合省(農業局), 日本大使館と日程, R/D(案)等検討 |
| 4 | 3/23 | 水 | バンコック→ハジャイ | 〔移動〕 RRC(ゴム研究所)と打合せ |
| 5 | 3/24 | 木 | ハジャイ | RRC, 農業局, 工業振興局と討議(UNDP 専門家も出席) |
| 6 | 3/25 | 金 | ハジャイ | 同 上 ハジャイ付近ゴム工場, ゴム園等の視察 |
| 7 | 3/26 | 土 | ハジャイ | 同 上 同 上 |
| 8 | 3/27 | 日 | ハジャイ | 同 上 |
| 9 | 3/28 | 月 | ハジャイ→ブケ | 〔移動〕 テックービハンのクラムラバー工場等視察 |
| 10 | 3/29 | 火 | ブケ→バンコック | 〔移動〕 日本大使館と打ち合せ |
| 11 | 3/30 | 水 | バンコック | タイASEAN事務局, DTEC, 農業局, ゴム研究所等と討議 |
| 12 | 3/31 | 木 | バンコック | 農業局, RRCと討議 |
| 13 | 4/ 1 | 金 | バンコック | R/Dに署名(対農業局, DTEC, タイASEAN 事務局) |
| 14 | 4/ 2 | 土 | バンコック | 資料整理 |
| 15 | 4/ 3 | 日 | バンコック | 団員打ち合せ |
| 16 | 4/ 4 | 月 | バンコック | タイ・ブリヂストン工場視察 |
| 17 | 4/ 5 | 火 | バンコック | ケン・リクレイム工場視察及び資料整理 |
| 18 | 4/ 6 | 水 | バンコック→東 京 | 〔移動〕 |

2. 実 地 調 査

2.1 タイ国のゴム産業

2.1.1 生産・消費及び輸出の現状

a) 1975年のタイの天然ゴム生産量は、348,737トン，対前年比8%減と74年に引き続き前年水準を下回った。これは、世界経済の同時的景気後退により、自動車タイヤを中心とするゴム需要が低迷を見せたこと、更には石油危機前後の旺盛な低需要の反動から消費国において過剰在庫傾向が見られたこと等によるものである。

しかしながら、75年後半以降、世界経済も先進国を中心に徐々に立直りを見せ始めたことから、タイの天然ゴム生産量も76年に入り増勢基調に転じ、1～11月で362,559トン，対前年同期比14.6%増と大幅な伸びを示した。

このため76年通年ベースでは、約40万トンと史上最高の生産量となったものと見込まれる。

タイ国内におけるゴム園の面積は、現在約250万エーカーと1965年時点の181.5万エーカーに比べ着実に増加を続けており、才1図に見られるようにタイ南部14県及び東部3県にまたがり分布している。一方、ゴム園の形態は、所有面積が100エーカー以下の家族単位の零細農園（スモールホルダー）が圧倒的に多く（約30万戸）全ゴム園面積の95%以上を占めると言われている。

b) タイ国内には、ゴム製品製造工場は170以上あり、タイヤ、チューブ、ベルト、バンド、フォームラバー等を生産しているが、大部分は零細企業である。

このため、国内で消費される天然ゴムの量は、1975年で14,000トンと生産量の約4%に過ぎない。

なお、自動車タイヤについては、ファイアストーン、グッドイヤー、ブリヂストンの3工場があり、自転車タイヤについては日本から井上ゴムが進出している。

c) 天然ゴムの輸出は、タイの総輸出金額のうち10%弱を占める。

1975年の輸出量は、334,737トン，対前年比8.3%減と不振であったが、76年に入り、1～11月で349,309トン，対前年同期比15.1%増と急速な回復を示している。

一方、価格についても需要の回復に伴い強含みで推移し、タイの主要商品であるRSS 3号について見れば、76年初の192円/kg（東京市場）から年央には250円/kgまで上昇を示し、その後低下は見せたものの年後半においても210円/kg～220円/kgの水準を維持した。

輸出先としては、日本向けが圧倒的に多く、75年には総輸出量の54.1%、76年

(1~9月)には51.1%が対日輸出となっている。また、最近中国との関係が改善され、従来皆無であった中国輸出が開始され、76年には総輸出量の6%を上回るに至っている。

なお、総輸出量の2割強がシンガポール及びマレーシア経由であるが、これらはタイの輸出制度、華僑筋の資金手当等の事情によるものと思われる。

2.1.2 天然ゴムに対する政策措置

政府による天然ゴムに対する政策措置には、ゴム樹植替援助基金(RRAF: Rubber Replanting Aid Fund)の創設(1960年)及びUNDPの援助の下にゴム研究所(RRC: Rubber Research Centre)の設置(1965年)がある。

a) ゴム樹植替援助基金

この基金は、天然ゴム輸出に際し、徴収するCess(地方税)を資金源とし、スモールホルダーがゴム樹の植替を行う際、段階的に3年間にわたり1ライ(0.4エーカー)当たり2500バーツの現金及び800バーツ相当額の肥料を与え、植替を促進しようとするものである。その結果1975年までに植替えられた。

また、本基金はハジャイ近郊に訓練学校を有しており、ゴム樹の植替、芽つき等のゴムの栽培方法全般にわたっての教育を行っている。

b) ゴム研究所

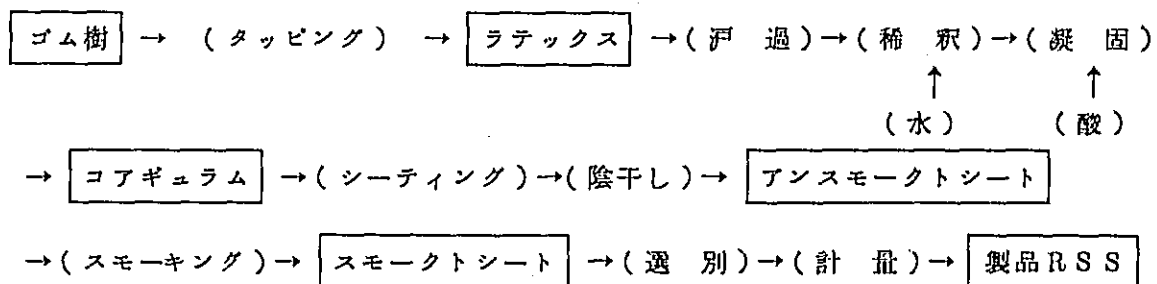
同研究所はUNDPの援助により1965年に設置されたものであり、主としてスモールホルダーによるラバーシートの生産に関する技術指導、ゴムの品質テスト、新方式のTTR生産方法の確立等について協力を実施している。

2.1.3 タイ国ゴム産業関連施設の視察

a) RRC訓練学校

天然ゴムの品質管理を向上させるためにRRC内に訓練学校を設置し、RSS(Ribbed Smoked Sheet)の製造方法(下図参照)の訓練を行っている。

天然ゴム(RSS)の製造方法



b) スモールホルダーのゴム製造所

ハジャイ周辺のスモールホルダーは、R R Oの指導によりグループを構成し、共同生産、共同出荷を行っている。又ゴム園はR R A Fの援助による再植樹が行われている見本園を見学、行く途中の個人園と比べて、かなり大規模かつ整備の良く行き届いたものであった。

c) R R A F 訓練学校

R R A Fの援助によりゴムの栽培及び採集方法全般にわたって訓練を行っている。我々調査団もゴムの芽つぎを実地に見学することができた。

d) ゴムバンド工場

ハザイ南方のKhlong Ngaeにあるゴムバンド工場を視察した。従業員100人程度の中規模の工場であるが、設備は旧式で安全装置も一切付いておらず、また工場内の換気、採光等も不十分であり、労働者の安全・衛生・管理に問題があるように思われた。

e) テックビーハンT T R工場

ハジャイ及びブーケ両工場を視察した。テックビーハン(株)は、タイにおける代表的T T Rメーカーであり、国内に7工場及び10ヶ所のスモークハウスを有している。ハジャイ工場は生産能力2,000トン/月、生産量1,500トン/月であり、ブーケ工場は生産能力3,000トン/月に対し生産量1,800トン/月である。その主たる需要先は日本のタイヤ企業であり、ハジャイ工場の場合、総生産量の約50%が日本に輸出されているとのことである。また両工場とも研究所を有しており、T T Rの品質について厳格な管理を行っている。

f) ソンクラ港

ソンクラ港はハジャイ東方約40kmの地点にあり、同港までは舗装道路が整備されている。現在のソンクラ港は水深が約5~6mと浅く、大型船が停泊できないためハシケにより沖合の本船に荷役を行っている。しかしながら、近年南タイ地区の開発が進むにつれて、ソンクラ港の重要性が高まってきており、現在大型船が直接停泊できるようなバースを建設中である。

g) タイ・ブリジストン本社工場

タイ・ブリジストンはバンコック郊外ランシット地区に1969年1月に資本金7億5,000万円(出資比率:ブリジストン51%,三菱商事9%,現地資本40%)で設立された。主要製品は自動車用タイヤ、チューブである。

現在の規模は、敷地面積15万 m^2 、従業員740人(うち工場680人)、月産能力4万5,000本、年間売上高約8億バーツ(120億円)である。

タイ国内には、先発メーカーであるファイアストーン、グッドイヤー及びタイ・ブリジストンの3社の自動車タイヤメーカーがあるが、現在のマーケットシェアは、タイ・

ブリジストンが41%、以下ファイアストーン38%、グッドイヤー22%となっており、タイ・ブリジストンがTB用タイヤを中心に首位に立っている。

なお、タイ・ブリジストンにおいては、新ゴム消費量26トン/日のうち、75%が天然ゴムであり全量タイ国内から供給を受けている。

才1表 天然ゴムの生産及び消費の推移

| | 生産量 (MT) | 前年比伸び率 (%) | 全世界に占めるシェア (%) | 消費量 (MT) |
|-----------|-------------|---------------|-------------------|-------------|
| 1973年 | 381,954 | 13.4 | 10.9 | 13,750 |
| 74 | 379,188 | △ 0.7 | 11.0 | 14,000 |
| 75 | 348,737 | △ 8.0 | 10.6 | 14,000 |
| 76(1~11月) | 362,559 | 14.6 | 10.9 | — |

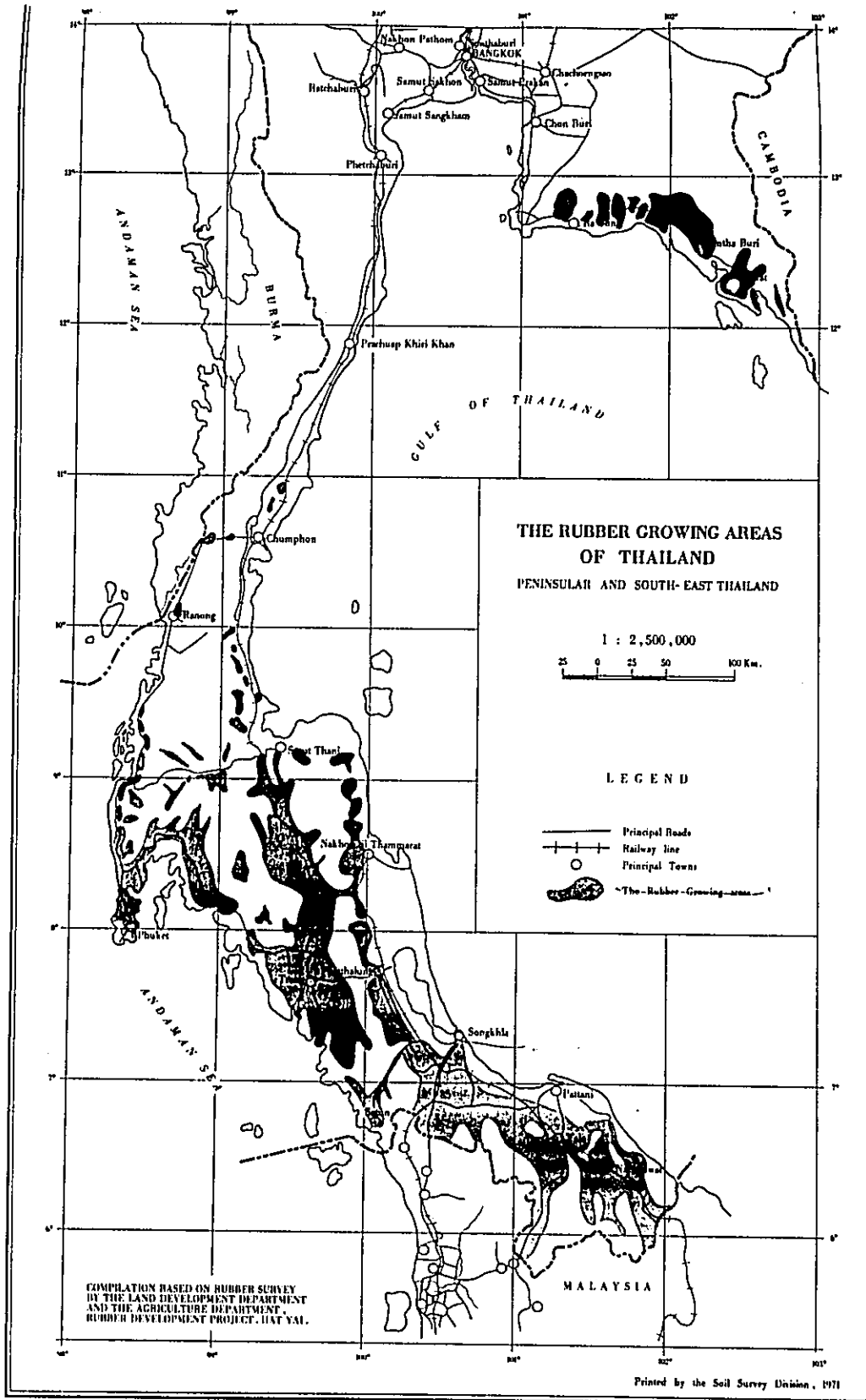
(資料) Rubber Statistical Bulletin

才2表 天然ゴムの輸出実績

| | 1975年 | | 1976年(1~9月) | |
|--------|---------|--------|-------------|--------|
| | (MT) | (%) | (MT) | (%) |
| 総輸出 | 348,737 | (100) | 279,537 | (100) |
| 日本 | 188,565 | (54.1) | 142,959 | (51.1) |
| シンガポール | 42,921 | (12.3) | 30,266 | (10.8) |
| アメリカ | 29,352 | (8.4) | 36,021 | (12.9) |
| マレーシア | 29,032 | (8.3) | 20,381 | (7.3) |
| 中国 | 19,165 | (5.5) | 16,950 | (6.1) |

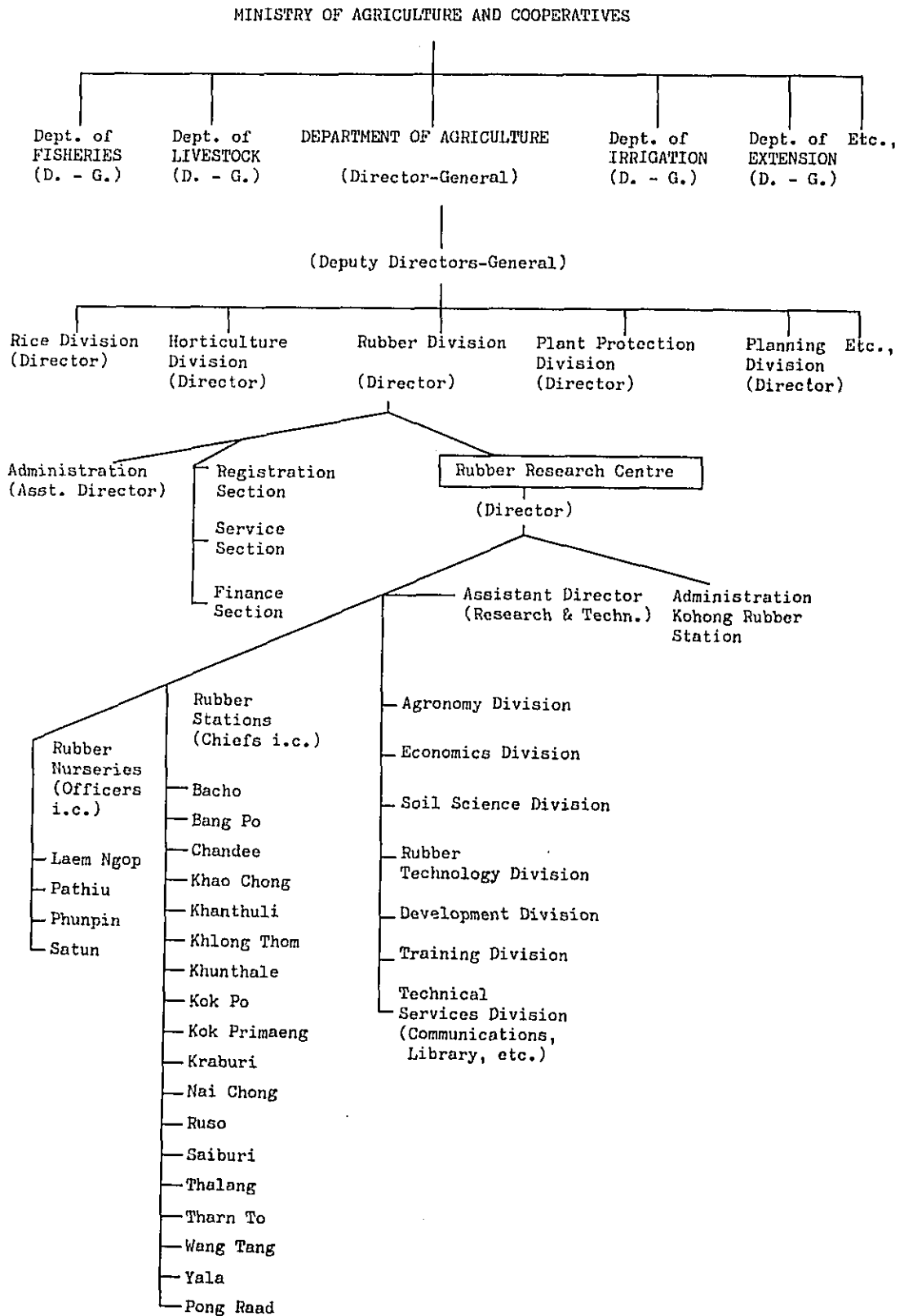
(資料) Rubber Statistical Bulletin

第1図 タイのゴム園分布



2.2 協力相手機関の現状

2.2.1 農業・共同組合省の組織



2.2.2 ゴム研究所 (R.R.C) の本部

a) ゴム研究所の組織及び人員

7部と18出張所よりなっている。

| 所 属 | ホワイトカラー | 正 規 雇 員 | 臨 時 雇 員 | 労 働 者 |
|---------|---------|---------|---------|-------|
| 7 部 | 102名 | 90 | 179 | 125 |
| 18* 出張所 | 82 | 230 | 22 | 1,009 |
| 計 | 184 | 320 | 201 | 1,134 |

他に苗木場関係 10名

総 合 計 1,849名

* 出張所とは Station の訳

i) 本 部

STAFF OF RUBBER RESEARCH CENTRE

| | Officers | Permanent Employee | Temporary Employee | Labour |
|--|----------|--------------------|--------------------|--------|
| Administration Kohong Rubber Station | 21 | 53 | 12 | 125 |
| Agronomy Division | 24 | 16 | 20 | |
| Economic Division | 7 | 9 | 13 | |
| Soil Science Division | 18 | 10 | 12 | |
| Rubber Technology Division | 15 | 31 | 36 | |
| Development Division | 17 | 14 | 46 | |
| Training Division | 13 | 5 | 25 | |
| Technical Service Division | 8 | 5 | 27 | |

直接の技術移転相手方である Rubber Technical Division 82名(内Officer 15名)よりなっている。

R R Oの技術者は、大学卒が82名(ドクター5名、マスター6名)でほとんどが農学部卒業である。Rubber Technology Divisionにおいては大学卒13名(ドクター・マスターはいない)でやはり農学部出身者である。

ii) 出張所

STAFF OF THE RUBBER STATIONS

| | Officer | Permanent Employee | Temporary Employee | Labour |
|---------------------|---------|--------------------|--------------------|--------|
| Bacho Station | 1 | 2 | - | 12 |
| Bang Po Station | 5 | 11 | - | 78 |
| Chandee Station | 2 | 11 | - | 16 |
| Khaochong Station | 2 | 16 | - | 25 |
| Khantuli Station | 13 | 20 | 1 | 180 |
| Khlong Thom Station | 7 | 13 | - | 100 |
| Khunthalay Station | 1 | 5 | - | 40 |
| Kok Po Station | 1 | - | - | 6 |
| Kraburi Station | 3 | 18 | 2 | 80 |
| Nai Chong Station | 5 | 18 | 2 | 96 |
| Ruso Station | 1 | - | - | 8 |
| Sai Buri Station | 1 | - | - | 1 |
| Thalang Station | 3 | 5 | 2 | 36 |
| Tharn To Station | 3 | 18 | 1 | 80 |
| Wong Tang Station | 3 | 13 | - | 50 |
| Yala Station | 6 | 17 | 2 | 80 |
| Pong Rad Station | 4 | 10 | - | 36 |

STAFF OF THE RUBBER NURSERIES

| | | | | |
|-------------------|---|---|---|---|
| Leam Ngop Nursery | - | - | - | 2 |
| Pathiu Nursery | - | 1 | - | 3 |
| Phunpin Nursery | - | - | - | 1 |
| Satun Nursery | - | - | 1 | 2 |

b) R R C の予算

1977年の予算は4,120万バーツで約206万US\$である。予算のうち70%は人件費である。

c) R R C のメンテナー

今後の方針として次の3項を掲げている。

- i) Technically Tested Rubber (T T R) の増産
- ii) 1項を是非促進
- iii) 国内消費ゴム量の拡大

以上を実現するために以下の項目の促進・充実を計る。

i) Staff

5年間に訓練し、次の項目の充実を計る。

| | |
|---------------------------|-----|
| Center T. T. R. TEST Lab. | 25名 |
| Station T. T. R. Lab. | 12名 |
| Rubber Technology Lab. | 15名 |
| Bangkok Lab. | 12名 |
| 検査員 | 5名 |
| 国内技術サービス | 10名 |
| 計 | 79名 |

又、有能な人材をロンドン、シンガポール及び短期にマレー R R I M に送る。

ii) Laboratories

- T T R のテスト能力を2部とする。(5年後)
- ゴム製品製造技術の指導を行う。

iii) 研究開発

ゴムの物性標価を P R I (P L A S T I C T Y R E T E N S I O N I N D E X) , ムーニ粘度, 加流速度, 抗張力に迄拡げる。(予定期間3年)

iii-1) タイヤラバー

低級ゴムに油展しタイヤラバーとする事を考える。

iv) 検査

5つのチーム編成を行い T T R の検査を進め規格不合格品の輸出を禁止する。

v) 政府

v-1) 港の能力をふやす。(東岸, 西岸に2箇所) 将来コンテナを考える。

v-2) ゴム製品の製造促進

小規模のゴム工場を南タイに作る。長期を要するが20年以内にタイのゴムの半

分を国内で製品にする事を目標とする。

d) 1972～1976迄の研究実績

280項目ある。ほとんどが生物関係のテーマである。

e) RRC内、現場 (Small Holder, 工場) に於けるQCシステム, 手法, クレーム処理。

生産者よりサンプルを集め, PRI, 灰分, ゴミ等のテストを行いデータとしている。その解析手法についてはグラフ化をなされていない。

クレームについては正規ルートのゴムでないもので発生しているとの意見が出されていた。但しメタルデテクターについては, 空港等で使用している程度で簡単に検知出来るとの感覚があるので設備的に大型になる事及びラインに固定化する必要がある旨伝えた。

f) Small Holder の教育

f-1) RRC内部に2階建の教室がありタッピング, ラテックスの凝固について教育している。視察の最中にも学卒のクラス10人前後が実習を行っていた。

その他8%等を使って遠隔地を廻って教育している。

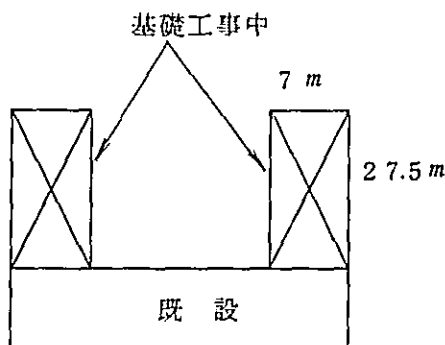
f-2) 訓練学校

ゴム樹の植替, 芽つき等ゴムの栽培方法全般にわたって教育を行っている。

g) 日本からの機材の設置, レイアウト

現在供与機材用建屋を建設中であるので速い時期に日本からのレイアウト等の専門家の派遣依頼があった。特に床の強度につき日本側の指導を受けたい旨申入があった。

パンバリ, コンプレッサーは別棟となる。



平家建

$$\frac{7m \times 27.5m \times 2棟}{3.3m^2} = \underline{\underline{\text{約} 120 \text{ 坪}}}$$

(参考 資料1参照)

h) 電力・保守能力・工業用水

h-1) 電力

トランスは400KVAであり800KVAに増す計画である。(工場400KVA, LAB 200KVA 官舎その他200KVA)

現在工場では電力不足し同時に1台のmachineしか運転出来ない。

電力 220 V, 5.0 cycle 3相

日本から試験機材搬入された場合総合的に検討する必要がある。

h-2) 保守能力

i) 電気関係

電気保守能力は高い旨報告されたがどの程度か不明

エンジニア C3クラス1名, C1クラス1名

作業員 11名 合計 14名

ii) 機材関係

レベルとしては, 1日自動車5台修理可能, オーバーホール1週間の由

エンジニア C3クラス1名, 作業員 11名 計 12名

iii) 溶接関係

ガス及び電気溶接器具あり

エンジニア C2クラス1名, 作業員 4名 計 5名

h-3) 工業用水

井戸は1本あり, もう1本計画中である。水質はやや硬水であるが問題はない。

井戸1は当初 200 gallon/分の能力があったがフィルター砂づまりのため 50 gallonに落ちている。もう一本は1分間 100 gallonの能力を計画中。

工業用水分析結果 (RCC資料)

| | |
|-------------------------------------|-----------------|
| Hardness (PPM) | Total 201 ppm |
| Perment | 107 ppm (理解できず) |
| Calcium | 110 ppm |
| PH | 7.4 |
| Conductivity(mho $\times 10^{-6}$) | 300 ~ 400 |

3. 討 議

3.1 背 景

タイ国天然ゴム振興を目途に、Rubber Research Centre に対して、品質管理技術及び
供与機材操作技術を、G-Gペースによって技術移転を目的とした。D/P (Discussion
Paper) 及び R/D (Record of Discussion) 案をタイ国側に提示した所、ゴム製品の開
発を目的としたカウンタープロポーザルを用意して来た。両国側案を下に議論した結果、ほぼ
日本側案通りの議事録を作成し合意に達することができた。(参考資料 2, 3, 4 参照)

3.2 合意議事録

実施調査団とタイ側プロジェクト関係者の討議結果は、次の Record of Discussions に
要約され、その具体的な実施内容は、後述の Tentative Implementation Programme に
まとめられた。

RECORD OF DISCUSSIONS BETWEEN THE JAPANESE IMPLEMENTATION SURVEY TEAM
AND THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF THAILAND ON
THE TECHNICAL COOPERATION FOR THE TECHNOLOGICAL DEVELOPMENT OF
NATURAL RUBBER PROCESSING

The Implementation Survey Team, organized by the Japan International Cooperation Agency and headed by Mr. Koji Ota, visited Thailand from March 20th to April 1st for the purpose of working out the details of the technical cooperation programme to implement the Technological Development Project for Natural Rubber Processing (hereinafter referred to as the "Project") between the Government of Japan and the Government of Thailand.

During its stay in Thailand, the team conducted a survey and had a series of discussions with the Thai authorities concerned with regard to a number of points in question for the implementation of the Project, in order to meet the request for the extension of technical cooperation concerning natural rubber made by the Association of South-East Asian Nations to the Government of Japan.

As a result of the survey and discussions, both parties agreed to recommend to their respective Governments the immediate implementation of the technical cooperation for the Project as specified in the Record of Discussions attached hereto.

Bangkok, April 1, 1977

Koji Ota
Head
Japanese Implementation Survey
Team
Japan International Cooperation
Agency

Prakob Kanjanasoon
Director-General
Department of Agriculture
Ministry of Agriculture and
Cooperatives

in the presence of

Wanchai Siriratta
Deputy Director-General
Department of Technical and
Economic Cooperation

M.R. Thep Devakul
Director-General
ASEAN Thailand
Ministry of Foreign Affairs

RECORD OF DISCUSSIONS

I. Objectives of the Project

The Government of Thailand aims at the technological development of natural rubber processing. In order to implement the objectives, the Project with Japan's technical cooperation has been planned, by making transfer of technology successful from Japan to Thailand, in such ways as the capability of the Quality Control in the Rubber Research Centre at Hat Yai (hereinafter referred to as the "RRC") is strengthened and the manpower in the field of natural rubber processing technologies is developed.

II. Outline of the Project

The Project is carried out in RRC, and consists of the following three functional activities:

1. Improvement of System and Techniques for the Quality Control;
2. Technical Advice and Guidance for Natural Rubber Producers such as Smallholders, Estates, Packers and Crumb Rubber Factories;
3. Training of Manpower.

III. Japanese Experts

1. In accordance with laws and regulations in force in Japan, the Japanese authorities concerned will take necessary measures to provide at their own expense the services of Japanese experts as listed in Annex I through the normal procedures under the Colombo Plan Technical Cooperation Scheme.
2. The Japanese experts referred to in (III.1) above, and their families, will be granted in Thailand the privileges, exemptions and benefits no less favourable than those accorded to experts of third countries working in Thailand under the Colombo Plan Technical Cooperation Scheme.

IV. Japan's Provision of Equipment, Machinery, Instrument and other Materials

1. In accordance with laws and regulations in force in Japan, the Japanese authorities concerned will take necessary measures to provide at their own expense such equipment, machinery, instrument and other materials as listed in Annex II, which are required for the implementation of the Project through the normal procedures under the Colombo Plan Technical Cooperation Scheme.
2. Articles referred to in (IV. 1) above will become the property of the Government of Thailand upon being delivered c.i.f. to the Thai authorities concerned at the ports and/or airports of disembarkation, and will be utilized exclusively for the implementation of the Project in consultation with the Japanese chief adviser referred to in Annex I.

V. Training and Studies for Thai Personnel in Japan

1. In accordance with laws and regulations in force in Japan, the Japanese authorities concerned will take necessary measures to receive the Thai personnel engaged in the activities of the Project for technical training and/or observational study in Japan through the normal procedures under the Colombo Plan Technical Cooperation Scheme.
2. The Government of Thailand will take necessary measures to ensure that the knowledge and experience acquired by the Thai personnel from technical training and/or study in Japan will be effectively utilized for the implementation of the Project.

VI. Measures to be taken by the Government of Thailand

1. In accordance with laws and regulations in force in Thailand, the Government of Thailand will take necessary measures to provide at its own expense:
 - i) services of the Thai counterpart personnel and administrative personnel as listed in Annex III;
 - ii) land, buildings and facilities as listed in Annex IV;

- iii) supply or replacement of equipment, machinery, instruments, vehicles, tools, spare parts and any other materials necessary for the implementation of the Project other than those provided by the Japanese authorities concerned under (IV. 1);
- iv) transportation facilities and the payment of travel allowance for the Japanese experts for official travel within Thailand;
- v) suitable furnished housing accommodation for the Japanese experts and their families;
- vi) expenses necessary for the transportation within Thailand of the articles referred to in (IV. 1) as well as for the installation, operation and maintenance thereof;
- vii) customs duties, internal taxes and any other charges, imposed in Thailand in respect of the articles referred to in (IV. 1);
- viii) all the running expenses necessary for the implementation of the Project.

VII. Responsibility for the Project

The Director-General of the Department of Agriculture will bear the overall responsibility for the implementation of the Project.

VIII. Claims against Japanese Experts

The Government of Thailand will undertake to bear claims, if any arises, against the Japanese experts engaged in the implementation of the Project, resulting from, occurring in the course of, or otherwise connected with, the discharge of their official functions in Thailand, except for those claims arising from willful misconduct or gross negligence of the Japanese experts.

IX. Mutual Consultation

There will be close consultation between both authorities concerned for the successful implementation of the Project.

X. Terms of Cooperation

The period of the technical cooperation mentioned in this Record of Discussions will be three (3) years from the date of signature and may be ~~extended~~ by mutual agreement between the authorities concerned of both Governments.

ANNEX I. List of Japanese Experts

1. Chief Adviser
2. Expert On Quality Control

Note: If necessary, additional short-term experts will be assigned to the Project.

ANNEX II. List of the Articles to be provided by the Japanese Authorities Concerned

1. Machinery and Equipment for Experimental Works.

- Akron abrasion machine
- Go drich flexometer
- Monsanto rheometer
- Dunlop resilience tester
- Ozone resistance tester
- Densimeter
- Aging oven
- Analytical balance
- Tensile testing machine
- Automatic mooney viscometer
- Shore hardness tester
- pH meter
- Hardness tester for foam goods
- Extruder (experimental)
- Various types of specimen cutters

2. Ancillary Research Equipment:

- Laboratory-size internal mixer
- Mixing mill
- Steam curing press
- Air compressor
- Water distiller
- Boiler
- Centrifugal machine
- Ball mill (chemical dispersion)

3. Others:

- Vehicle and other necessary materials.

Note: The above articles will be selected on the following criteria:

1. To exclude the equipment which is locally produced in Thailand;
2. To exclude the equipment which requires extremely high level of technology.
3. To exclude the accessories of lesser importance which are not vital to the performance of the equipment.

ANNEX III. List of Thai Counterpart Personnel and Administrative Personnel

1. Counterpart personnel
 - (i) Project Leader
 - (ii) Expert on natural rubber
2. Administrative personnel
 - (i) Administrative Officer
 - (ii) Secretary
 - (iii) Clerk
 - (iv) Typist
 - (v) Driver

ANNEX IV. List of Land, Buildings and Facilities

1. Land and buildings:

Necessary land and buildings for the implementation of the Project will be provided in the area of the Rubber Research Centre.

2. Facilities:

- (i) Offices for Japanese experts
- (ii) Offices for Thai counterpart personnel and administrative personnel
- (iii) Meeting room
- (iv) Lecture and seminar room
- (v) Library
- (vi) Other necessary facilities



4. 実施案の具体的内容

実施案の具体的内容は、Tentative Implementation Programme として、調査団とタイ国側によりまとめられた。

TENTATIVE IMPLEMENTATION PROGRAMME
TO THE RECORD OF DISCUSSIONS CONCERNING TECHNICAL COOPERATION
ON THE TECHNOLOGICAL DEVELOPMENT
OF NR PROCESSING BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY
AND
DEPARTMENT OF AGRICULTURE
MINISTRY OF AGRICULTURE AND COOPERATIVES
GOVERNMENT OF THAILAND

Bangkok
April 1, 1977

I. PROGRAMME FOR THE IMPLEMENTATION

Japan's technical cooperation will be executed according to Table 1.

(1) Terms of Reference of Japanese Experts

1. Chief Adviser

- 1.1 To assist the Project Leader in the technical operation of the Project and to assist Thai officers in conducting experiments.
- 1.2 To provide technical advisory service to staff of RRC and NR producers with a view to improve the quality of NR.

2. Expert on Quality Control

- 2.1 To set up the physical testing laboratory in the Technology Division.
- 2.2 To improve and control the quality of Technically-Specified Rubber (TSR) and conventional NR production.
- 2.3 To train Thai officers in the operation and maintenance of all equipment.

(2) Training Programme

Training programme for Thai counterparts in Japan is divided into three parts:

1. Training on how to use equipment: 2 x 2 months.
2. Training in laboratories and factories:

| | | |
|-------------|---|--------------|
| First year | - | 4 x 4 months |
| Second year | - | 4 x 4 months |
3. Post graduate level training (leading to a Master's Degree when available in a suitable University or College).

Note:

- i) Training consists of studying the procedure and test after arrival of NR to the Rubber Products manufactures' factories in Japan and familiarizing laboratory procedures and tests required for Compounded Rubber.
- ii) University training is subject to acceptance of the candidate by the University or college concerned.

II. IMPLEMENTING AGENCIES

Thai side: Department of Agriculture, Ministry of Agriculture and Cooperatives.

Japanese side: Japan International Cooperation Agency.

III. PROJECT TEAM AND ITS STAFFING

The Project Team consisting of Thai counterpart personnel and Japanese experts will be set up within RRC. It must be noted that activities of the project are mainly carried out by the Thai counterpart personnel with the assistance of Japanese experts.

IV. EQUIPMENT AND MACHINERY TO BE INSTALLED

The following equipment and machinery will be installed to achieve the objective of the project:

(1) Equipment and Machinery for experimental works

- Akron abrasion machine
- Goodrich flexometer
- Monsanto rheometer
- Dunlop resilience tester
- Ozone resistance tester
- Densimeter
- Aging ovens (1 large size unit and 1 medium size unit)
- Analytical balances (4 units)
- Tensile testing machine
- Automatic mooney viscometer
- Shore hardness tester
- pH meter
- Hardness tester for foam goods
- Extruder (experimental)
- Various types of specimen cutters

(2) Ancillary Research Equipment

- Laboratory-size internal mixer
- Mixing mills (2 units)
- Steam curing presses (2 units)
- Air compressor
- Water distiller
- Boiler
- Centrifugal machine
- Ballmills for chemical dispersion (12 one-gallon units)

(3) Others

- Vehicle and other necessary materials.

Bangkok

April 1, 1977

Made by Mr. Koji Ota
Head of Japanese Implementation
Survey Team
Japan International Cooperation
Agency

TABLE 1. STATE OF ACTUAL OPERATION

| | FY 1977 | FY 1978 | FY 1979 |
|---|--|-------------|------------------------|
| Japanese Experts | I II III IV | I II III IV | I II III IV |
| Planning and Layout of Facilities | 4 7 10 1 | 4 7 10 1 | 4 7 10 1 |
| | 1 m/m (2 people x 2 weeks) | | |
| Installation of Equipment | 2 m/m | 2 m/m | 2 m/m |
| | (2 people x 1 month x 3 times) | | |
| Promotion of Quality Control Operation of Equipment | 72 m/m | 72 m/m | 72 m/m |
| | (1 person x 2 Co. x 18 months x 2 times) | | |
| Japan's Provision of Equipment | | | |
| Training of Thai Counterparts | | | |
| in Thailand | | | |
| in Japan | | | |
| in Laboratories | 4 m/m | 4 m/m | 4 m/m |
| | (2 people x 2 months) | | |
| in Laboratories and Plants | 16 m/m | 16 m/m | 16 m/m |
| | (2 people x 2 Co. x 4 months x 2 times) | | |
| in University | | | 24 m/m |
| | | | (1 person x 24 months) |

Note The fiscal year referred to in the above table is the Japanese fiscal year which starts in April and ends in March.

4.1 品質管理の促進について

(1) 日本人 Experts は下記事項を推進し、NRの品質管理の促進を企る。

Chief Adviser (1名) ○ NRの品質を改良するため、RRC及びNR生産者の関係者に対する技術的アドバイスを行なう。

○ このプロジェクトの技術面の責任者の立場で、タイ側のリーダーを補助し、実験を通してタイ側関係者を援助する。

品質管理の専門家 (1名) ○ T S R, NRの品質管理をコントロール

○ すべての供与機材の操作法と維持管理について、タイ側関係者を訓練する。

○ RRCの Technology Division で物理試験室の設計にたづさわる。

4.2 人材の養成(タイ側の日本に於る人材養成)

(1) 供与機材の使い方の訓練を日本で実施する。同時にメカニクス、保守管理技術の訓練を実施し、タイ側の Machine に関する人材を2名×2ヶ月訓練する。

(2) 民間のゴム研究機関及びタイヤプラントに於て、化学分析、配合品質管理、一般のゴム物理試験の訓練を次の要領で実施し、各訓練項目の専門家を養成する。

First year 4 × 4 Monthe ('77 / 7 ~ 8 月スタート)

Second year 4 × 4 Monthe ('78 / 7 ~ 8 月 ")

(3) 大学関係

大学における研修生の訓練については、大学及び関係当局の受け入れによっていることを明記し、日本側では日本の大学及び関係当局に対して受け入れるよう努力することを約束した。

4.3 供与機材

合意議事録にある機材を3年間に渡って供与する。タイ側より機材の供与について下記のように年度毎の要求があった。この Priority については、試験器材関係の専門家がいないので、日本側の助言を受け入れる。

Priority of Supply of Equipment

First year

- (1) 3.5.4 (ii) Mixing Mill 12" x 6" ϕ
- (2) 3.5.4 (vi) Steam Curing Press with Temperature Recorder
(2 daylight of 18" x 18")
- (3) 3.4.9 Various Types of Specimen Cutters (as Agreed)
- | | |
|---|----------|
| 1. Specimen Punching Machine | 1 piece |
| 2. Mould for Akron test pieces | 6 pieces |
| 3. Mould for Goodrich fleximeter pieces (6 test pieces in 1) | 3 " |
| 4. Mould for Dunlop Resilience test pieces | 2 " |
| 5. Dumbbell cutters 3 sizes | 2 each |
| 6. Nicker for tear test piece | 1 |
| 7. Tear test piece cutter | 2 |
- (4) 3.4.3 Monsanto Rheometer
- (5) 3.4.7 Gear Aging Oven (one big, one small)
- (6) 3.4.6 Densimeter
- (7) 3.6.2 Water Distiller 10 Litre/hrs.

Second year

- (1) 3.4.1 Akron Abrasion Machine
- (2) 3.4.4 Dunlop Resiliense Tester
- (3) 3.5.4 (i) Laboratory size Internal Mixer (about volume 4.3 litres)
- (4) 3.5.4 (ii) Mixing Mill 20" x 10" ϕ
- (5) 3.6.3 Boiler 1,000 kgs/hours
- (6) 3.5.4 (v) Steam Curing Press with Temperature Recorder
size 36" x 36" (4 daylight)
- (7) 3.6.1 Air Compressor 7.5 H.P.

Third year

- (1) 3.4.8 Analytical Balance : 4 Units
- (2) 3.4.5 Ozone Resistance Tester
- (3) 3.4.2 Goodrich Flexometer (for heat built-up and Dynamic compression tester)
- その他

Others

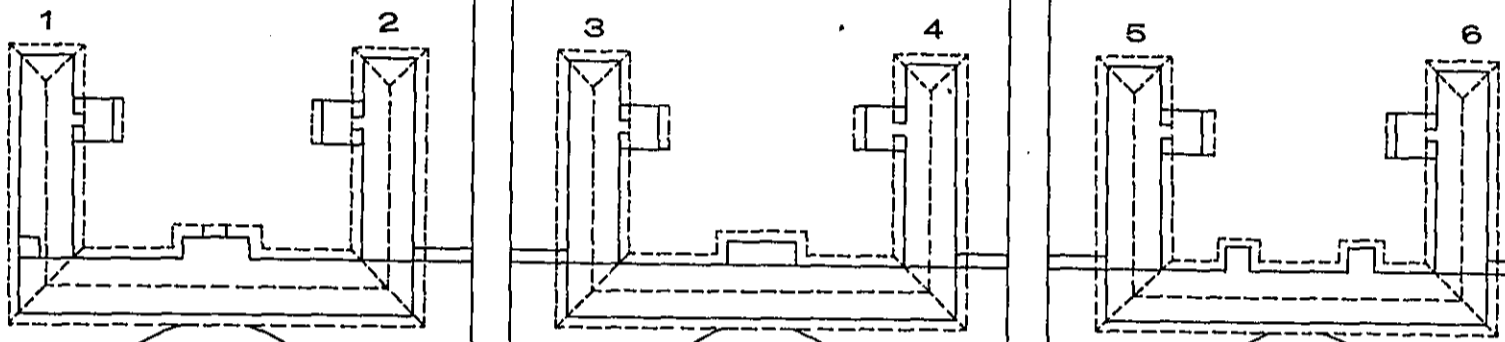
- (1) Tensile Tester (most essential)
- (2) Automatic Mooney Viscosimeter
- (3) Shore Hardness Tester
- (4) pH Meter
- (5) Hardness for Foam Testing
- (6) 3.6.4 Centrifugal Machine 30 - 50 Litres/hrs.
- (7) 3.5.4 (iii) 2 1/2" Extruder
- (8) 3.5.1 (i) Ballmill for chemical dispersion
12 pieces of one-gallon capacity

日本側としては、予算及び専門家意見を考慮して送ることを考えること伝えた。

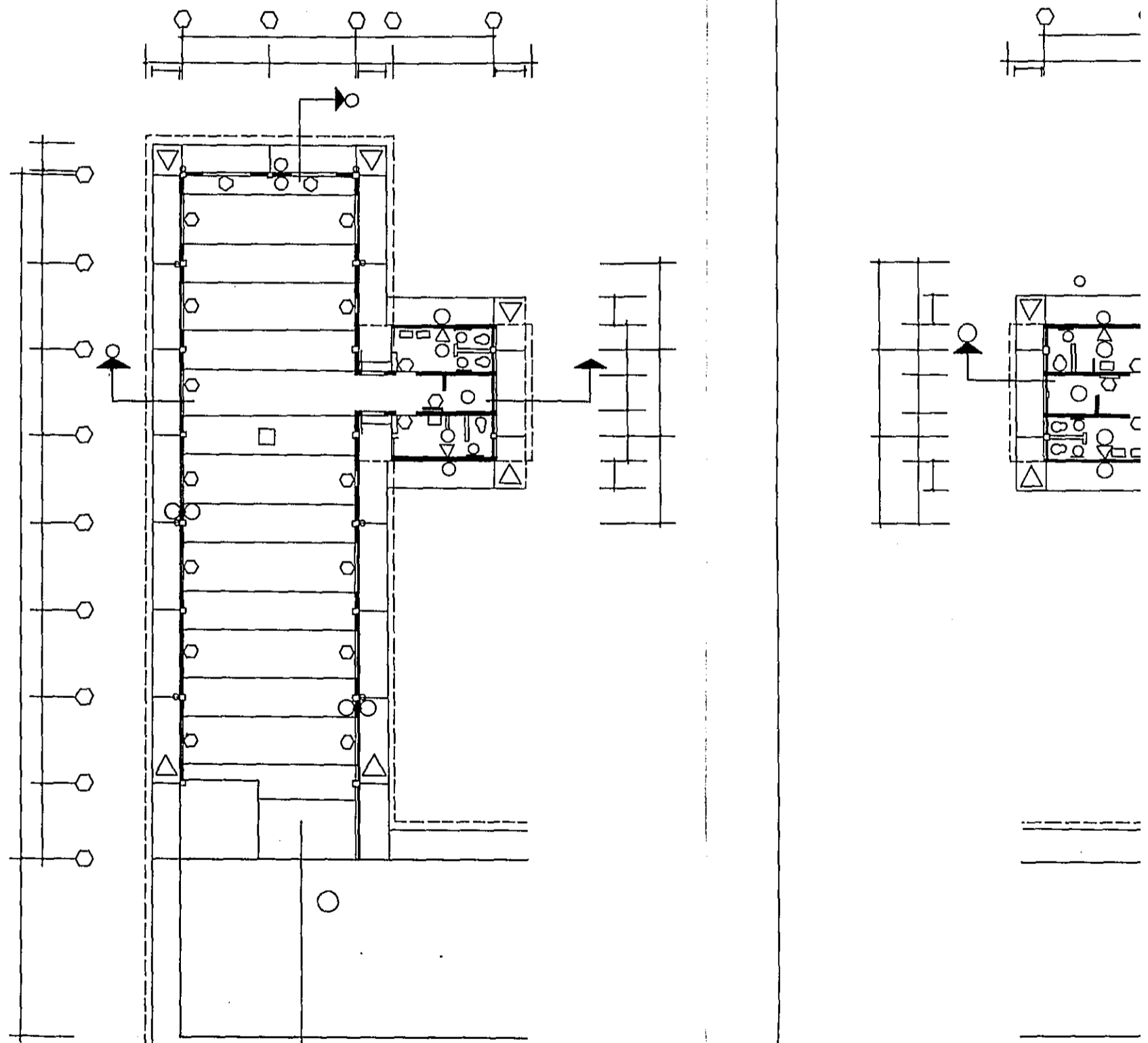
参 考 资 料

1. RRO增設圖
2. DISSCUSSION PAPER
3. RECORD OF DISSCUSSIONS (DRAFT)
4. COUNTER PROPOSALS

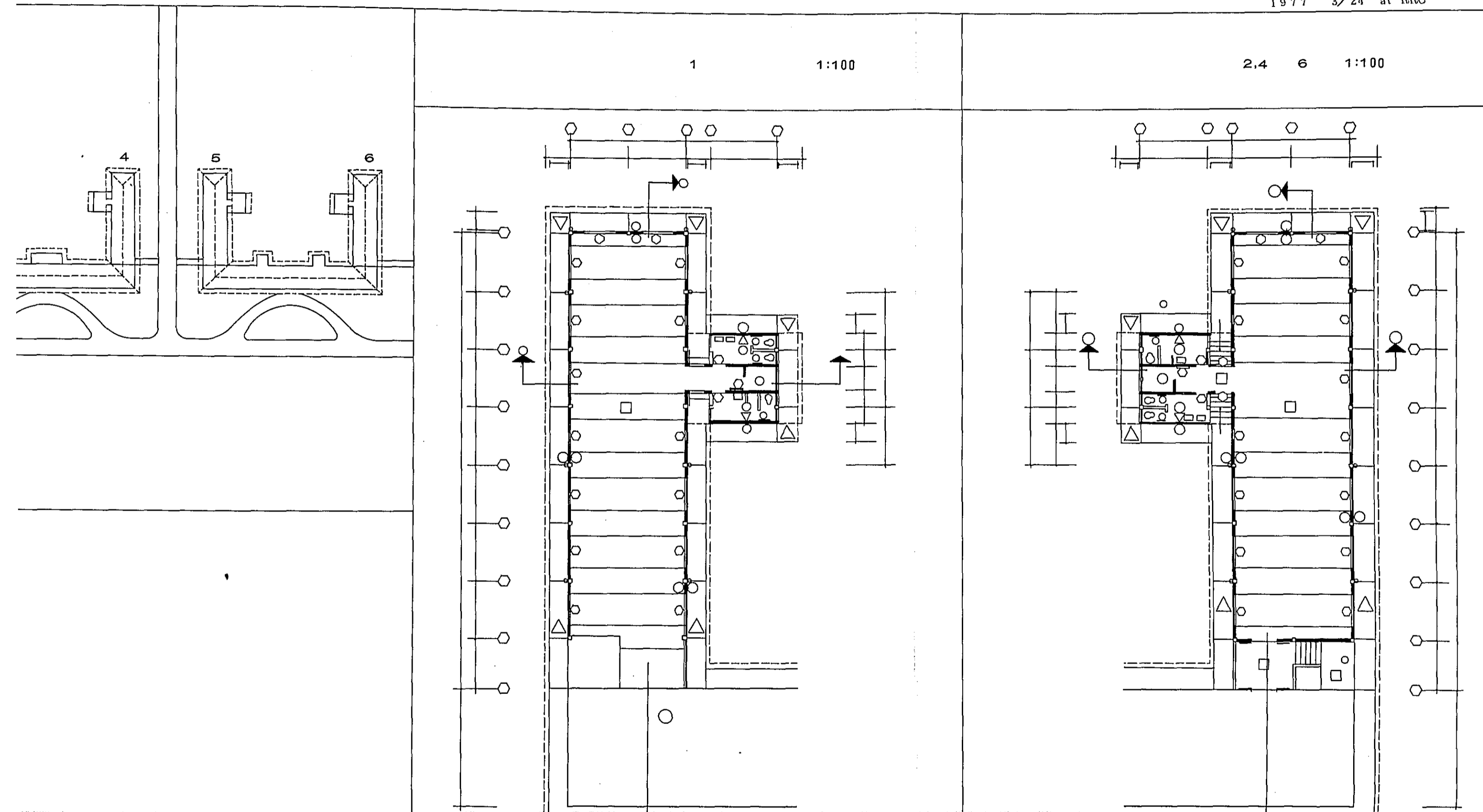
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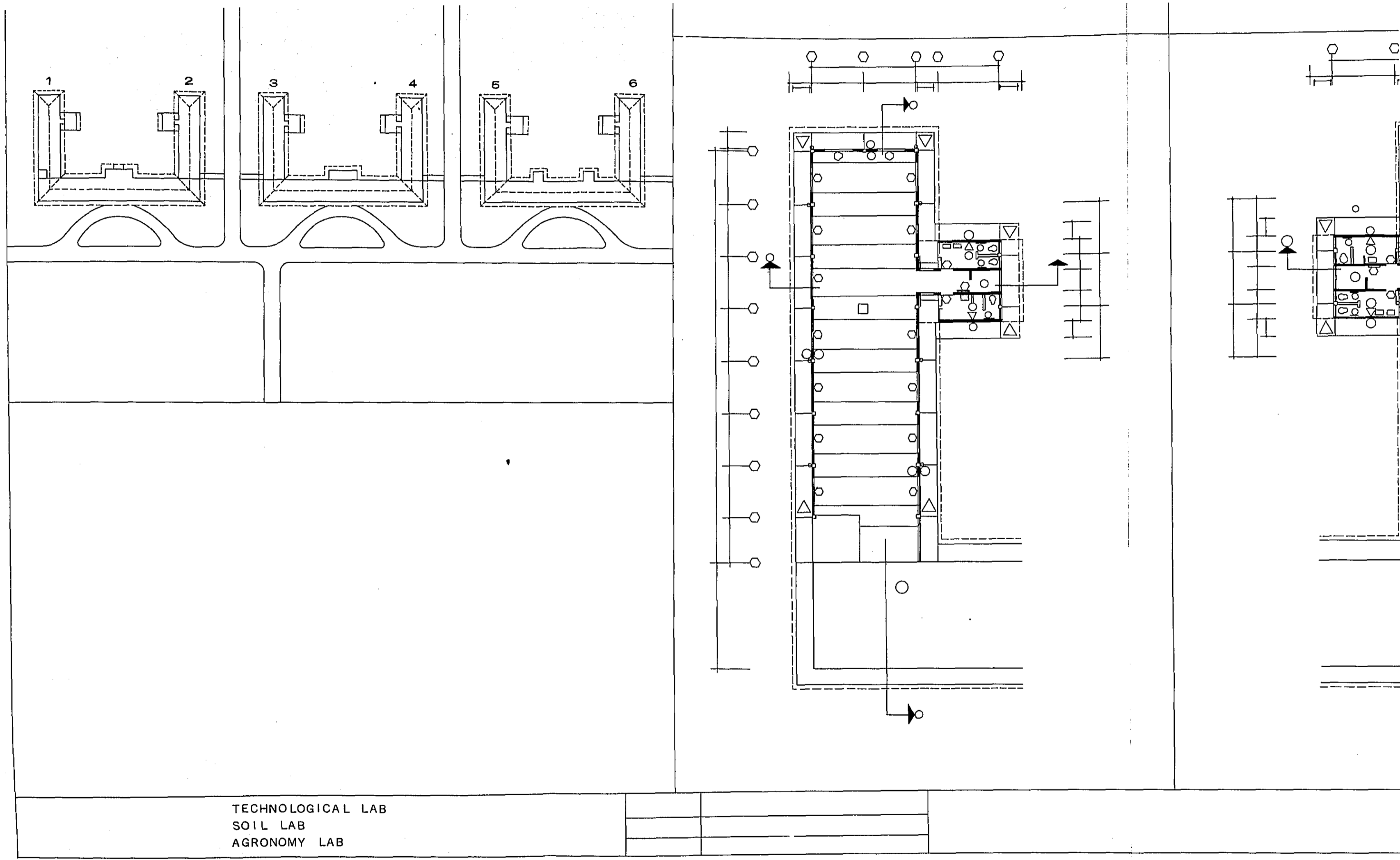


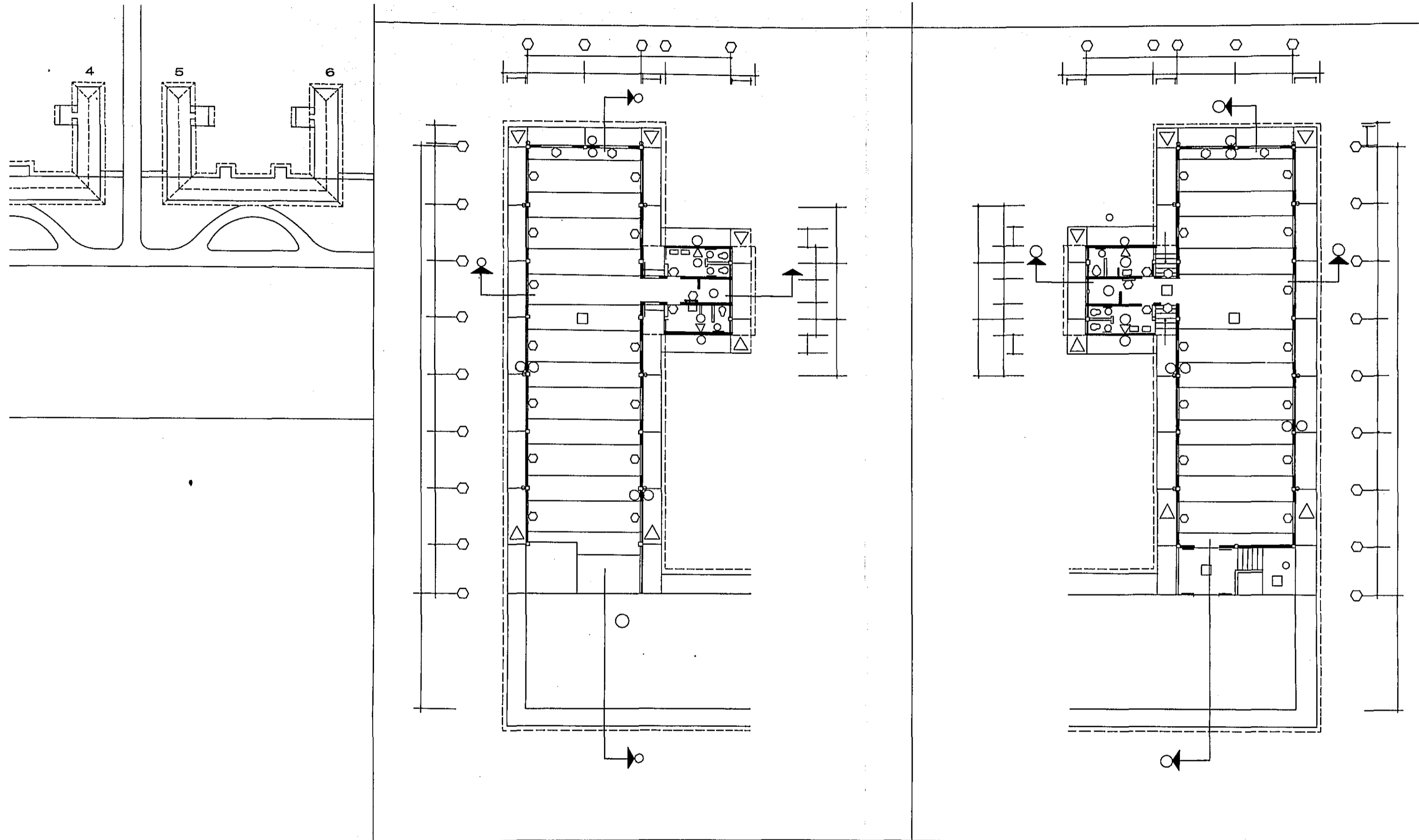
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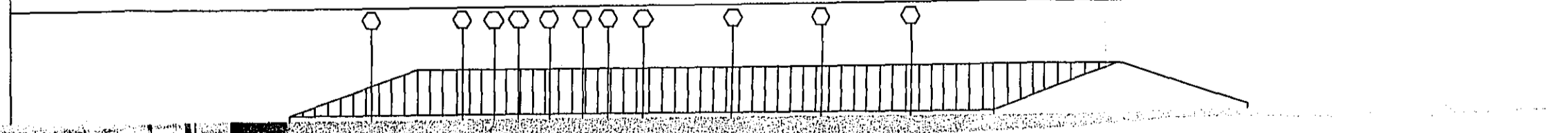
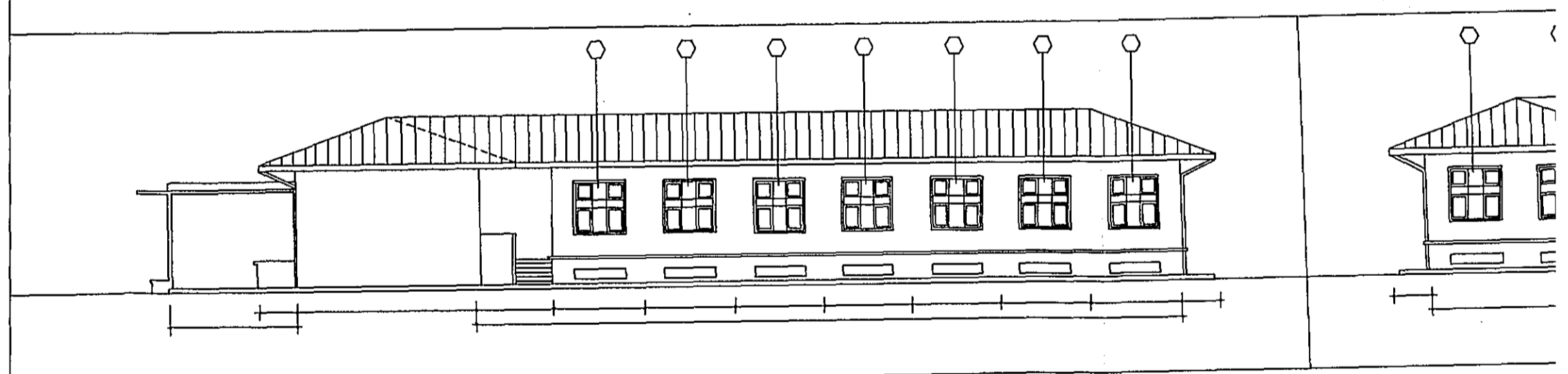
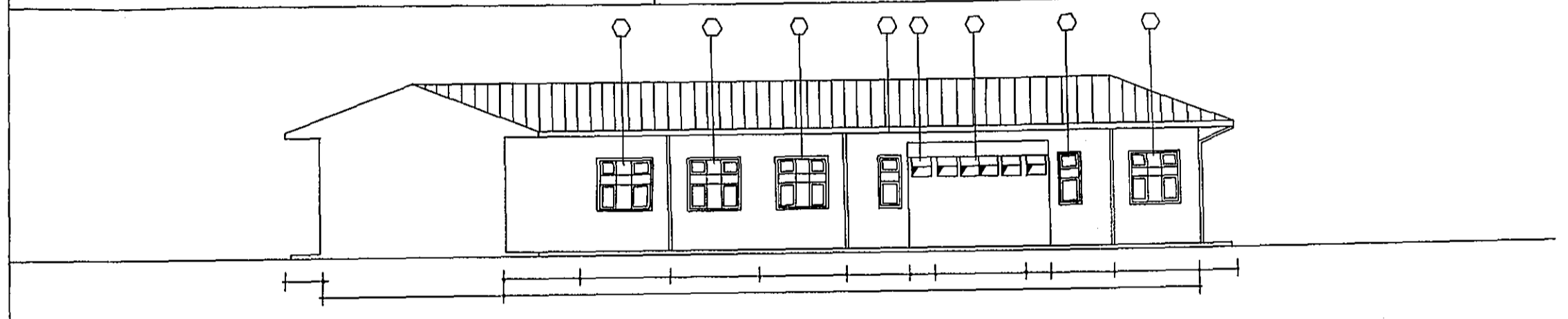
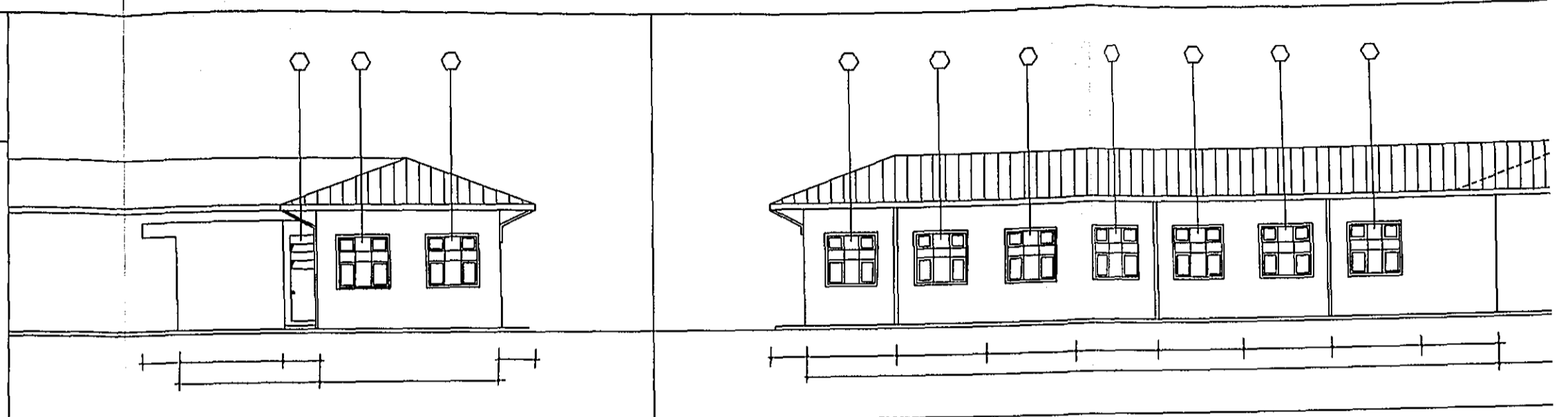
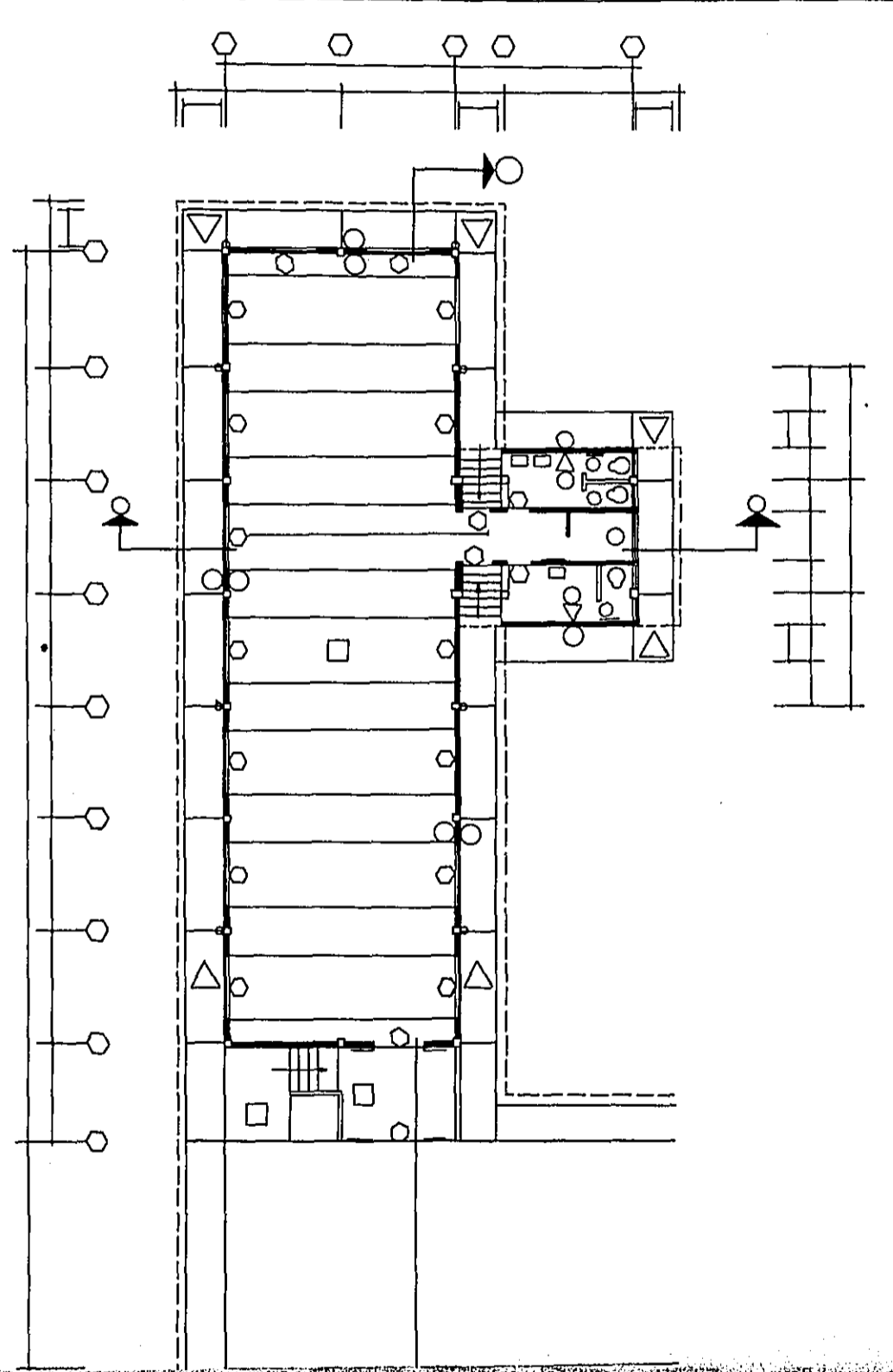




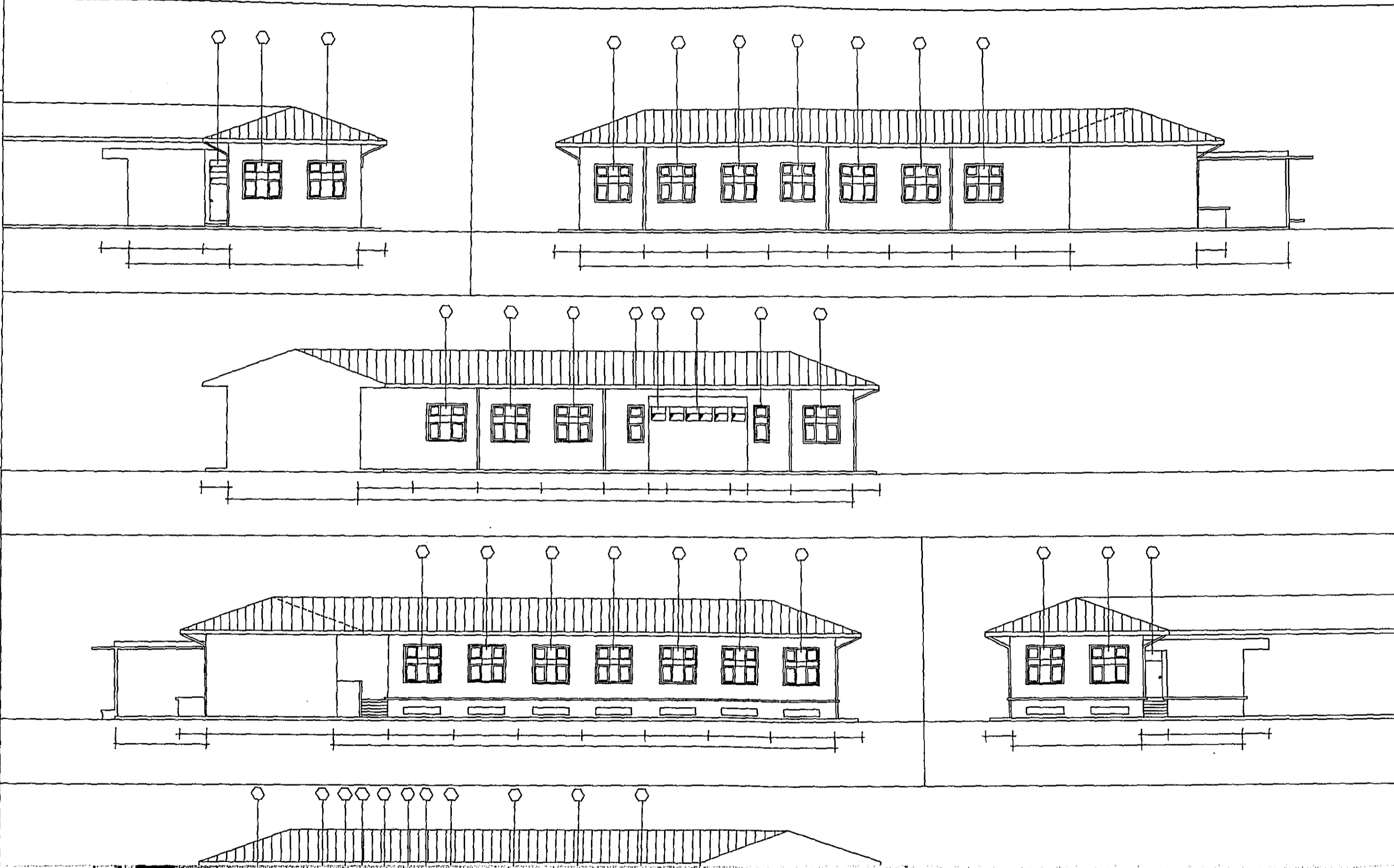
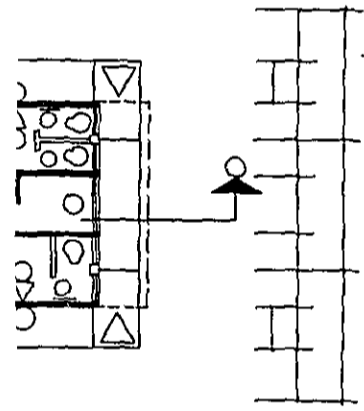


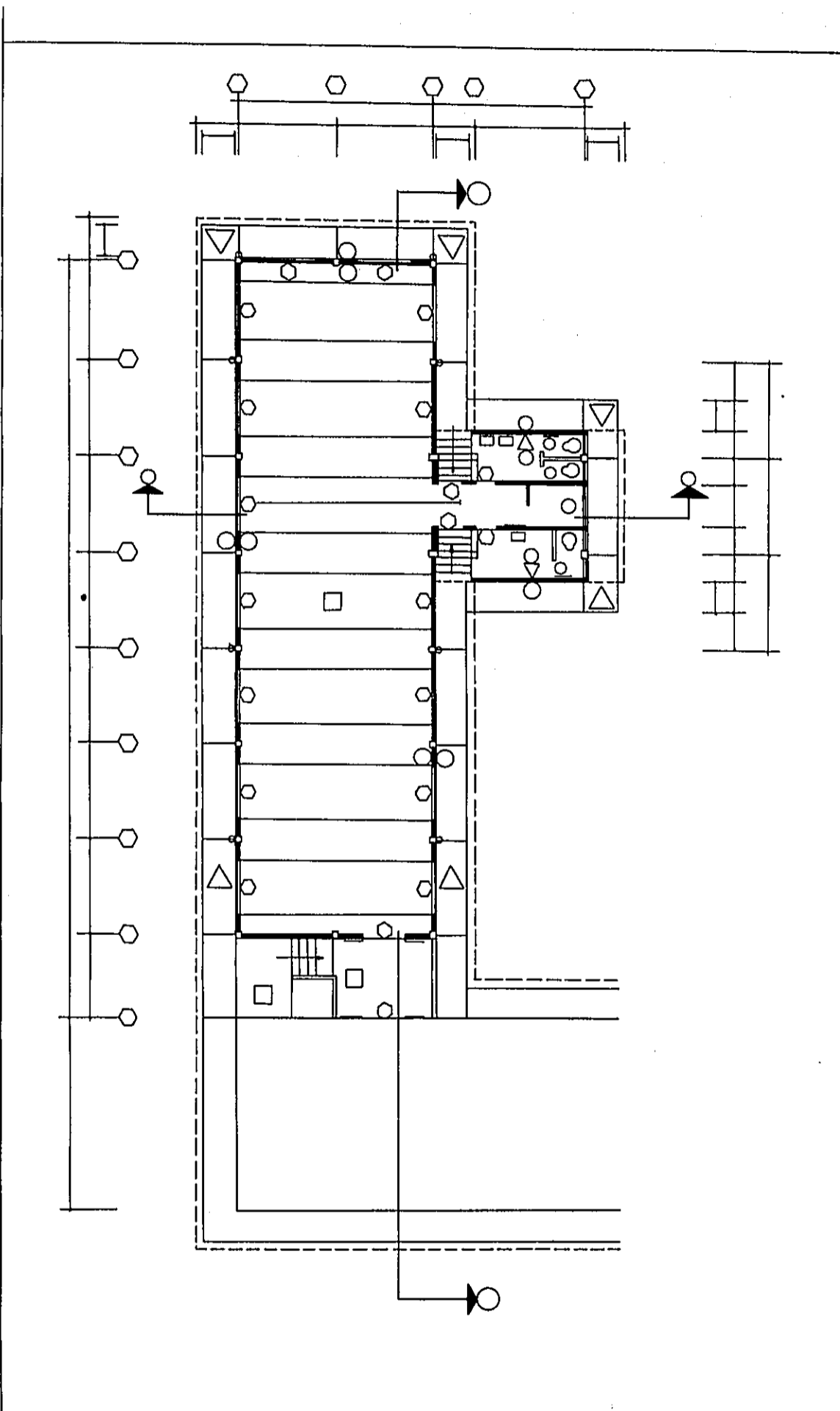
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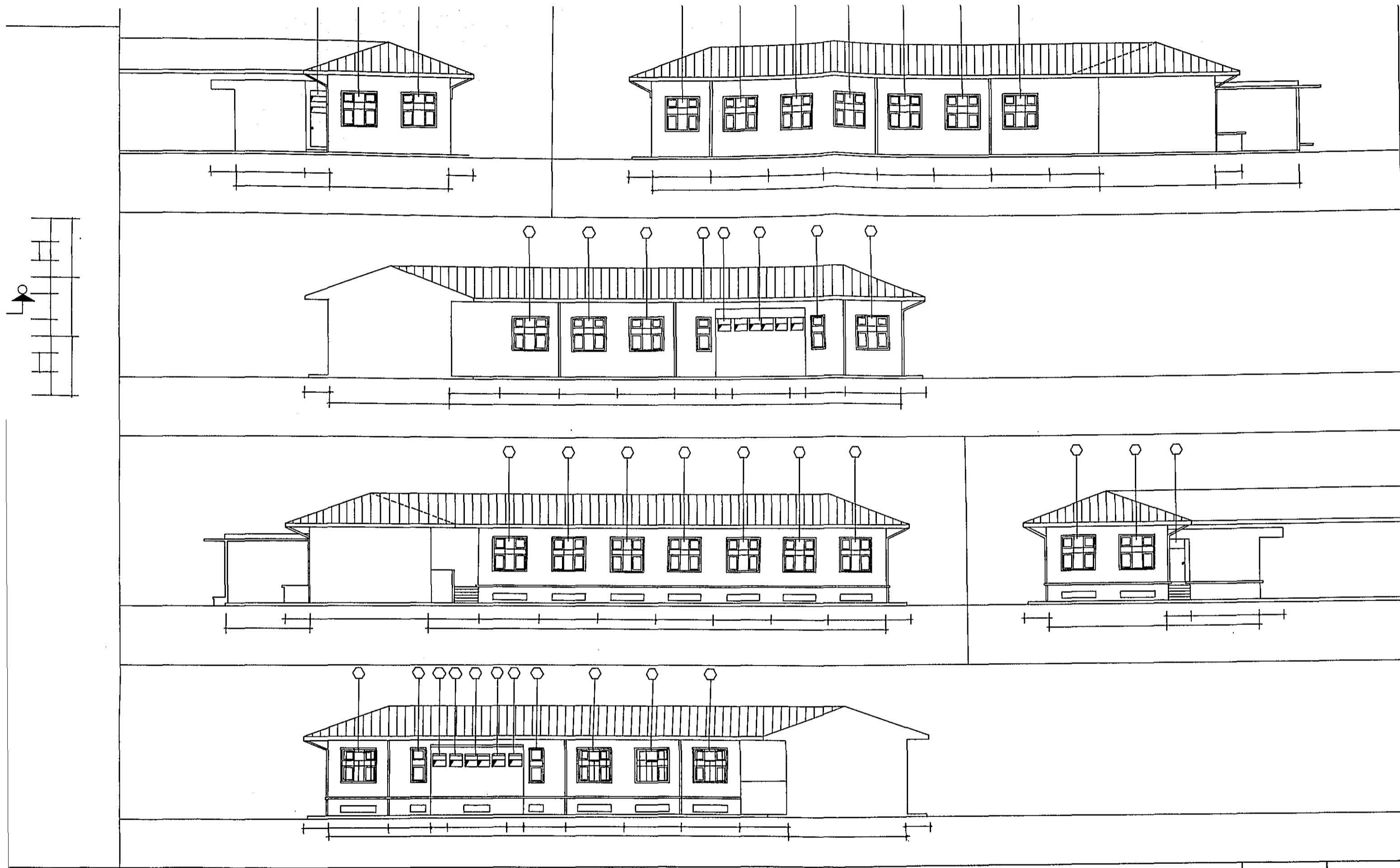
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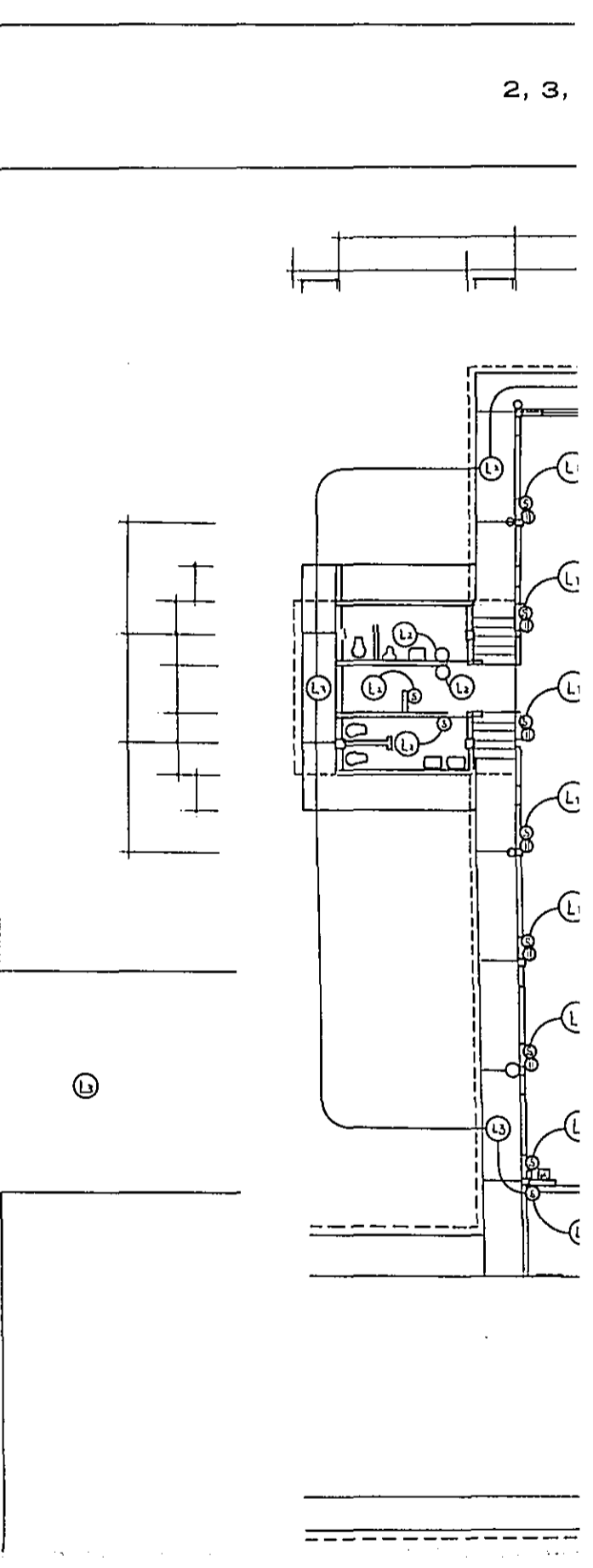
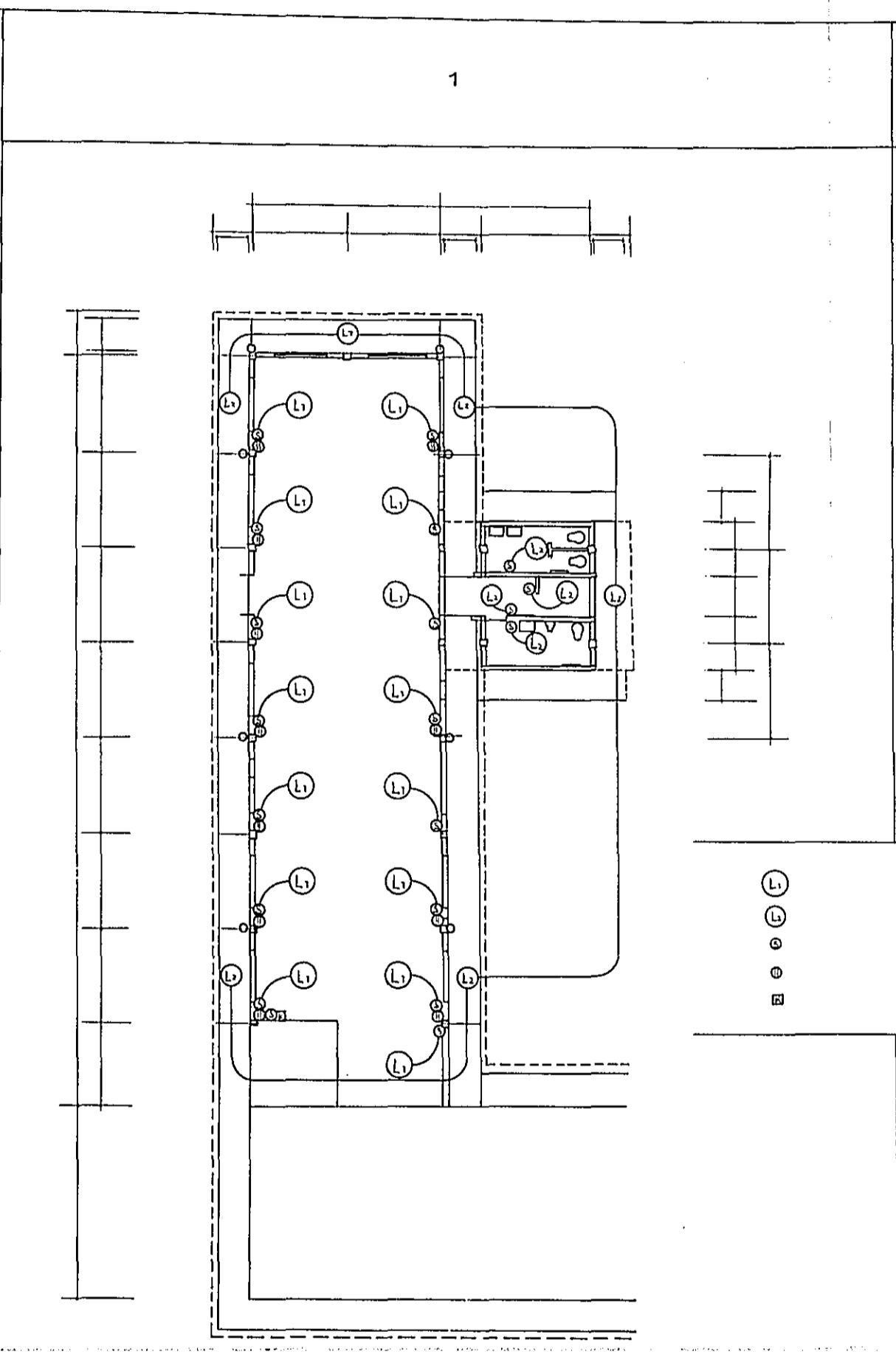
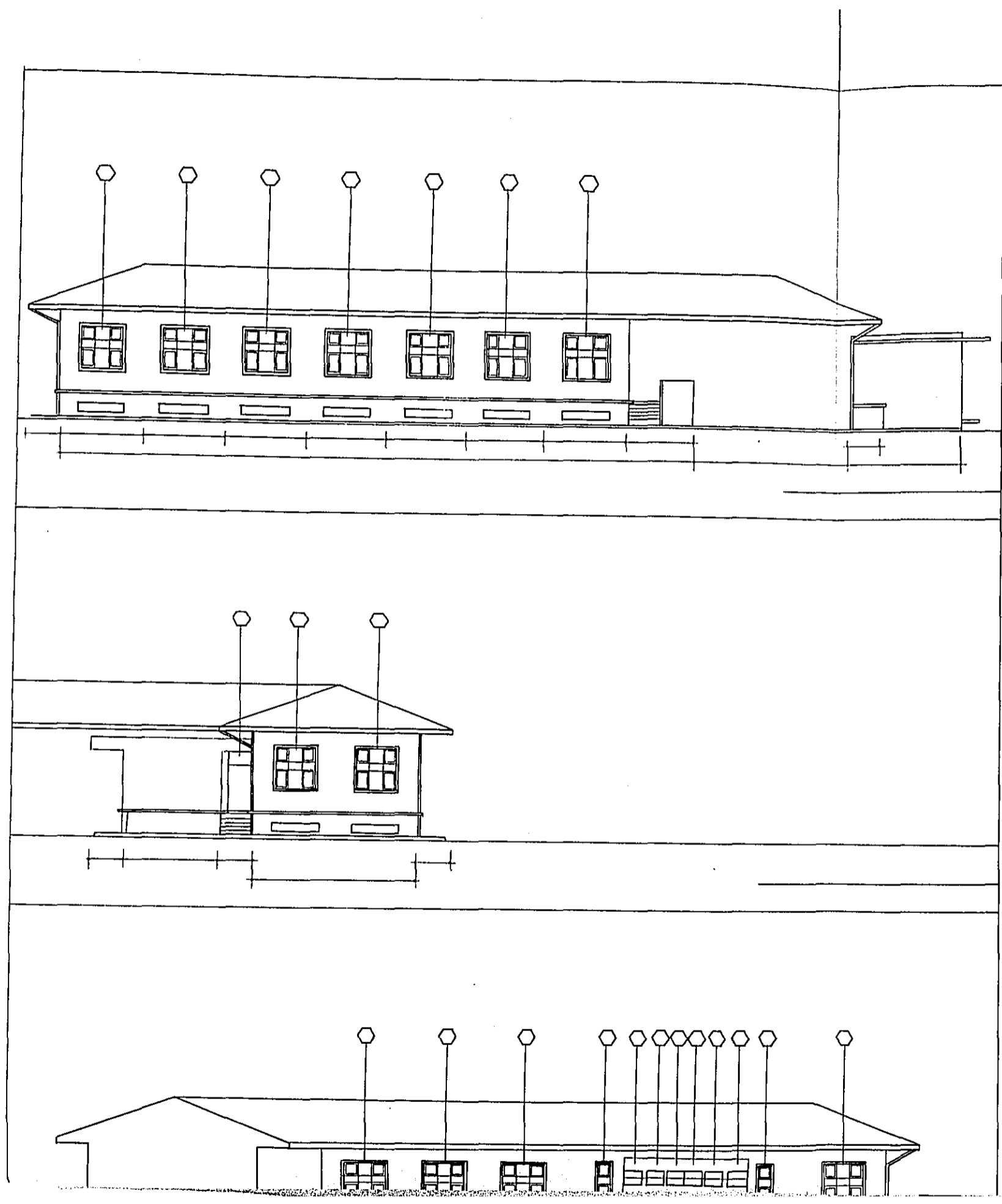


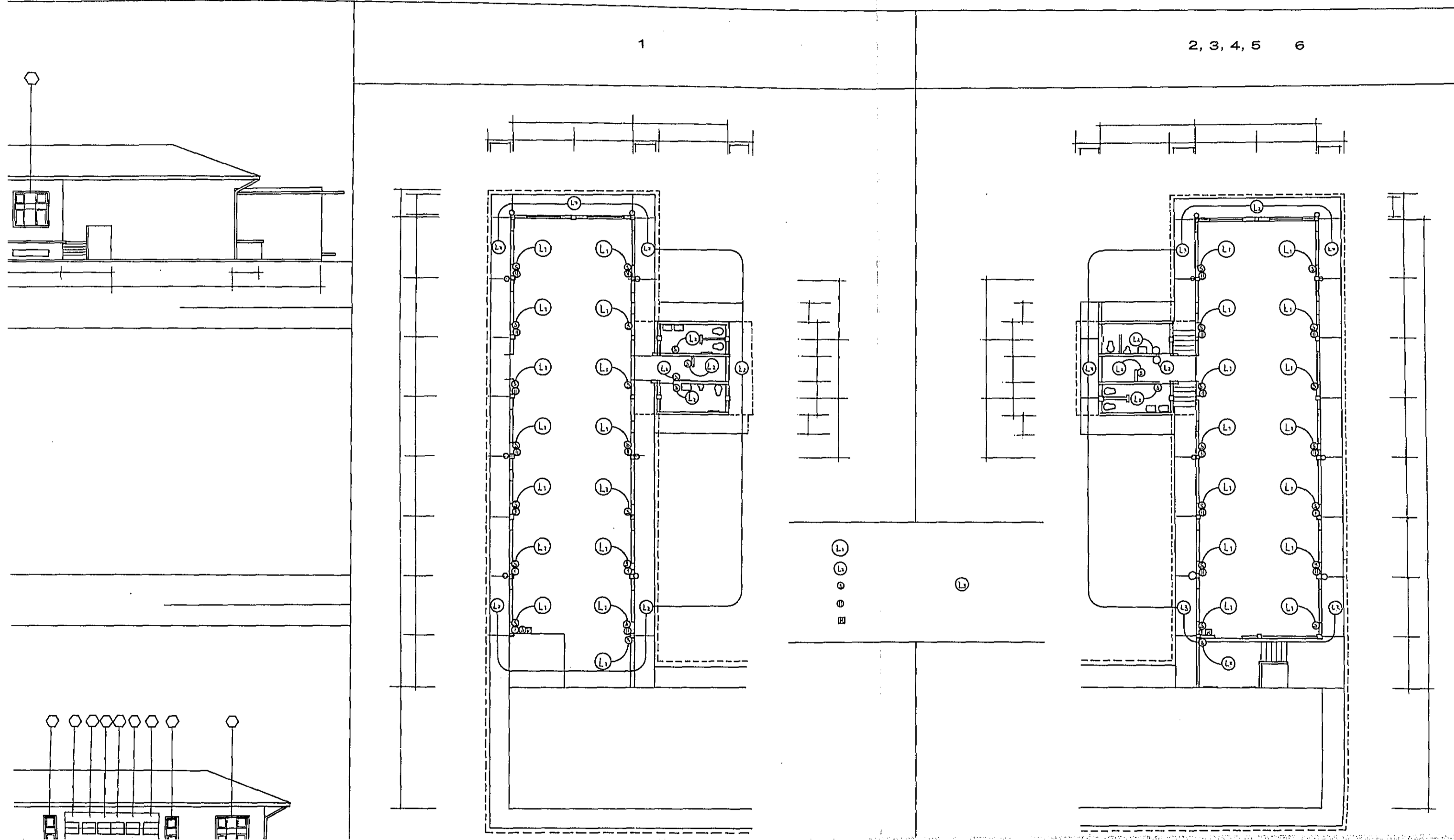
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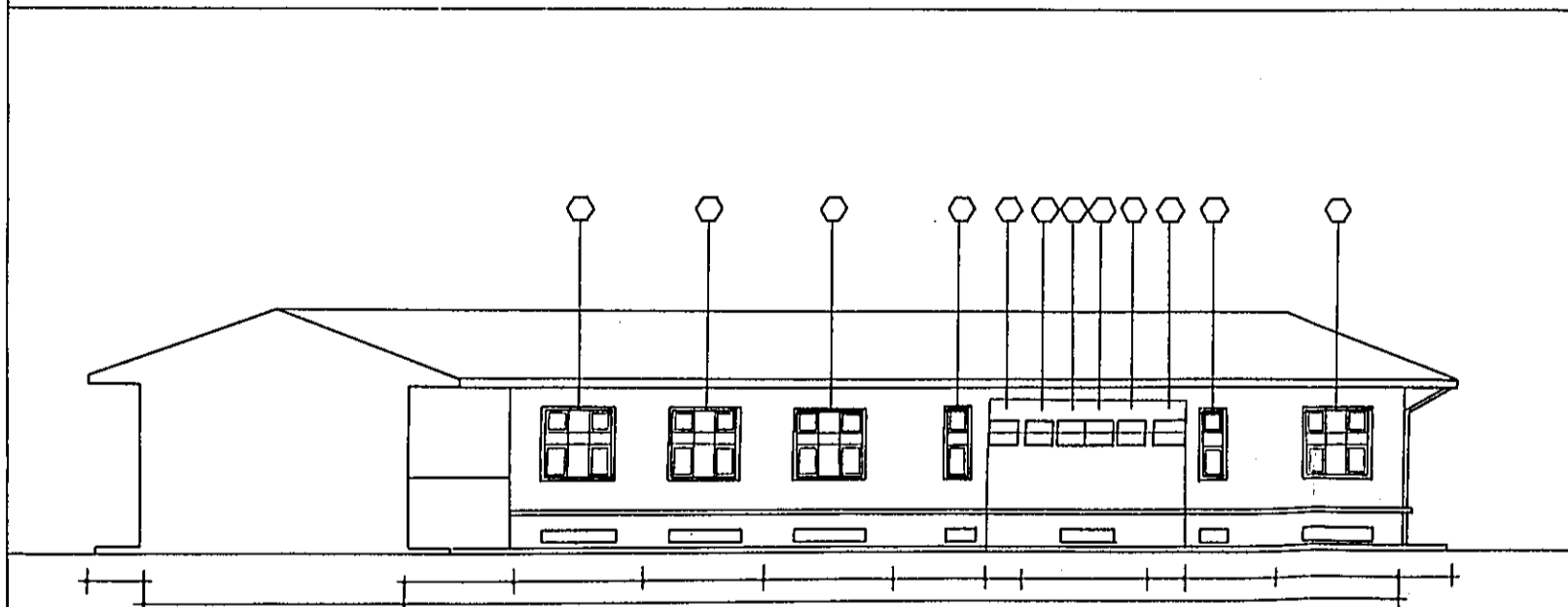
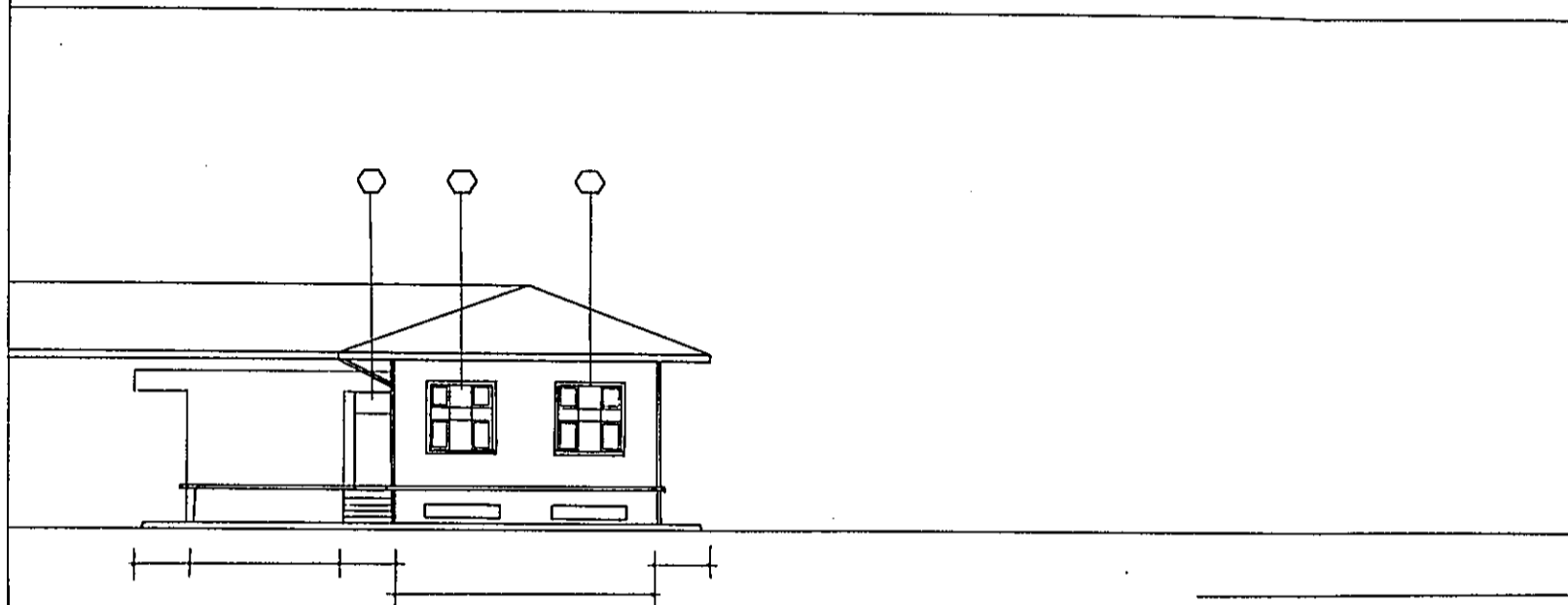
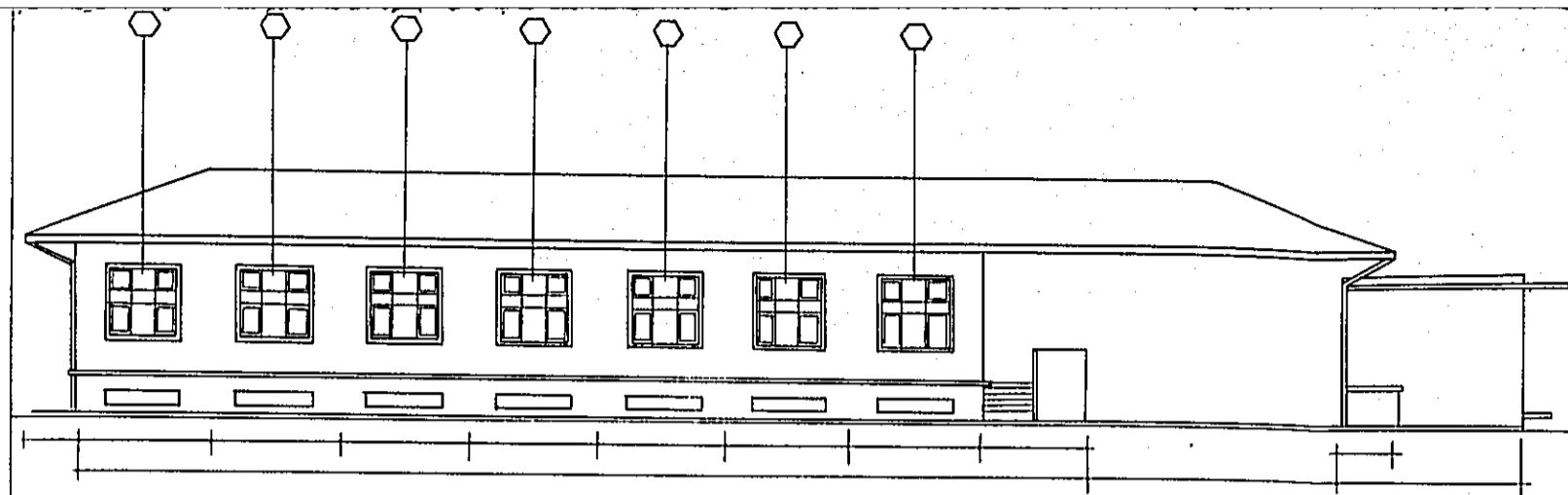
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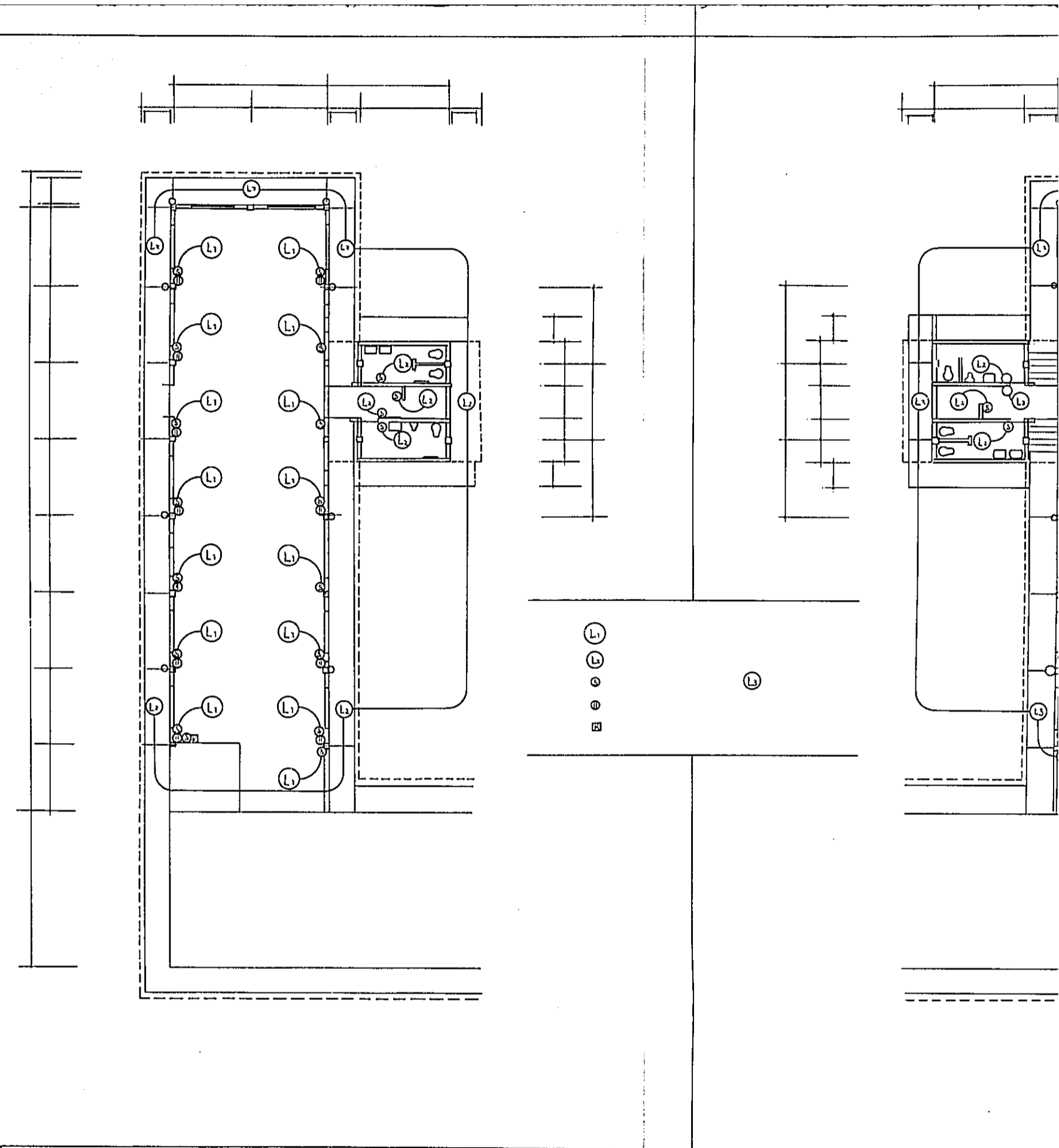
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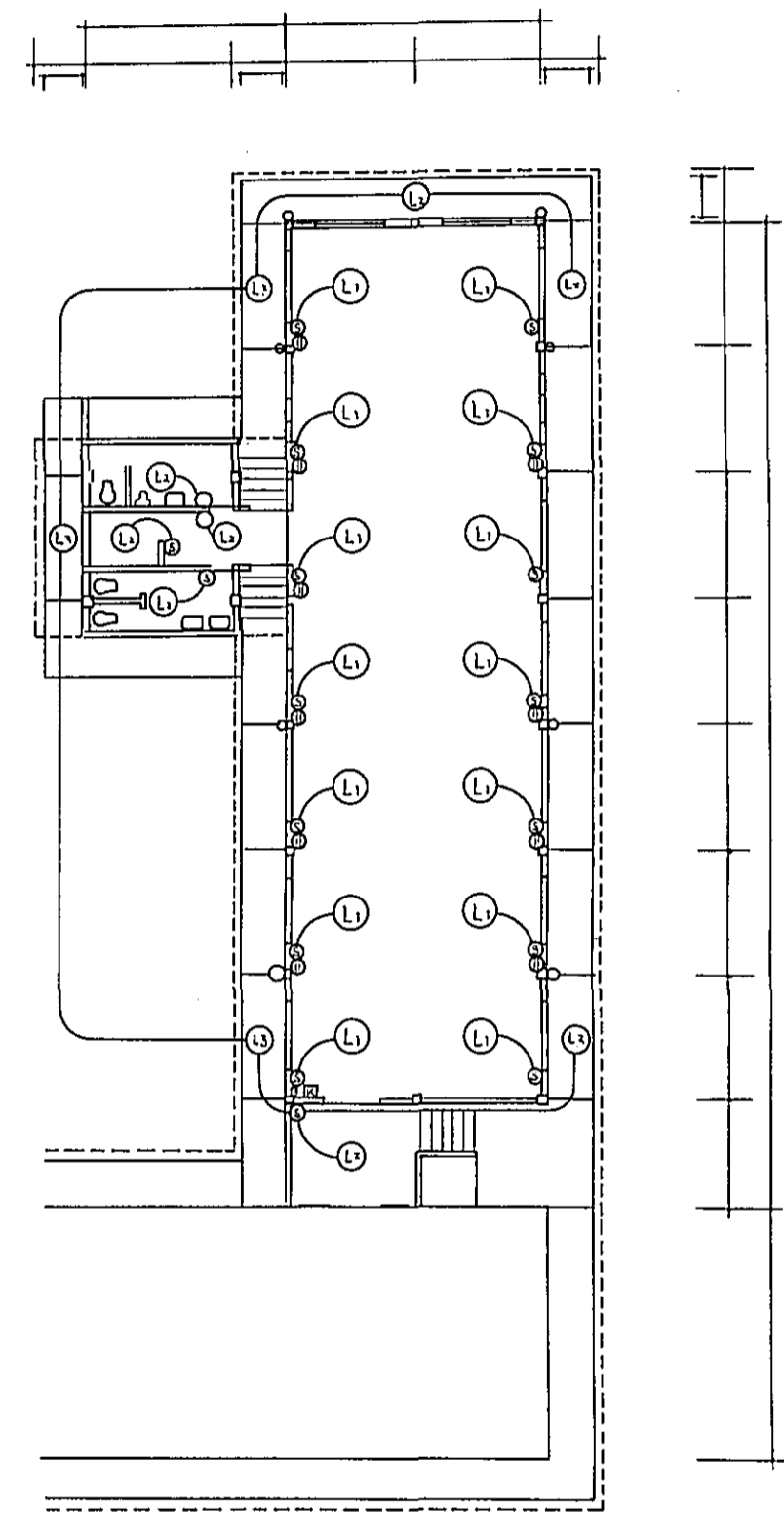
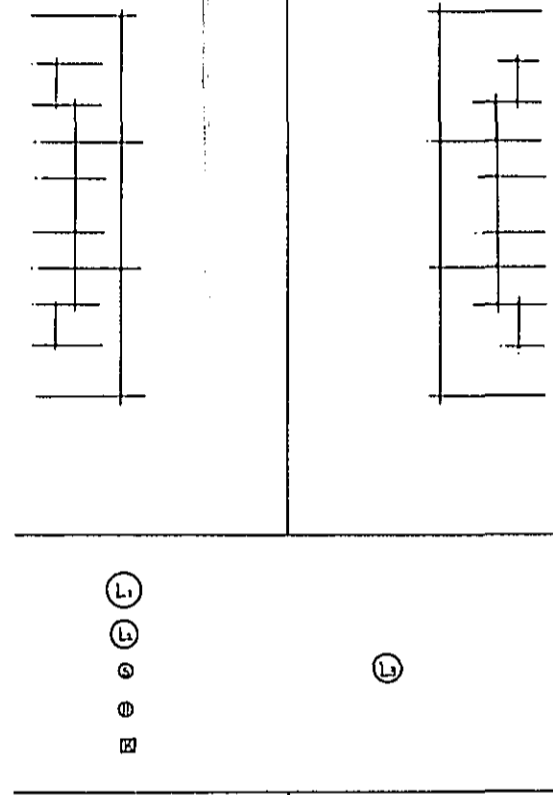
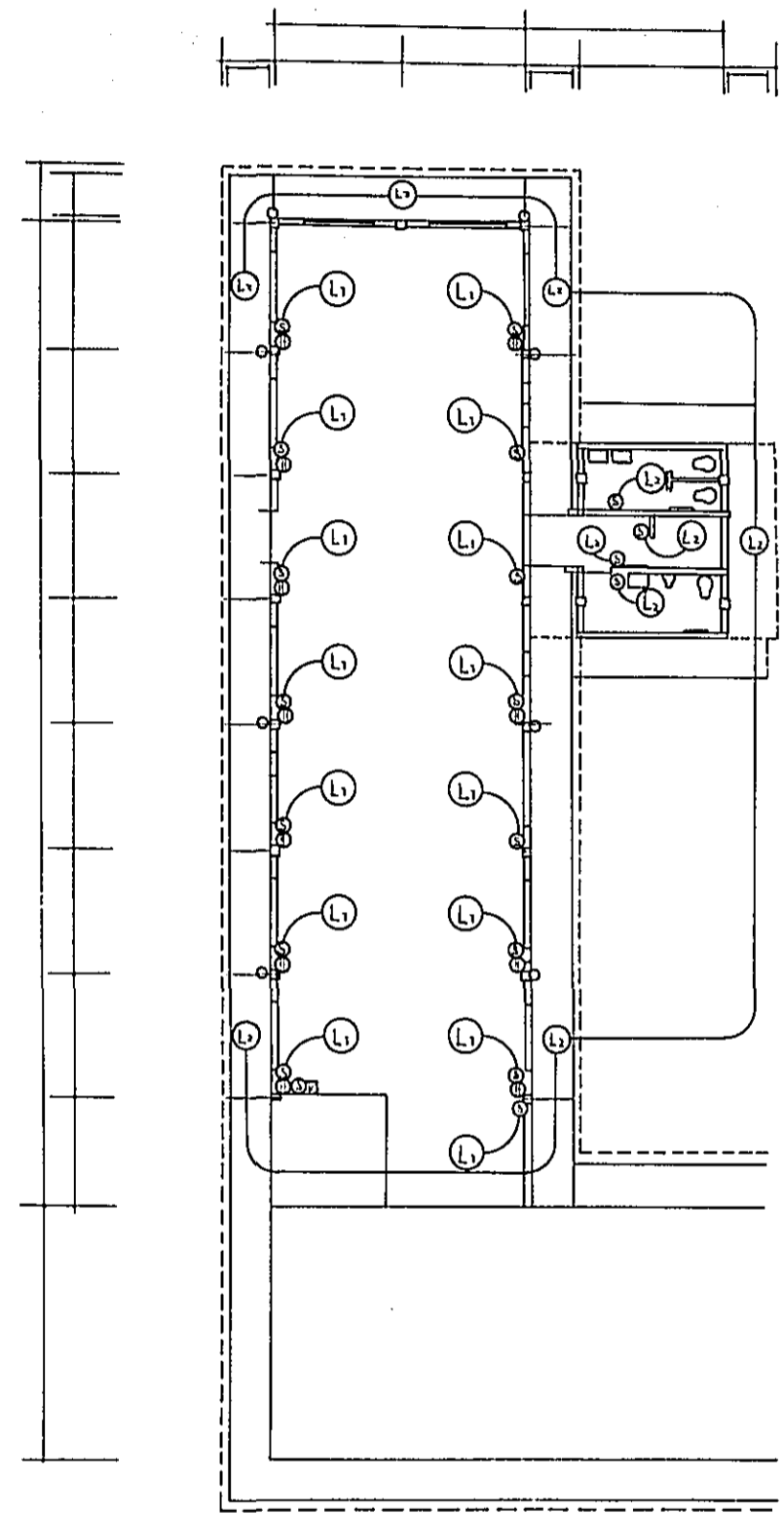
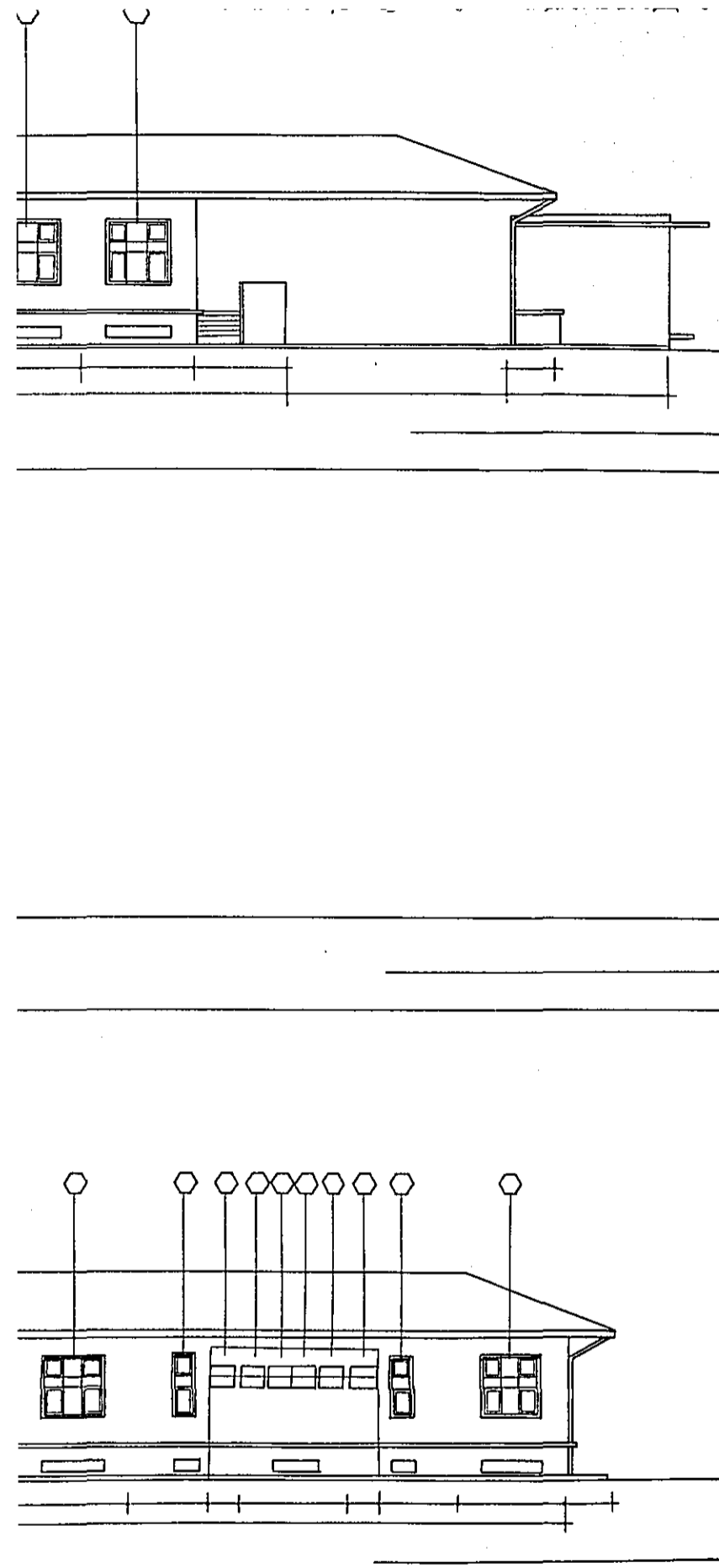






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03

DISCUSSION PAPER
FOR
TECHNICAL COOPERATION
ON
THE TECHNOLOGICAL DEVELOPMENT OF NATURAL RUBBER PROCESSING
IN
THAILAND

March, 1977

Japanese Implementation Survey Team

sent by

Japan International Cooperation Agency

JICA

Part One: Preliminary Session

A. Objectives and the Duties of the Japanese Implementation Survey Team

The Japanese Implementation Survey Team sent by the Japan International Cooperation Agency (hereinafter referred to as the "JICA") is expected to complete the following scope of work assigned, by exchanging views with the Thai authorities concerned, in order to realize Japan's technical cooperation for the technological development of natural rubber processing in Thailand (hereinafter referred to as the "Project") to meet the request for the extension of technical cooperation concerning natural rubber made by the Association of South-East Asian Nations to the Government of Japan.

- (1) To clarify and make up the basic plan of Japan's technical cooperation;
- (2) To determine the methods for the implementation of the technical cooperation and confirm the schedules thereof;
- (3) To identify the responsibility of each Government through the exchange of views with the Thai authorities concerned for the implementation of the Project;
- (4) To study on local conditions of natural rubber processing and the working conditions of Japanese experts which are required for the effective implementation of the technical cooperation for the Project.

Upon the mutual consent on the technical cooperation for the Project, the discussions between the two parties will be summarized in the form of the Record of Discussions, which will be signed by both parties as the basis of the implementation of the technical cooperation.

B. Tentative Schedules of the Japanese Implementation Survey Team in Thailand

| <u>Dates</u> | <u>Schedules</u> |
|--------------|---|
| Mar. 20 S | Lv. Tokyo Av. Bangkok |
| 21 M | Meeting at the Japanese Embassy and JICA Office |
| 22 T | Courtesy Call: Department of Agriculture, Ministry of Agriculture and Cooperatives Department of Industrial Promotion, Ministry of Industry Department of Technical and Economic Cooperation Office of ASEAN-Thailand |
| 23 W | Meeting with Department of Agriculture and Others |
| 24 Th | -do- |
| 25 F | Observation of rubber industries within Bangkok Area |
| 26 Sa | Meeting within the Japanese Team |
| 27 S | Move to Hatyai |
| 28 M | Visit to the Rubber Research Center Field Studies and Observation of the Rubber Research Center and Others |
| 29 T | -do- |
| 30 W | -do- |
| 31 Th | Move to Bangkok |
| Apr. 1 F | Discussions with Department of Agriculture and Others |
| 2 Sa | -do- |
| 3 S | Meeting within the Japanese Team |
| 4 M | Final Discussion and Signing the Record of Discussions |
| 5 T | Summarizing the Report within the Team |
| 6 W | Lv. Bangkok Av. Tokyo |

Part Two: Discussion Session

A. Confirmation of the Scope of Japan's Technical Cooperation

I. The objectives of Japan's Technical Cooperation

The ultimate goal of Japan's technical cooperation is to contribute to the development of manpower in a developing country through the transfer of technology from Japan to that country in such ways as not only sufficient knowledge and skill but also research and development capabilities are fully acquired by the nationals of the country. However, the scope of Japan's technical cooperation is limited by the following conditions:

1. Transferable Technology

Transferable technologies on Japan's technical cooperation on a Government to Government basis are limited to the publicly generalized technologies. Therefore the technologies exclusively owned privately in such forms as patent or technological knowhow are excluded.

At present stage Japanese Government does not have any facilities to provide developing countries with such strictly private-owned technologies for the technical cooperation on a grant basis.

2. Means for the Transfer of Technology

Japan's technical cooperation consists of the following three major elements:

- (1) Assignment of Japanese experts who will undertake technical advices and guidances for achieving the intended transfer of specific technologies;
- (2) Provision of equipment and machinery to be utilized for helping Japanese experts in carrying out their assigned duties;
- (3) Training of the counterpart personnel to the Japanese experts in Japan so as to facilitate the transfer of technology.

3. Combination of Three Elements

The above mentioned three elements of technical cooperation are provided by the Japanese Government in a packaged form. Although all of the three elements are sometimes not available from the starting year of the implementation of technical cooperation, they are expected to be completed in a packaged form by the end of the agreed duration of the technical cooperation. The amount of technical cooperation is decided in the light of the needs of a recipient country as well as available resources of the Japanese Government.

B. Outline of the Project

I. Objective of the Project

The objective of the Project is to contribute to the technological development of natural rubber processing in Thailand through the transfer of technology from Japan to Thailand, in such ways as the capability of the Quality Control in the Rubber Research Center at Hatyai (hereinafter referred to as the "RRC") is strengthened and the manpower in the fields of natural rubber processing technologies is developed.

II. Outline of the Project

1. Framework of the Project

The Project is carried out in the Rubber Research Center of Ministry of Agriculture and Cooperatives and consists of the following three functional activities:

- (1) Improvement of System and Techniques for the Quality Control;
- (2) Technical Advice and Guidance for Natural Rubber Producers such as Smallholders, Estates, Packers and T.T.R. factories;
- (3) Training of Manpower.

2. Programs for the Implementation

The period of Japan's technical cooperation will be three years. In order to secure the effective implementation of the Project, the implementation programs are outlined in table 1.

3. Implementing Agencies

Thai side : Department of Agriculture, Ministry of Agriculture and Cooperatives
Japanese side: Japan International Cooperation Agency

4. Project Team and its Staffing

The Project Team consisting of Thai counterpart personnel and Japanese experts will be set up within RRC. It must be noted that activities of the Project are mainly carried out by the Thai counterpart personnel with the assistance of Japanese experts.

5. Equipment and machinery to be installed

The following equipment and machinery will be installed to achieve the objective of the Project:

(1) Equipment and Machinery for experimental works

- Akron abrasion machine
- Goodrich flexometer (for heat built-up and dynamic compression tests) 3000 cycles
- Monsanto rheometer
- Dunlop resilience tester
- Ozone resistance tester
- Densimeter
- Aging ovens (2 large size units and 2 medium size units)
- Analytical balances (4 units)
- Various types of specimen cutters

(2) Other Ancillary Research Equipment

Dry Rubber

- Laboratory-size internal mizer
- Mixing mill
- Steam curing press
- Air compressor
- Water distiller
- Boiler
- Vehicle

6. Facilities

If there are any facilities to be newly established, or improved for the sake of the Project, RRC will take necessary measures to provide such facilities at its own expense.

TABLE 1 (Tentative Schedule)

STAGE OF ACTUAL OPERATION

| | 1977 | | | | | | | | | | | | 1978 | | | | 1979 | | | | 1980 | | | |
|---|------|---|--|----|---|--|-----|---|----|----|---|---|------|---|---|----|------|---|-----|---|------|----|--|--|
| | I | | | II | | | III | | | IV | | | I | | | II | | | III | | | IV | | |
| | 4 | 7 | | 4 | 7 | | 4 | 7 | 10 | 1 | 4 | 7 | 10 | 1 | 4 | 7 | 10 | 1 | 4 | 7 | 10 | 1 | | |
| Japanese Experts | | | | | | | | | | | | | | | | | | | | | | | | |
| Promotion of Quality Control Operation of Testing Machines | | | | | | | | | | | | | | | | | | | | | | | | |
| Japan's Provision of Equipment | | | | | | | | | | | | | | | | | | | | | | | | |
| Training of Thai Counterparts | | | | | | | | | | | | | | | | | | | | | | | | |
| Training of Manpower in Thailand in Japan in University in Tire Plant | | | | | | | | | | | | | | | | | | | | | | | | |

RECORD OF DISCUSSIONS BETWEEN THE JAPANESE IMPLEMENTATION SURVEY TEAM
AND THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF THAILAND ON
THE TECHNICAL COOPERATION FOR THE TECHNOLOGICAL DEVELOPMENT OF
NATURAL RUBBER PROCESSING
(Draft)

The Implementation Survey Team, organized by the Japan International Cooperation Agency and headed by Mr. Koji Ota, visited Thailand from March 20 to April 6 for the purpose of working out the details of the technical cooperation program to implement the technological development Project of natural rubber processing (hereinafter referred to as the "Project") between the Government of Japan and the Government of Thailand.

During its stay in Thailand, the team conducted a survey and had a series of discussions with the Thai authorities concerned with regard to a number of points in question for the implementation of the Project, in order to meet the request for the extension of technical cooperation concerning natural rubber made by the Association of South-East Asian Nations to the Government of Japan.

As a result of the survey and discussions, both parties agreed to recommend to their respective Governments the immediate implementation of the technical cooperation for the Project as specified in the Record of Discussions attached hereto.

Bangkok, April, 1977

Koji Ota
Head
Japanese Implementation
Survey Team
Japan International
Cooperation Agency

Department of Agriculture
Ministry of Agriculture and
Cooperatives

in the presence of

Department of Technical
and Economic Cooperation

RECORD OF DISCUSSIONS

I. Objectives of the Project

The Government of Thailand aims at the technological development of natural rubber processing. In order to implement the objectives, the project with Japan's technical cooperation has been planned, by making transfer of technology successful from Japan to Thailand, in such ways as the capability of the Quality Control in the Rubber Research Center at Hatyai (hereinafter referred to as the "RRC") is strengthened and the manpower in the field of natural rubber processing technologies is developed.

II. Outline of the Project

The Project is carried out in RRC, and consists of the following three functional activities:

1. Improvement of System and Techniques for the Quality Control;
2. Technical Advice and Guidance for Natural Rubber Producers such as Smallholders, Estates, Packers and Crumb Rubber factories;
3. Training of Manpower

III. Japanese Experts

1. In accordance with laws and regulations in force in Japan, the Japanese authorities concerned will take necessary measures to provide at their own expense the services of Japanese experts as listed in Annex I through the normal procedures under the Colombo Plan Technical Cooperation Scheme.
2. The Japanese experts referred to in 1. above and their families will be granted in Thailand the privileges, exemptions and benefits no less favourable than those accorded to experts of third countries working in Thailand under the Colombo Plan Technical Cooperation Scheme.

IV. Japan's Provision of Equipment, Machinery, Instrument, and other Materials

1. In accordance with laws and regulations in force in Japan, the Japanese authorities concerned will take necessary measures to provide at their own expense such equipment, machinery, instrument and other materials as listed in Annex II, which are required for the implementation of the Project through the normal procedures under the Colombo Plan Technical Cooperation Scheme.

2. Articles referred to in 1. above will become the property of the Government of Thailand upon being delivered c.i.f. to the Thai authorities concerned at the ports and/or airports of disembarkation, and will be utilized exclusively for the implementation of the Project in consultation with the Japanese chief advisor referred to in Annex I.

V. Training and Studies for Thai Personnel in Japan

1. In accordance with laws and regulations in force in Japan, the Japanese authorities concerned will take necessary measures to receive the Thai personnel engaged in the activities of the Project for technical training and/or observational study in Japan through the normal procedures under the Colombo Plan Technical Cooperation Scheme.

2. The Government of Thailand will take necessary measures to ensure that the knowledge and experience acquired by the Thai personnel from technical training and/or study in Japan will be effectively utilized for the implementation of the Project.

VI. Measures to be taken by the Government of Thailand

1. In accordance with laws and regulations in force in Thailand, the Government of Thailand will take necessary measures to provide it at their own expense:

(1) services of the Thai counterpart personnel and administrative personnel as listed in Annex III;

(2) land, buildings and facilities as listed in Annex IV;

- (3) supply or replacement of equipment, machinery, instrument, vehicle, tools, spare parts and any other materials necessary for the implementation of the Project other than those provided by the Japanese authorities concerned under IV-1;
- (4) transportation facilities and the grant of the travel allowance for the Japanese experts for the official travel within Thailand;
- (5) suitable furnished housing accommodations for the Japanese experts and their families.

2. In accordance with laws and regulations in force in Thailand, the Government of Thailand will take necessary measures to meet:

- (1) expenses necessary for the transportation within Thailand of the articles referred to in IV-1 as well as for the installation, operation and maintenance thereof;
- (2) customs duties, internal taxes and any other charges, imposed in Thailand in respect of the articles referred to in IV-1;
- (3) all the running expenses necessary for the implementation of the Project.

VII. Responsibility of the Project

The Director General of Department of Agriculture will bear the overall responsibility for the implementation of the Project.

VIII. Claims against Japanese Experts

The Government of Thailand will undertake to bear claims, if any arises, against the Japanese experts engaged in the implementation of the Project, resulting from, occurring in the course of, or otherwise connected with, the discharge of their official functions in Thailand, except for those claims arising from willful misconduct or gross negligence of the Japanese experts.

IX. Mutual Consultation

There will be close consultation between both authorities concerned for the successful implementation of the Project.

X. Terms of Cooperation

The period of the technical cooperation mentioned in this Record of Discussions will be three (3) years.

Annex I. List of Japanese Experts.

1. Chief advisor
2. Expert on Quality Control

Note: If necessary, additional short-term experts will be assigned to the Project.

Annex II. List of Equipment, Machinery, Instrument, and Other Materials to be provided by the Japanese Authorities concerned

(1) Machinery and Equipment for experimental works

- Akron abrasion machine
- Goodrich flexometer (for heat built-up and dynamic compression tests) 3000 cycles
- Monsanto rheometer
- Dunlop resilience tester
- Ozone resistance tester
- Densimeter
- Aging ovens (2 large size units and 2 medium size units)
- Analytical balances (4 units)
- Various types of specimen cutters.

(2) Other Ancillary Research Equipment

Dry Rubber

- Laboratory-size internal mixer
- Mixing mill
- Steam curing press
- Air compressor
- Water distiller
- Boiler.

Note: The above articles will be selected on the following criteria;

1. To exclude the equipment which is locally produced in Thailand
2. To exclude the equipment which requires extremely high level of technology
3. To exclude accessories of lesser importance which are not vital to the performance of equipment

Annex III. List of Thai Counterpart Personnel and Administrative Personnel

1. Counterpart personnel
 - (1) Project leader
 - (2) Expert on natural rubber
2. Administrative personnel
 - (1) Administrative officer
 - (2) Secretary
 - (3) Clerk
 - (4) Typist
 - (5) Driver

Annex IV. List of Land, Buildings and Facilities

1. Land and buildings:

Necessary land and buildings for the implementation of the Project will be provided in the area of the Rubber Research Center.

2. Facilities:

- (1) Offices for Japanese experts
- (2) Offices for Thai counterpart personnel and administrative personnel
- (3) Meeting room
- (4) Lecture and seminar room
- (5) Library
- (6) Other necessary facilities

DRAFT PROJECT PROPOSALS FOR JAPANESE ASSISTANCE
TO THAILAND'S RUBBER RESEARCH CENTRE

I. OBJECTIVES AND SCOPE

1.1 BACKGROUND INFORMATION

Natural rubber (NR) is the most important export commodity of South Thailand. Its quality is constantly being improved and production is expanding. Total NR production for 1976 was approximately 400,000 tons; at present the domestic consumption is about seven percent of the production. It is estimated that the production will be increased about 5 - 7 percent annually.

There are over 170 rubber-product factories in Thailand. Most of them are on small scale. Locally-produced rubber products include tires and tubes, automobile parts, bands, belts, foam, gloves, hoses, acid-proof lining, machinery parts, nipples, prophylactics, rugs, soles, tiles, and solid rubber wheels for push carts. However, because there is a lacking of technical know-how, Thailand has to import many types of rubber product that could be locally produced.

In 1965 Thailand's Rubber Research Centre (RRC) was established at Hat Yai in South Thailand with the assistance of UNDP. However, RRC is mainly concerned with production research with a limited amount of research on rubber as a raw material. At present, there is no Thai institute conducting research on NR in its vulcanized form, or in the development of NR products.

The main obstacles to the expansion of a rubber manufacturing industry are the lack of technical know-how and of research development facilities in the country.

1.2 OBJECTIVES

The priority objective of the project is to assist promoting the greater end-use of NR within Thailand, both for locally-required and export-oriented products.

Japan will contribute to the technological development of NR manufacturing in Thailand through the transfer of technology to Thailand, in such ways as the capability of the RRC is strengthened and the manpower in fields of natural rubber manufacturing technologies is developed. The functions of the RRC will be broadened to include research on rubber product development and to create a technical service to assist problem-solving by commercial manufacturers of rubber goods.

Concurrently assistance is requested to improve packaging of raw NR exported in technically-specified and conventional forms so as to improve efficiency and profitability for both producers and consumers. Possibilities of master-batching or other partial processing of NR will be investigated so to increase the value-added to raw rubber before its export.

1.3 SCOPE

In order to strengthen Thailand's Rubber Research Centre, the scope of the Japanese assistance are as follows :

- To provide training and technical know-how.
- To provide and expand facilities for end-use research.
- To provide assistance in forms of machinery and equipment.

II. PROJECT JUSTIFICATION

Justification for the request for Japanese assistance is based upon a combination of the following factors :

2.1 As Japan has expressed goodwill to the Asian countries, and the request for assistance is from ASEAN Countries on a group basis.

2.2 Because of the oil crisis and the awareness of Arab countries of eventual exhaustion of their old reserves, it is believed that Japan may be interested in research on development of new NR products.

2.3 Greater care will be imposed on the exploitation and utilization of energy resources such as natural gas and oil due to limitation of the reserves. Since synthetic rubbers are the products of gas and oil, greater consideration should be given to NR, an alternative renewable resource, to substitute the usage of products from gas and oil.

2.4 Benefits may accrue to Japan from her assistance in the form of joint venture projects, the sale of machinery and equipment, the purchasing of semi-finished or finished NR products, etc.

III. PROJECT IMPLEMENTATION

The project is expected to last for three years; a programme of operation is given in Table 1.

3.1 IMPLEMENTING AGENCIES

The project will be implemented by the Department of Agriculture of the Ministry of Agriculture and Cooperatives; the associated implementing agency will be the Japan International Cooperation Agency (JICA).

3.2 PROJECT STAFFING

The JICA will provide expert personnel who will assist Thai counterpart staff to achieve the objectives of the project. The following are envisaged :

3.2.1 Expert In The Manufacture Of Goods Derived From Dry-Rubber Mixes (Including Carbon-Black Masterbatches). The expert will assist the equipping and operation of a laboratory for the production of test-pieces of vulcanized rubber such as may be used for testing of mixes for the production of moulded or extruded rubber goods. Test methods for such goods will be established, and staff trained in the methods. Staff will also be trained to enable them to offer advice on compounding and processing to manufacturers of moulded or extruded rubber products.

30 man/months

3.2.2 Expert In Manufacture Of Latex-Based Products. The expert will assist the equipment and operation of a laboratory for production of test-pieces of latex-based goods, i.e., foam products and dipped goods. Test methods for quality control of foam products and dipped goods will be established, staff will be trained to operate the equipment, and to compare the qualities of various compound mixes. Others will be trained to enable them to offer advice and assistance to Thai manufacturers of latex-based goods.

30 man/months

3.2.3 Consultant In Packaging And Transport Of Raw Rubber. The consultant will make three or four visits to Thailand. With the assistance of an official counterpart, and the cooperation of commercial packer/exporters of NR, he will attempt to improve packaging of both conventional and technically-specified block rubbers. The objective is to reduce the present excessive cost of packaging technically-specified rubbers and to improve the convenience to the end-user. Concurrently it is hoped that the advantages of small bales, and unitized loads may be conferred on the large bulk of Thai rubber exports not yet marketed under technically-specified specified guarantees. This may possibly be achieved by devising technical specifications for conventionally-processed rubbers that are mutually acceptable to producer and consumer.

It is envisaged that trial shipments of specially-packed rubbers would be followed through by the consultant and his Thai counterpart by inspection of the shipments at all stages from point of export to the consuming factory.

6 man/months

3.3 TRAINING

3.3.1 One fellowship in Rubber Technology or Polymer Chemistry for training up to Bachelor's Degree level.

48 man/months

3.3.2 Three non-graduating 12-month fellowships in Rubber Technology, Chemical Engineering, and rubber-oriented Mechanical Engineering respectively.

36 man/months

3.3.3 Six on-the-job training fellowships of about six months each. Trainees to be posted to work in small or moderate scale commercial factories producing dipped goods, latex foam goods, extruded goods, moulded goods, "mechanicals" (e.g. engine mountings, belting, etc.), tire re-treads. The objective is for the trainees to gain sufficient practical experience as to enable them, on return to Thailand, to offer technical service advice to Thai rubber manufacturers.

36 man/months

3.4 TEST EQUIPMENT

Necessary test equipment will include :

3.4.1 Akron abrasion machine.

3.4.2 Goodrich flexometer (for heat built-up and dynamic compression tests).

3.4.3 Monsanto rheometer.

3.4.4 Dunlop resilience tester.

3.4.5 Ozone resistance tester.

3.4.6 Densimeter.

3.4.7 Aging ovens: 2 large size units and 2 medium size units.

3.4.8 Analytical balances: 4 units.

3.4.9 Various types of specimen cutters.

3.4.10 Hardness tester for foam goods.

3.4.11 Latex thread testing machine.

3.5 MICRO-SCALE PRODUCTION

3.5.1 Dipped Goods.

- i. Ballmill for chemical with 12 one-gallon jars.
- ii. Dipping machine.
- iii. formers such as gloves, balloons, toys, etc.

3.5.2 Foam Production.

- i. Latex foaming machine.
- ii. Aluminium moulds of different shapes and sizes.
- iii. Dynamic and static compression tester.
- iv. Hardness tester.

3.5.3 Latex Thread.

- i. Latex thread production machine.

3.5.4 Dry Rubber Machinery.

- i. Laboratory-size internal mixer.
- ii. Mixing mill.
- iii. Three-inch or four-inch extruder.
- iv. Fabric spreader.
- v. Steam curing press: 4 daylights of 24" x 36" or 36" x 36".
- vi. Steam curing press: 2 daylights of 18" x 18".
- vii. Injection moulding and moulds.

3.6 ANCILLARY RESEARCH FACILITIES

3.6.1 Air compressor.

3.6.2 Water distiller.

3.6.3 Boiler.

3.6.4 One set of centrifugal machine comprising of four machines and one separator.

3.7 PROGRAMME OF IMPLEMENTATION

Additional laboratory buildings for rubber technology are under construction at the RRC, Hat Yai. They are expected to be completed at the end of 1977. Whilst installation of machinery might conceivably commence before the year's end, the monsoon reaches its peak at Hat Yai

during November-December; unpacking and installation of equipment, especially of delicate and expensive items is best scheduled for January-February.

3.7.1 Expert In Dry Rubber Processing. A visit of one month duration is suggested for September 1977 to inspect progress with building, advise on location of machinery, suggest any necessary building design modification, and produce final estimates of cost of equipment requested. The expert would return to Thailand for the remainder of his assignment to supervise installation and commence operation of equipment. Target for second visit is January 1978 (see below).

3.7.2 Expert In Latex-Based Technology. A visit of one month duration is suggested for September 1977 to inspect progress with building, advise on location of machinery, suggest any necessary building design modification, and produce final estimates of cost of equipment requested. The expert would return to Thailand for the remainder of his assignment to supervise installation and commence operation of equipment. Target for second visit is July 1978, but it may be that the heavier and more expensive dry rubber processing and testing equipment may take longer to manufacture and ship, in that case the latex goods expert would commence his assignment first. To attempt installation of both dry rubber and latex-based equipment at the same time would over-strain the workshops infrastructure at the RRC.

3.7.3 Consultancy In Rubber Packaging And Shipment. The first visit of a consultant could be accepted as soon as practicable for the donor country. Repeat visits could be at intervals of six months.

3.7.4 Schedule For Training.

(a) Bachelor's Degree training to commence at the beginning of the next academic year after identification of a suitable candidate.

(b) Non-graduating fellowships to be awarded with tenure of one in each year 1978, 1979 and 1980.

- (c) On-the job training fellowships to be awarded with tenure for two in each year 1978, 1979 and 1980.

Priority to be given to provision of factory experience in tire retreading and latex foam production.

3.7.5 Schedule For Provision Of Machinery And Equipment. It is difficult to obtain estimates of costs of requested items,

- (a) because the implementing agency is unfamiliar with Japanese suppliers of the specialized equipment needed, and

- (b) because costs are changing from month-to-month.

For this reason it is proposed that Japanese experts assigned to the project should make an early visit to the project site and - in addition to finalizing recommendations on specific items needed - produce up-to-date estimates of its expected costs.

Table 1. Schedule of Project Operations

| 19 | 1977 | 1978 | 1979 | 1980 |
|--|------|---------------------------|-------|-------|
| <u>Japanese Experts</u> | | | | |
| 1. Dry Rubber Manufacturing Technology | — | ————— | ————— | ————— |
| 2. Latex-based Rubber Technology | — | ————— | ————— | ————— |
| 3. Pakaging Consultant | ——— | ——— | ——— | ——— |
| <u>Provision of Equipment</u> | | ——— | ——— | |
| <u>Training of Counterparts</u> | | | | |
| Ratchelor Degree Candidate | | (48 man/months envisaged) | | |
| Non-Graduating Fellowships | | ————— | ————— | ————— |
| On-the-job Training | | ===== | ===== | ===== |

