

タイ国東部海岸パイプライン建設

実施設計調査報告書

(概要版)

昭和57年8月

国際協力事業団

開二



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國際協力事業団

輸入 月日	84.8.24	122
登録No.	13868	634
		SDS

序

文

日本国政府は、タイ王国政府の要請に応じて、タイ東部海岸パイプライン建設実施設計調査に対する技術協力を行なうこととし、国際協力事業団がこれを実施することを決定した。

国際協力事業団は、片山祐一氏を団長とする株式会社建設技術研究所及び株式会社三祐コンサルタンツより構成される調査団を結成した。調査団は、昭和56年11月から昭和57年8月にわたりタイ王国及び日本国内にて王室かんがい局と共同し、現地調査及び資料分析を行なうとともに詳細設計を実施した。今般その全ての作業を終了し、最終報告書を提出した。

本報告書は実施設計調査結果の概要版であり、主文と付録より成っている。

本調査が同開発計画に寄与するとともに二国間の友好親善に役立つならば、これにまさる喜びはない。

終りに、当調査団に対し密切な協力を惜しまなかつたタイ王国政府関係者に対し、ここに深く感謝する次第である。

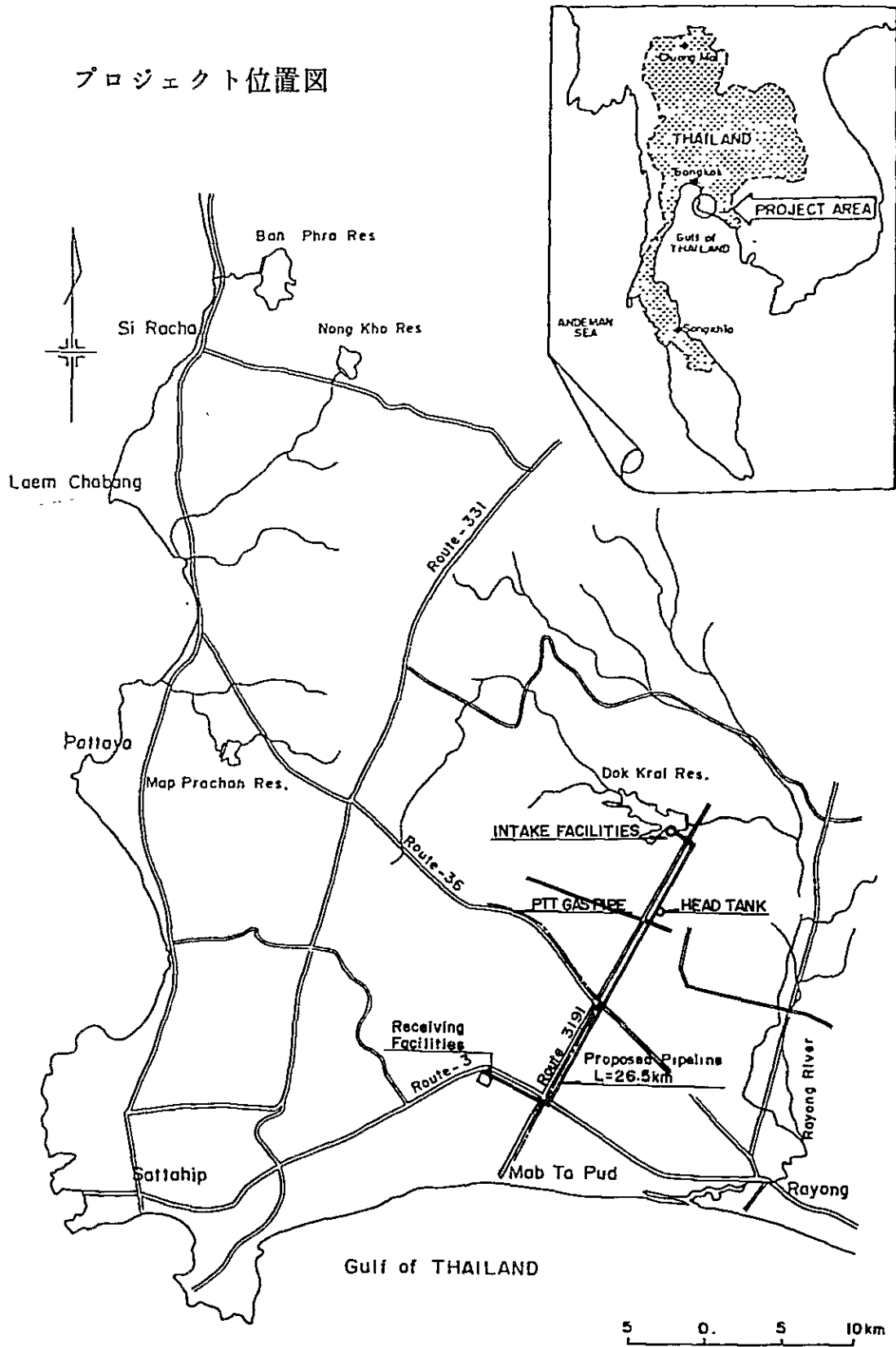
昭和57年8月

国際協力事業団

総裁 有 田 圭 輔

（印）

プロジェクト位置図



5 0 5 10km

施 設 諸 元

項	目	諸 元	摘 要
取水施設 (ドックラライ)	取水塔	構造：RC構造物，諸元：長さ2.2m 幅1.7m 高さ31.8m，基礎：直接基礎 設備：ポンプ(立軸渦巻き両政込型，容量3.1.5 m ³ /分/台，全揚程79m) 6台	ポンプ6台中1台は予備
	管理橋	構造：プレテンションPC桁橋，橋長：支間16.0m×径間数10=160.0m 幅員：道路部3.5m+水管部2.0m=5.5m，基礎：バイアルベント式鋼管杭	
パイプライン	取水ヤード	施設：エアチャンバー，オフイス，変電所，倉庫及び車庫，コンプレッサールーム， 職員住宅(ワイヤレスアンテナ)	RID所有地を使用する
	エアチャンバー	構造：鋼製シンダ一型コンプレッサ一付 容量：3基，計100m ³	
ヘッドタンク	パイプライン	材質：鋼管，諸元：内径1,350mm 肉厚11.9mm 延長：26.5m	塗装 内面：タールエポキシ 外面：コーラルタールエナメル十布張
	ヘッドタンク	構造：PC構造物 円筒型，諸元：内径1.6.0m 内部高さ24.4m，1基 基礎：直接基礎，有効容量：4,222m ³	
ヘッドタンク	余水吐	材質：RCパイプ，諸元：内径900mm 肉厚80mm 延長：422m	
	ヘッドタンクヤード	施設：ヘッドタンク，余水吐，管理員詰所，職員住宅	面積：5,100m ²
受水施設 (マブタブッド)	箱水井	構造：RC構造物，諸元：長さ29.7m 幅11.0m 高さ6.6m	
	受水池	構造：盛土構造物，諸元：長さ156m，幅78m，有効深さ3m 有効貯水量：28,000m ³	
維持管理用通信システム	受水ヤード	施設：着水井，受水池，オフイス，修理工場，倉庫・車庫，発電機室，職員住宅	面積：109,800m ²
	ドックラライ	FM/VHFによる無線通信，公共電話 固定局：2ヶ所(ドックラライ，マブタブッド)，移動無線機：14台 操作室(取水塔)：563m ² ，オフイス：97m ² ，変電所：102m ² 倉庫及び車庫：79m ² ，コンプレッサールーム：22m ² ，職員住宅：431m ²	
管理用建物	ヘッドタンク	管理員詰所：29m ² ，職員住宅：291m ²	
	マブタブッド	オフイス：214m ² ，修理工場，倉庫，車庫：125m ² ，発電機室：22m ² 職員住宅：711m ²	

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第 1 章 概 要

1-1 背 景

タイ国における工業開発は 1962 年～1981 年迄の 4 次にわたる社会・経済開発計画の実施によりめざましい発展をとげた。

1982 年より始まった第 5 次社会・経済開発 5 ヶ年計画ではその一部として、近年サタヒップ南部のタイ湾中部において発見された大量の天然ガスをバックに首都バンコクに近い地理的条件、並びに平坦な地形条件を利用して、チョンブリ県、ラヨン県にまたがる東部海岸地域工業開発計画が最重要計画とされた。

この開発計画によれば、ラヨン-サタヒップ地区に基幹産業、即ち天然ガス分離工場・ソーダ灰及び化学肥料工場・銑鉄及び製鋼一貫生産工場等が配置され、ラムチャバン地区に輸出向加工業が配置される計画となっており、その内最も早く具体化するものとして天然ガス分離工場が 1983 年より建設開始され、1984 年 6 月に操業開始の予定である。

一方、本地域の農業についてみると、キャッサバ・さとうきびを主体に米が植付けられているが、降雨量が少ない事、灌漑施設が発達していない事から、乾期の作付面積が少なく、また生産性も低い。従って、この地域の農業は、首都に近い事や地形が平坦である事などの地域的利点を充分いかしていない状態にある。

関連した社会基盤整備事業としては、現在サタヒップ港が拡張中であり、L.P.G の積出しのためにラムチャバンに港湾新設をはじめ電力供給施設、鉄道、電信、電話等の通信施設の増強計画が既に作成され、建設に移る段階である。

この様に、工業開発計画が進行しつつある地域において、問題点は水であ

る。即ち、本地域の年平均降雨量は約 1,300 mm で全国平均より少ない事、ならびに水資源として利用し得る主要河川が工業地域ではラヨン川のみであること等より、慢性的水不足に悩まされており、工業開発計画を実施した場合水供給不足が隘路となる事は必至である。

上記状況に鑑み、都市・工業用水および農業用水の将来の需要に対処すべく「タイ東部海岸水資源開発計画」のフィージビリティ スタディが1981年～1982年に実施された。

このタイ東部海岸水資源開発計画は、工業開発地区であるラヨン、マブタブット、サタヒップへの都市・工業用水供給を主目的とするノンブラライ サブプロジェクトとバンブン市への都市用水供給を主目的とするバンブン サブプロジェクトより成っている。

ノンブラライ サブプロジェクトの給水地域にタイ石油公社（PTT）がガス分離工場（マブタブット）を現在計画中であり、その操業開始が1984年6月に予定されている。このガス分離工場は、ノンブラライ サブプロジェクトの一部であるドククライーマブタブット パイプラインを建設することにより工業用水の供給を受ける事となっている。このためガス分離工場の操業開始に合わせて用水供給が行えるよう、緊急に上記パイプラインシステムを完成する事が必要となり、これの実施設計を行う事となった。

1-2 目的

本調査の目的は、既設のドククライ貯水池よりマブタブット迄の導水施設の実施設計を行う事である。

1-3 調査範囲

本調査の調査項目は下記の通りである。（なお詳細は付録-5「調査業務の概要」を参照）

(1) 測 量

- (2) 地質調査
- (3) フィージビリティ スタディの検証
- (4) 施設の実施設計
- (5) 入札書類作成
- (6) 入札資格審査
- (7) 実施計画書（案）作成
- (8) 工事費積算
- (9) 技術移転

1-4 対象地域およびその現況

本プロジェクトの対象地域は、タイ東部ラヨン県に属し、バンコクの南々東約 200 Km に位置し、ラヨン県を流れるラヨン川の支川であるドククライ川に位置するドククライダムから海岸寄りのマブタプット迄の国道 3191 号線と 3 号線に沿った 26.5 Km 区間である。

対象地域の自然環境、社会・経済環境は次の通りである。

(1) 自然環境

地形・地質

対象地域の地形は、海岸線に沿った緩やかな丘陵地であり、標高 100 m を越える地形はまれである。この丘陵地をいくつかの小河川が流下し、タイ湾に注いでいる。

工業開発地域最大の河川はラヨン川である。

ラヨン県の地質は古生代の堆積岩、変成岩および花崗岩から成り平野部ではこれらを第 4 紀の沖積層が覆っている。堆積岩は主に頁岩、千枚岩、珪岩、石灰岩から成り、対象地域のほぼ北西から南東方向に分布し、花崗

岩は対象地域中央部に広く分布している。また第4紀の沖積層は砂礫、砂、粘土等から成り、ラヨン川中、下流域に発達している。

気 候

気候は、熱帯モンスーン気候で5月から10月までが雨期、11月から4月までが乾期であり、年平均降雨量は約1,300 mmである。

最近20年間の降雨記録によれば、最大雨量は1974年の1,863 mm、最小雨量は1965年の707 mmである。

(2) 社会経済的環境

ラヨン県の人口は36万人(1980年)で全国の約0.8%に当る。

1人当り生産額は5,100 B(1976年)でほぼ東部7県の平均値である。

ラヨン県の産業は農林・水産の1次産業およびそれらの加工業で占められている。農業は砂糖、キャッサバ、パイナップル等の畑作が主でその生産高はタイ全土の約10%であるのに対し、タイ国の主要作物である稲はラヨン県の生産高は全国の0.4%を占めるに過ぎない。

農林加工業はキャッサバの加工品であるタピオカ、粗糖、ゴム、木材等の加工業がある。水産業では小規模な沿岸漁業および水産加工業がある。農林・水産企業はラヨン県で約800企業あるがその殆んどが小さいし零細企業である。

交通手段について見ると、工業開発地域では道路が非常に良く整備されており、車による移動に支障は無い。鉄道は現在バンコク東60kmのチャチュンサオ迄開通しており、マブタブット迄の延長線を現在建設中である。

電話の普及率は、1.15台/100人で全国平均0.83台/100人を上回っているが、工業開発計画の進行に伴い一層の拡充が望まれている。

上水供給は、地方水道公社(PWWA)の手によりなされており、普及率

はラヨン市で66%、ブラサエで24%であるが、乾期には水不足の為、通常1日4～5時間の給水制限を行っている。

第 2 章 工業開発地区における水需給計画

マブタブットに都市・工業用水を供給することを目的とする本プロジェクトは1981年～1982年に実施された「東部海岸水資源開発計画」の中のノンプラライ サブ プロジェクトの一環として、その計画策定が行われた。

ここでは、ノンプラライ サブ プロジェクトのフィージビリティスタディ結果より工業開発地区であるラヨン、マブタブット、サタヒップに対する水需給計画の概要を記す。

2-1 水需要予測

東部海岸地区の主要工業開発地区であるラヨン、マブタブット、サタヒップ等における2000年までの都市・工業用水需要の予測が実施された。

この結果は、次の通りである。

都市・工業用水需要予測

(単位 MCM/年)

地 区	1986	1990	1995	2000
ラヨン市	4.8	6.0	8.4	22.2
マブタブット	22.8	30.0	30.0	33.8
サタヒップ	14.9	17.6	19.4	24.0
合 計	47.5	53.6	57.8	80.0

MCM : $10^6 m^3$

これらの需要地のうち、マブタブットでは1984年に天然ガス分離工場が、またサタヒップでは、1986年にソーダ灰等の重化学工場の操業開始がそれぞれ予定されており、これに合わせて水供給を開始することが要請されている。

一方、かんがい用水について見ると、かんがい可能区としてはラヨン川流域に位置するノンブラライかんがい区（3,650 ha）その他のかんがい区がある。これらの水需要のうち、都市・工業用水に優先順位がおかれ、かんがい用水には余剰水があれば、ノンブラライかんがい区に供給される。

2-2 水供給計画

Handwritten notes: 2000年と1975年 (with a checkmark) and other illegible scribbles.

計画目標年度を2000年とし、都市・工業用水供給の優先、マブタブット、サタヒップ地区への水供給の緊急性を勘案して、水供給計画が策定された。水供給計画の概要は2期に分けられ第1期には緊急に都市・工業用水が必要なマブタブット、サタヒップ地区に既設のドククライ貯水池より導水し、第2期にノンブラライダムを建設して、プロジェクト対象区域に農業用水を供給する。

一方、ドククライ貯水池は当初の目的を変更してラヨン市、マブタブット、サタヒップに於ける2000年の需要量を供給する。

水供給計画の詳細は下記の通りである。

(1) 第1期

1986年のノンブラライダム完成前にマブタブット、サタヒップにおいて水需要が発生するため、既存ドククライ貯水池⁴¹を利用して同貯水池より両地区へ導水する。ドククライダムはバンカイかんがい区（4,800 ha）へかんがい用水を供給する事を目的に、1975年完成したが利用実績から見て同貯水池は、1986年の両地区の需要量（37.7 MCM/年）をまかなう余裕があると判断した。

(2) 第2期

1986年のノンブラライダム完成後は、ドククライ貯水池は従来の機能

⁴¹ ダム高=26.5 m, 堤頂長=1,500 m, 流域面積 291 Km²
有効貯水容量 490 MCM 供給可能水量 80 MCM/年
ダム目的 かんがい, 洪水調節

およびマブタブット-サタヒップ（延長 21.9 km、内径 1,000 mm）のパイプラインシステムおよびラヨン市への導水システムより構成されている。

ドククライ-マブタブット間のルートにおいては、ドククライ貯水池でポンプアップされたのち、3191 号線および 3 号線道路沿いのパイプラインによりマブタブットの着水井迄導水される。

マブタブットからサタヒップ迄は増圧ポンプを経て、3 号線沿いのパイプラインによって導水され、浄水場の着水井に至る。

ラヨン市への導水について見ると、ドククライダムよりドククライ川へ放流された水は、新設取水堰（現バンカイ堰上流）で取水され、約 1 km のパイプラインを経由して着水井に送られ、その後ラヨン市に配水される。

かんがいシステムに関しては、ノンブラライかんがい区 (3,650 ha) のかんがい用水量 (69.4 MCM/年) をバンノンバウ地点の分水堰で分水する計画となっている。幹線水路（延長 46.2 km のコンクリート水路）は、ラヨン川の左岸の丘陵地に沿って敷設される。また総延長 6.5 km の幹線排水路が敷設される。

各施設の主要諸元を表-1 に示す。ただし、ドククライ-マブタブット導水施設の諸元については、実施設計結果をまとめた表-2 を参照されたい。

2-4 経済便益

ノンブラライ サブ プロジェクトの年便益は、システムがすべて稼動する 2000 年以降において、US \$ 21.07 × 10⁶ となる。

(1) 都市・工業用水

都市・工業用水の便益は、水の単位当り便益に水の供給量を乗ずることによって算出された。単位当り便益は Willingness to Pay と水のコスト

を基に $B\ 5.0/m^3$ とされた。施設が全面運用される 2000 年以降の年便益は $US\ \$\ 17.36 \times 10^6$ となる。

(2) かんがい

かんがい用水の供給によって増加した純年間生産額が便益である。ノンブラライかんがい区のかんがい施設が全面運用となる 1993 年には、雨期にかんがい区全域 (3,650 ha) で米の生産が、また乾期には 975 ha の地区で米の生産および 1,945 ha の地区でグランドナッツの生産が可能となり、その便益は $US\ \$\ 3.44 \times 10^6$ となる。(プロジェクトを実施しない場合の純生産額 $US\ \$\ 1.80 \times 10^6$ 実施した場合の純生産額 $US\ \$\ 5.24 \times 10^6$)

(3) 洪水調節

ノンブラライダムによって行われる洪水調節の便益は、その調節効果による、水田を主とする氾濫地区の洪水被害軽減額である。ダム建設によって、現況の年平均被害額 $US\ \$\ 2.70 \times 10^6$ は $US\ \$\ 2.43 \times 10^6$ に減少する。したがって、洪水調節の便益は $US\ \$\ 0.27 \times 10^6$ /年となる。

2-5 実施計画

ドククライからマブタブットに至るパイプライン プロジェクトの実施内容と工程については表-3 に示す通りである。

2-6 建設事業費

ノンブラライ サブ プロジェクトの総建設事業費は $US\ \$\ 175.4 \times 10^6$ である。

上記建設事業費の算定は 1981 年時点の価格を用い請負方式により実施することを前提としており、内訳は次の通りである。($US\ \$\ 1 = B\ 23 = ¥\ 230$)

(単位：10⁶ US \$)

工 種 別	外 貨	内 貨	合 計
ノンブラライダム	29.85	36.70	66.55
導水システム	63.73 (32.60)	29.07 (13.19)	92.80 (45.79) ^{△1}
かんがいおよび排水システム	7.01	9.04	16.05
合 計	100.59	74.81	175.40

() 内ドククライーマブタブット導水施設

2-7 プロジェクトの経済評価

ノンブラライ サブ プロジェクトの経済評価は、内部収益率 (IRR) を用いて行った。

IRR は、都市・工業用水・かんがいおよび洪水調節の3部門別に算出した。

(1) 経済コスト

建設費

予備設計に基づいて積算された建設費からあらゆる税金、保険料、補助金および補償費を差し引き、社会経済的機会費用を考慮して経済コストを算出した。労働コストに関しては、財務コストのうち、非熟練労働コストの70%および熟練労働コスト100%が採用されまた、プライスコンティンションシーは含まれない。

ノンブラライ プロジェクトの総建設費は、US \$ 115.13 × 10⁶ である。ダム、導水システムおよびかんがい排水システムの工種別費用は、それぞれ US \$ 35.58 × 10⁶、67.56 × 10⁶、11.99 × 10⁶ である。

ダム建設費用を分離費用身替り妥当支出法により、部門別にアロケート

△1 なお、実施設計における積算結果はUS \$ 39.21 × 10⁶ である。

すると、都市・工業用水、かんがいおよび洪水調節の費用は次のようになる。

(単位：US \$ × 10⁶)

部 門	費 用
都市・工業用水	4.91
かんがい	88.91
洪水調節	21.31
合 計	115.13

維持管理費

ノンブラライダム、導水システムおよびかんがいシステムの維持管理費は年間それぞれUS \$ 0.30 × 10⁶、1.20 × 10⁶、0.18 × 10⁶ 合計US \$ 1.50 × 10⁶ と推定される。パイプラインシステムの維持管理費はフル操業時のものであって、これは主にポンプ場における揚水のための電気代である。

(2) 内部収益率

上記のように推定されたコストと2-4で述べた便益からノンブラライサブプロジェクトの内部収益率は11.2%となる。

各部門毎に算出した内部収益率は下記の通りである。

<u>部 門</u>	<u>IRR (%)</u>
都市・工業用水	11.3
かんがい	12.1
洪水調節	3.5
プロジェクト全体	11.2

以上の結果から、ノンブライ サブ プロジェクトは技術的に、かつまた経済的に実施妥当なものと判断された。

第 3 章 ドククライーマブタブット パイプライン プロジェクト

3-1 本プロジェクトの位置づけ

本プロジェクトはドククライ貯水池 - マブタブット間の導水施設の実施設計である。

3-2 施設計画

(1) 計画基本条件

下記条件により、施設の計画を行う。

水源地： ドククライ貯水池（有効貯水量 49.0 MCM）

着水地： マブタブット

水需要量： 57.8 MCM/年

（マブタブット、サタヒップ 2000 年需要量）

導水施設設計流量： $2.62 \text{ m}^3/\text{s}$

（上記水需要量に対して、需要変動係数 1.3、漏水率 1.1 として算出）

(2) 施設

ドククライの既設貯水池よりマブタブット迄 57.8 MCM/年の水を送る施設として下記の諸施設がある。

1. 取水施設（ドククライ貯水池）
2. パイプライン（ドククライ貯水池 - マブタブット）
3. ヘッドタンク（ドククライ貯水池より 7.5 km）
4. 受水施設（マブタブット）
5. 維持管理用通信システム
6. 電力供給施設

7. 管理用建物

これらの施設の諸元は表-2に示す。

以下、これらの内主要な施設を計画する上での基本的考え方について記す。

取水施設

取水施設としては、取水塔、揚水のためのポンプおよびこれらの施設の管理のための橋梁からなる。

取水施設は、ドククライ貯水池の水位を下げることなしに施工する事と、タイ側のその他の開発計画を踏まえた強い要請および技術的可能性を検討した結果、工期を18ヶ月とする事を基本的な条件とした。これらの条件とポンプ型式、経済性とを勘案して貯水池内にコンクリートケーソンタイプの取水塔を構築し、ポンプも取水塔内に収める事とした。このタイプはポンプの保守点検・交換が容易で、且つ経済的であり耐久性も充分である。

管理橋は通行部分と、パイプライン部分から成り、通行部分は人間・車輛の通行用で有効巾員は3.5m、パイプ部分は取水塔内配管と陸上パイプを接続するもので、パイプは鋼管、径1,350mmである。

パイプライン

工事期間が非常に短い事から、用地交渉を出来るだけ少なくして直ちに着工出来る事が必要である。

このことを踏まえて、パイプラインは図-1に示す様にドククライよりダム管理用道路、国道3191号線、3号線の道路用地を使用して、マブタプットに至るルートを採用した。

パイプ材質については、鋳鉄管、コンクリート管、鋼管が比較され、タイ国で製産されている事、漏水が少ない事、経済的に有利である事などの

理由により、鋼管が採用された。

受水施設

受水施設は着水井と受水池から成る。

着水井は着水位を一定に保つために設けられる。各工場へ途中のヘッドロスを考えても自然流下で配水できる事、将来パイプラインのサタヒップへの延長に便利である事を考慮して、マブタブット工業地の西側で地区内の最高点である国道3号線沿いの場所に決定した。

着水井下流側には、日々或いは時間毎の需要量変動を調整するために受水池を設け、着水井における流量調節バルブは季節的変動に対応する様な大きな変動に対して操作する事とした。

受水池の容量は導水量の3時間相当分とし、これ以上の容量は各業種で必要な調節容量が異なるため各工場で独自に調節池を持たせる事とした。

ウォーターハンマー防止施設

パイプラインの最高点にヘッドタンクを設け自由水面を作り、ウォーターハンマーが最も生じ易いポンプ急停止時にヘッドタンク～マブタブット間のウォーターハンマーを防止する。従って、ドククライ貯水池より7.5km地点のパイプライン上の最高点にヘッドタンクを設ける。ヘッドタンクはその他にポンプ制御、非常時のヘッドタンク下流パイプ充水の2つの機能を有する。

ポンプ～ヘッドタンク間のウォーターハンマー防止にはエアーチャンバーをポンプ近傍に置いて対処する事とした。

管理施設

導水施設、全体の管理本部は、以下の理由でマブタブットの受水施設側

に置く事とし、ドククライ、ヘッドタンクにはそれぞれの施設維持管理に必要な施設のみ置く事とした。

- 1) パイプライン流量コントロールバルブは着水井にある。
- 2) 将来、浄水場が受水施設に隣接して設置されることが予想される。
- 3) 将来、マブタブット-サタヒップ間パイプラインが延長された時、マブタブットがパイプラインの中間点となる。
- 4) マブタブットが水需要の中心となる。

通信施設は管理施設がドククライ、ヘッドタンク、マブタブットと点在している事より、その設置が絶対必要であり、且つ、万一の場合を考えて公共電話と無線電話の2系統を備える事とした。

職員住宅は、各管理用建物に隣接して配置する。

3-3 施設概要

各施設の概要を次に記す。

(1) 取水施設

取水塔は既存のドククライ貯水池の水中に建設し、その位置はドククライダムダム軸より上流 300 m、右岸より 200 m 離れた地点に位置し、長さ 22 m、巾 17 m、高さ 31.8 m の RC 構造物であり、4 階建の建物の中には、ポンプ室・制御室が収まる。取水塔構造図を図-3 に示す。

管理橋は取水塔建設中の資機材搬入および完成後の維持管理の目的で建設される。P.C.ボックス桁 16 m 長 × 10 スパンで延長 160 m、幅員 5.5 m でうち 3.5 m を道路橋、2.0 m を送水管橋とする。

取水塔は花崗岩基盤を基礎とする直接基礎であり、管理橋の基礎は鋼管杭を打ち込んだものである。

予備機 1 台を含むポンプ 6 台の諸元は 31.5 m³/分/台、全揚程 7.9 m の

立軸渦巻両吸込型である。ポンプとヘッドタンクの間で生じるウォーターハンマーを未然に防ぐために鋼構造のエアチャンバー 3 基（容量 100 m^3 ）をポンプ近傍に据えつける。

(2) パイプライン

パイプは肉厚 11.9 mm の鋼板より溶接にて製造され、外面はコーラルエナメルと布張で塗装、内面はタールエポキシで塗装される。直径 $1,350\text{ mm}$ のパイプの継手はトレンチ内の溶接され、しかるのち埋設される。埋設深さは $1.5 \sim 3.0\text{ m}$ である。

関連施設としては、エアバルブ、ドレインバルブとメインバルブがあり、いずれもコンクリートボックス内に設置されおおいがなされる。

(3) ヘッドタンク

ヘッドタンクは円筒形のタンクであり、その直径は 16 m 、高さ 24.4 m の PC 構造でパイプライン上の最高点である標高 82 m の丘に設置され、基礎は直接基礎である。タンクの余水吐として $\phi 900\text{ mm}$ RC パイプを 400 m 離れた川迄布設する。余水吐の計画流量は $2.62\text{ m}^3/\text{s}$ であり、導水施設の計画流量と同一である。ヘッドタンク構造図を図-4 に示す。

(4) 受水施設

着水井は長さ 29.7 m 、巾 11.0 m 、深さ 6.6 m の RC 構造物である。受水池は長さ 156 m 、巾 78 m 、深さ 3 m のもので、有効貯水量は $28,000\text{ m}^3$ で、導水施設の計画流量に換算すると 3 時間分に相当する。受水池は盛土堤防で築造され、EPT ラバーシートを内面に張って漏水を防ぐ構造で着水井の下流に設けられ、将来のパイプライン延長、マブタブットにおける取水に備えて数ヶ所の取水口、および余水吐が設置される。受水施設の

配置は図－５に示す。

(5) 維持管理用通信システム

無線通信施設はドククライとマブタブットの固定局各１、移動簡易無線機１４台より成っている。

また、本地域における公共電話システムは１９８４年末に完成の予定であり、完成後には両システムが利用できる。

なお、公共電話システムが建設された時点で、ドククライおよびマブタブットにおけるパイプライン関係の内線電話は外部システムと接続される。

(6) 電力供給設備

ドククライ、ヘッドタンクおよびマブタブットにおける必要電力容量は、それぞれ 3,350 KW、30 KW、152 KWである。ドククライでの 3,350 KW は主に大型ポンプの運転によるものであるが、既存送電線では容量オーバーになるため、地方電力庁により新たに 22 KV 線を国道 36 号沿いの幹線より引き込んで供給する。ヘッドタンクの電力容量は小さく、現行送電線でまかなうことができる。マブタブットの 152 KW は関係施設および職員住宅向けのものであり、既存送電線を増強して対応する。

(7) 管理用建物

導水施設の管理用建物として、本部をマブタブット受水施設側に置いて全体を管理し、本部下部機構としてマブタブットに取水施設管理事務所、取水塔にポンプ制御室、ヘッドタンクにタンク管理員詰所を配置している。

第 4 章 事 業 費

本プロジェクトの事業費は建設費、予備費、維持管理費、用地買収費、補償費より成り、全体で $901.9 \times 10^6 \text{ B}$ 、その内外貨 $6,023.3 \times 10^6 \text{ 円}$ 、内貨 $299.6 \times 10^6 \text{ B}$ である。

資機材・労務単価はラヨン市における調査結果とタイ国内の他のプロジェクトの価格を参考に決定した。

なお、価格は1982年価格であり、事業費の内訳は下記の通りである。

但し、 $1 \text{ B} = 10 \text{ 円}$ 、 $1 \text{ US \$} = 23 \text{ B}$ である。

	Total	F C	L C
予備費を含む建設費	$823.9 \times 10^6 \text{ B}$	$5,723.3 \times 10^6 \text{ 円}$	$251.6 \times 10^6 \text{ B}$
一般経費	65.0	210.7	43.9
取水施設	164.2	1,337.2	30.5
パイプライン	409.9	3,113.2	98.6
ヘッドタンク	13.0	81.2	4.9
受水施設	51.1	362.8	14.8
コントロールシステム	6.1	55.4	0.6
建　　築	50.4	126.0	37.8
試　運　転	4.2	36.8	0.5
予　備　費	60.0	400.0	20.0
維持管理費	70.0	300.0	40.0
用地買収費	4.0	0	4.0
電柱その他の補償費（仮定）	4.0	0	4.0
計	901.9	6,023.3	299.6

第 5 章 プロジェクトの実施

5-1 実施機関

プロジェクトの実施機関は、農業省王室かんがい局 (RID) である。(タイ国政府機関組織図は付録-4を参照)

5-2 導水施設の工事工程計画

パイプライン工事は、1983年3月より1984年8月迄の18ヶ月が予定されているが、既にPTTガス分離工場の操業開始が1984年6月と決定されており、これに送水開始を間に合わせる様、タイ政府から要請された。しかし工期を18ヶ月より短くする事が非常に困難であるので、1984年6月からの送水はテストランを兼ねて行う工程とした。

なお、工事工程表は表-4に示した。

5-3 資金計画

ドククライからマブタブットに至るパイプライン建設工事について、その四半期毎の資金計画を示すと、表-5のようになる。

5-4 コンサルタントと施工業者の選定

(1) ローン申請

プロジェクトの遂行にあたっては、事業費の外貨相当分を外国の貸出し機関に依存する必要がある。タイ国政府は、資金的な援助を日本の海外経済協力基金(OECF)に要請した。

(2) コンサルタントの選定

王室かんがい局(RID)は、日本の海外経済協力基金(OECF)が設定しているコンサルタント選定基準に基づいて、コンサルタント会社を選定する

ことになる。

エンジニアリングサービスは単独のコンサルタント会社か共同企業体によって実施され、またコンサルタントはタイ国内のコンサルタントと協力関係にある外国のコンサルタントが望ましいであろう。

なお、現時点では1982年10月始めに施工業者の入札を行い、1983年3月始めには、工事に着手する予定であるので、コンサルタントの選定および契約は1982年8月までに完了しておく必要がある。

(3) 施工業者の選定

施工業者はOECDローンが適用されるよう、OECDの選考基準に合致した業者による国際競争入札を経て、選定される。

パイプラインの工事は、工事の進捗をスムーズにするため、資材の供給と工事施工を一本にした一括契約の形で行われる。

元請業者は単独、または共同企業体であり、業者選定時に資機材供給メーカを含めて選定される事となる。

第 6 章 導水施設の運営・管理

6-1 運営と管理機関

導水施設の運営・管理は図-6に示すような新しい組織によって行われる。この組織は、水の供給量の配分、システム全体の管理・維持を行い、当然、権限と責任を合わせ持つ機関である。

6-2 運営・管理計画

(1) 導水システムの概要

ポンプの運転は、ヘッドタンク内の水位と着水井における設定流量に応じて自動的に、運転・停止を繰り返す。本方式はシステムが最も簡易で、施設費・運転費が最も低廉であり、最も信頼性が高い。

(2) システムの操作

導水施設の操作は次の通り行う。

○ 日常操作

着水井における吐出流量は、着水井に設置する制御バルブで設定される。一方、ポンプは設定流量に応じた台数がフル運転される。もし揚水量が設定流量を上回ればヘッドタンク水位が上昇し、あらかじめ設定された上限水位でリミットスイッチが作動して稼働中のポンプの内1台が停止する。すると揚水量は設定流量を下回る様になるためヘッドタンク内の水位は下がり、下限水位でリミットスイッチが作動して、停止したポンプが再び稼働する。

以下常時これをくり返して、平均して設定流量が流れる。

○ 流量変更時

着水井の制御バルブにより、流量調節する。

- 23 -
pipe line の 5 台 1 台
ポンプの 2 台 1 台 1 台 1 台
ポンプの 1 台 1 台 1 台 1 台 1 台

○ 緊急時

停電その他事故によりポンプが全機一斉に停止した場合は着水井のバルブを直ちに閉鎖して、パイプ内の水が流出してパイプ内に空気が流入するのを防がねばならない。停電からバルブ完全閉鎖迄の間に流出する水は、ヘッドタンクにそのための容量を持たせてある。

(3) 保守点検および予備部品の保持

ポンプ・モーター・コンプレッサー・流量計・水位計および電気機器等の主要項目については、定期的な検査を実施する。

また、空気弁・チェックバルブ・ジョイント・ゴムパッキン・ボルト等、消耗の激しい部品については予備を用意しておく。

(4) 水質分析

水質試験は、水が飲料水として使用されるまでの数年間については無機物含有試験のみを乾期・雨期を含めて、1年間に4回も実施すれば充分であろう。それ以後は、浄水場が設置されるので、浄水場において飲料水としての基準値を満たす分析が行われねばならない。

工業用水の水質基準は業種毎に異なるので各工場に必要な処理を行う事とする。

6-3 原水単価

「タイ国東部海岸水資源開発計画」フィージビリティ スタディにおけるノンブラライ サブ プロジェクトに含まれる費用の内、本プロジェクトに含まれる費用については実施設計で算出された事業費と置きかえて、受水施設における原水コストを算定する。コスト算定の条件としてはプロジェクトライフは37年、外貨ローン条件はOECD ローンの年利率3%、償還期間30年、支払い猶

予期間10年として原水コストは 3.2 ¥/m^3 となる。

圖一-1 導水施設平面圖

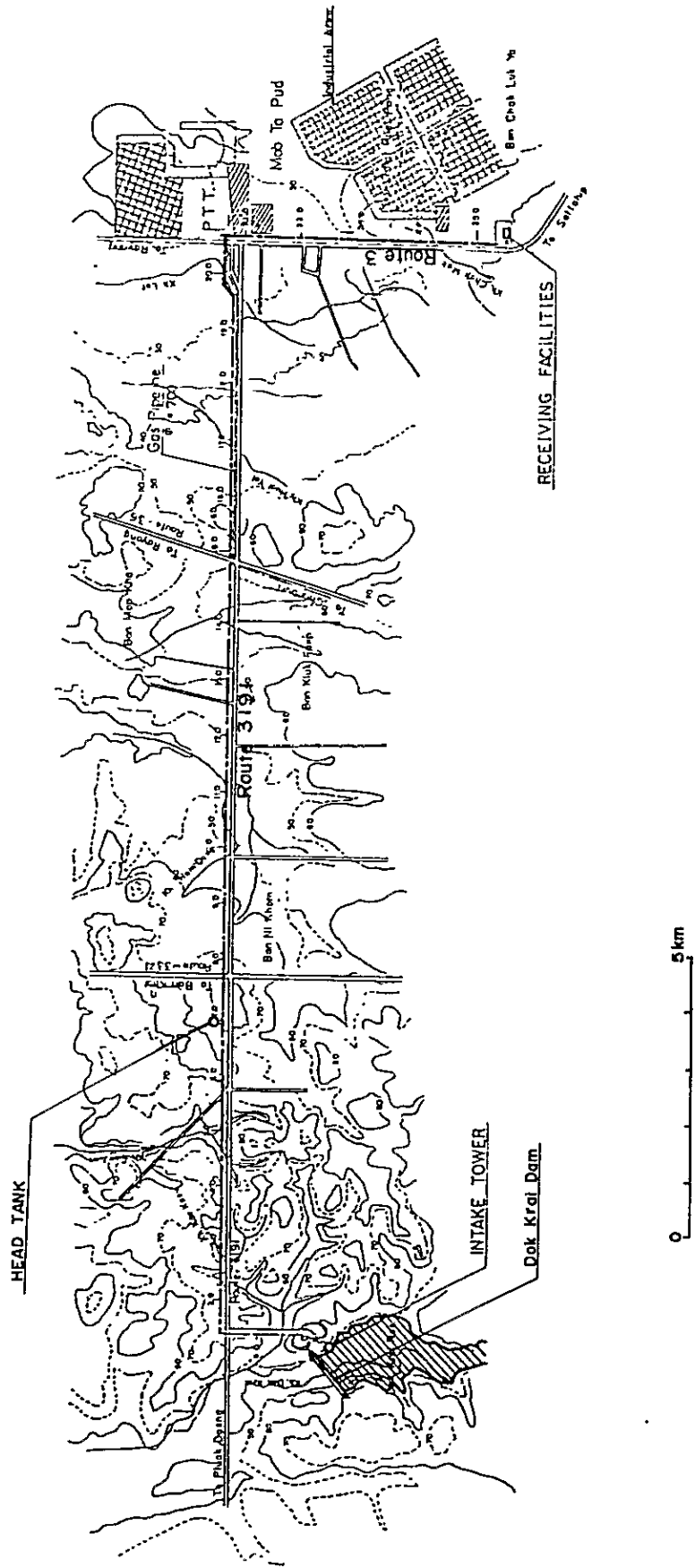


図 - 2 導水施設縦断面図

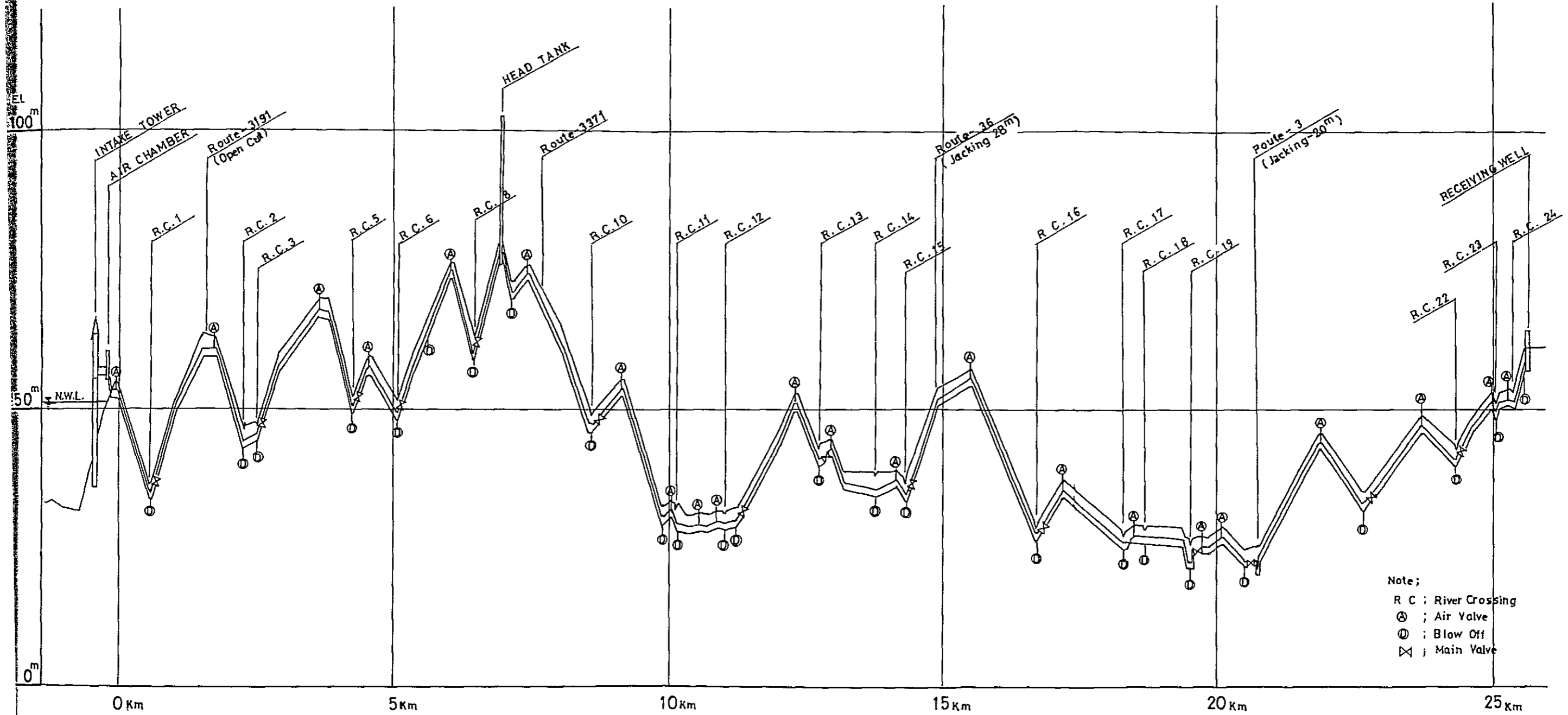


图 - 3 取水塔构造图

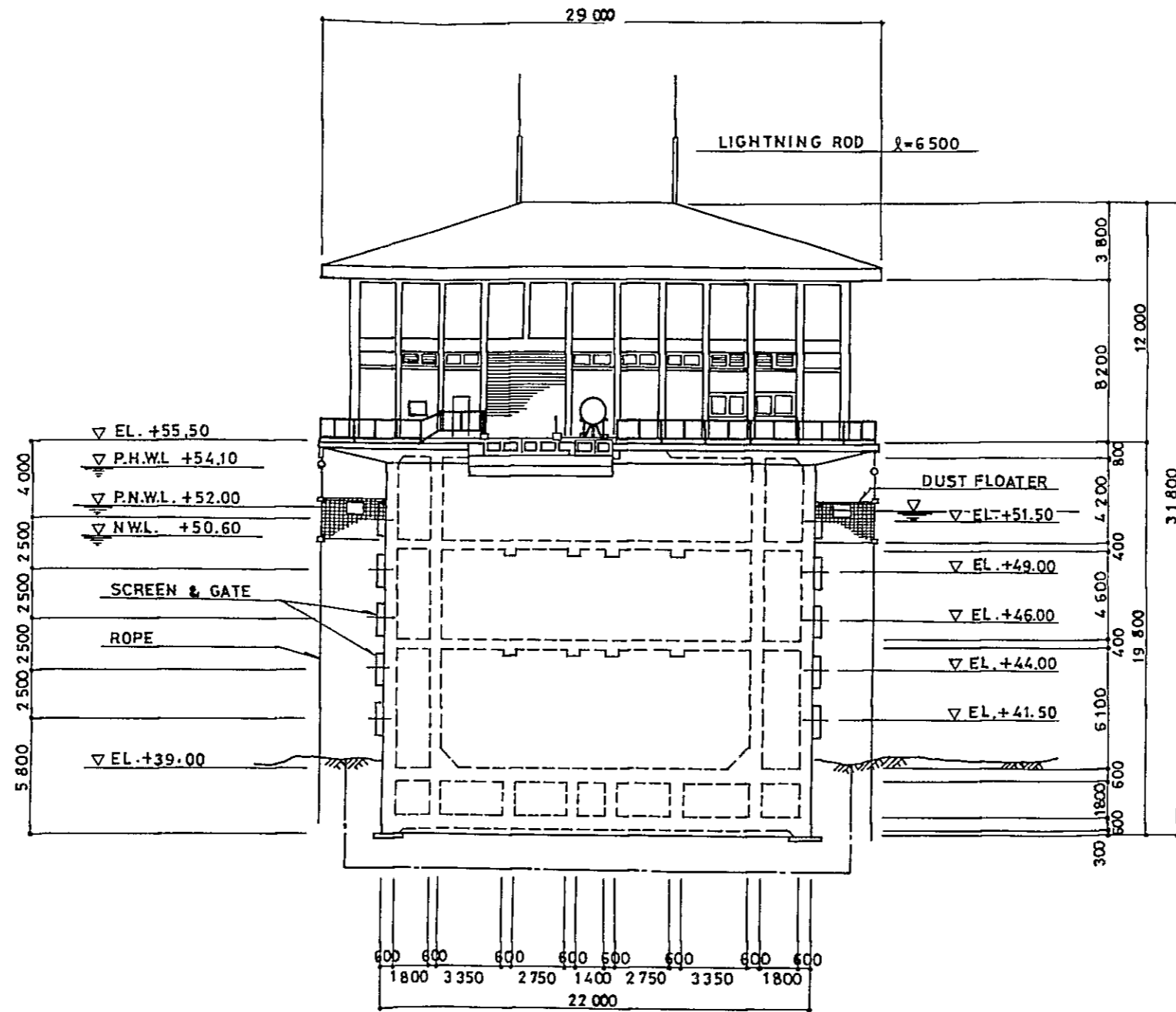


図-4 ヘッドタンク構造図

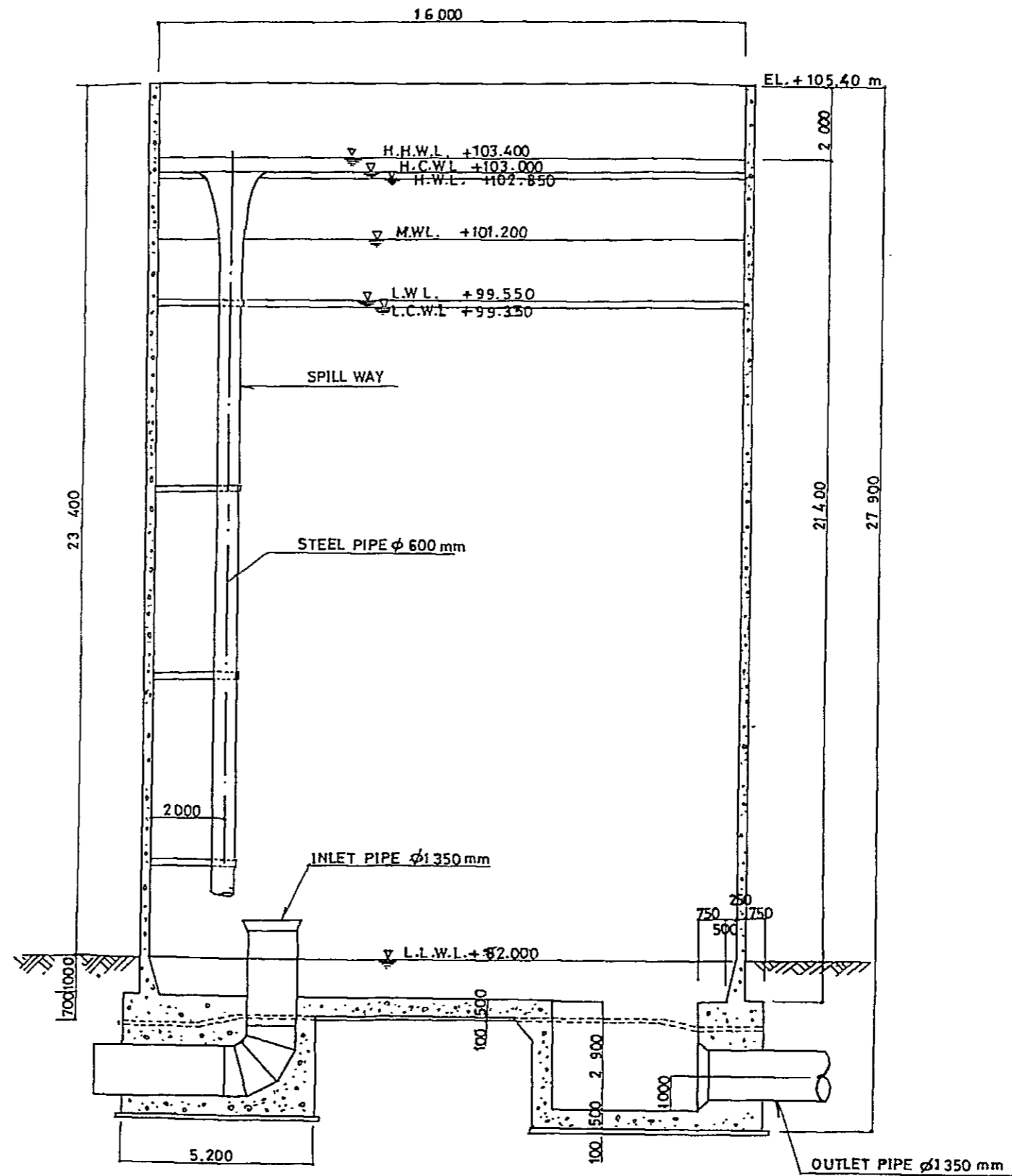
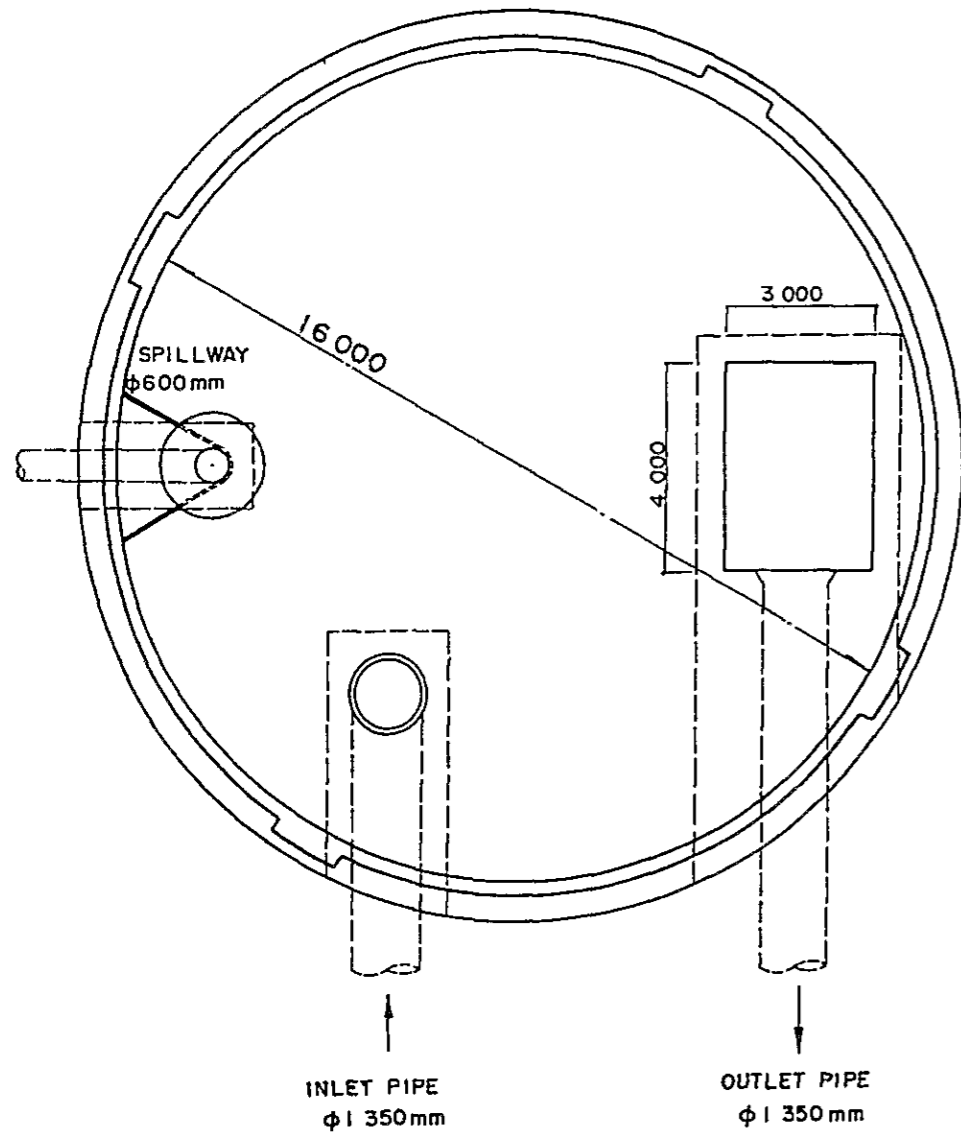


圖 - 5 受水施設平面圖

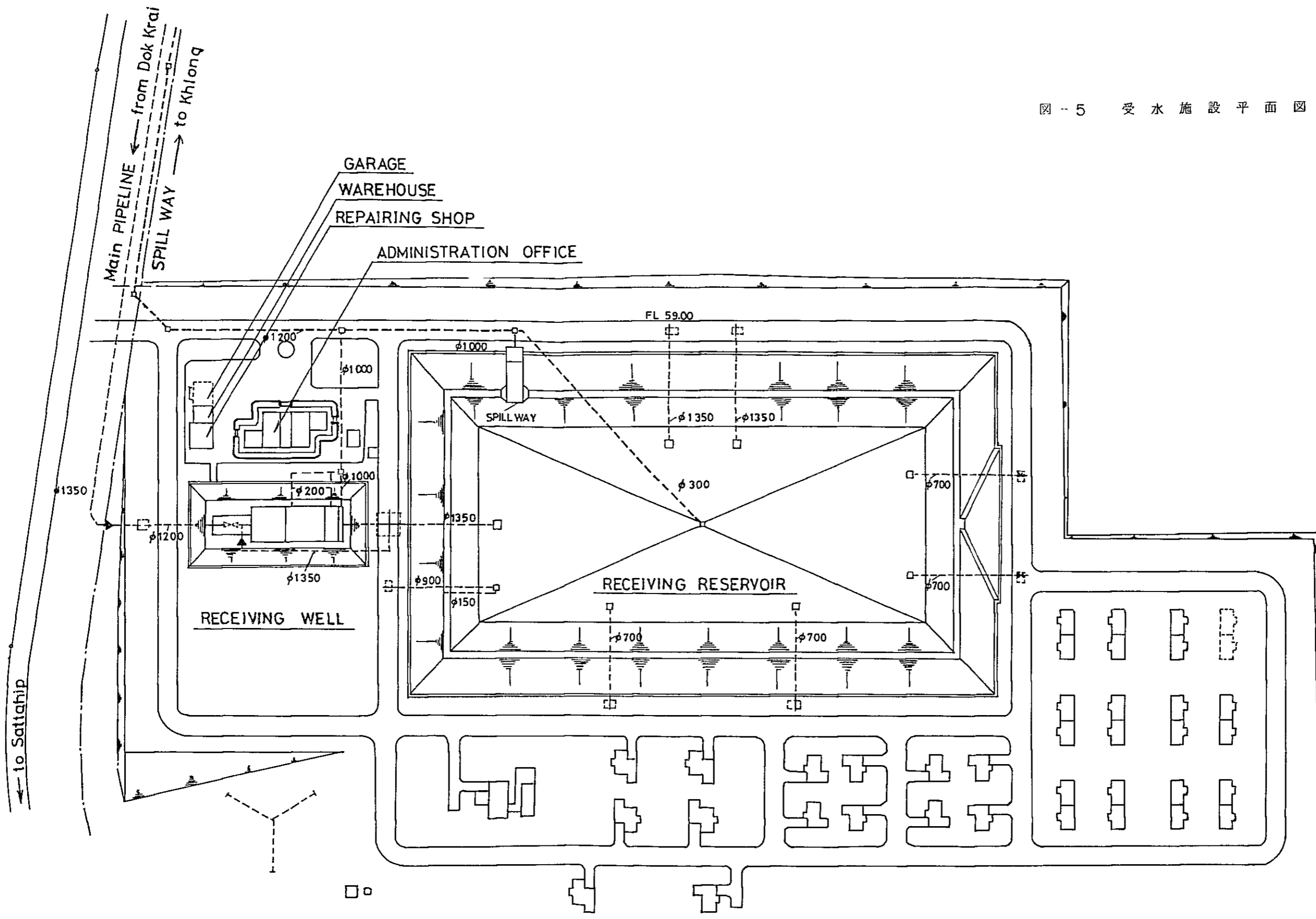


圖 - 6 管理機關組織圖

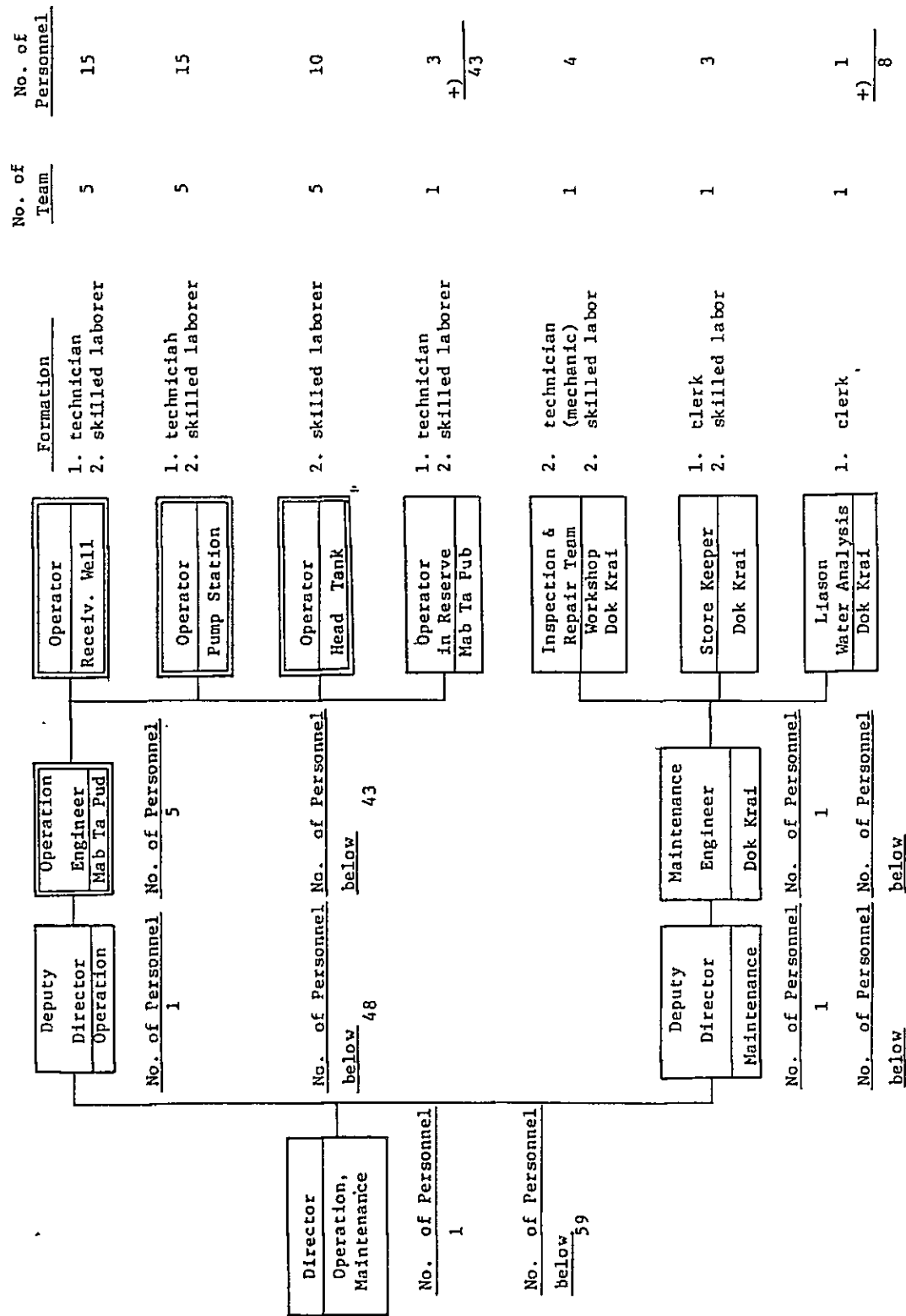


表-1 ノンブラライ プロジェクト諸元

(ドククライ-マブタブット パイプライン プロジェクトを除く)

1. ノンブラライ サブ プロジェクト

1-1 ダムおよび貯水池

貯水池

集積面積	426 km ²
最高水位湛水面積	23 km ²

貯水位

最高水位 (H.W.L.)	EL. 47.0 m
常時満水位 (N.W.L.)	EL. 45.0 m
最低水位 (L.W.L.)	EL. 33.3 m

貯水容量

総貯水容量	200.7 × 10 ⁶ m ³
サーチャージ容量	43.5 × 10 ⁶ m ³
利水容量	144.4 × 10 ⁶ m ³
堆砂容量	12.8 × 10 ⁶ m ³

ダム

ダム

ダム型式	カットオフレンチ付き アースフィルタイプ
堤頂高	EL. 49.0 m
ダム高	31.0 m
堤頂長	4,000.0 m
法面勾配	上流面 1 : 3.0 下流面 1 : 2.5

堤体積	$3.2 \times 10^6 \text{ m}^3$
余水吐	
型式	非常用ゲート付横越流堰
放流量	$700 \text{ m}^3/\text{s}$ (H.W.L.)
水門 (非常用ゲート)	ローラーゲート $5.0 \text{ m} \times 5.0 \text{ m} \times 1 \text{ 門}$
取水および放流施設	
取水施設	取水塔型式
かんがい用放流施設	
調整弁	ジェットフローゲート $\phi 1,500 \text{ mm} \times 1 \text{ 門}$
放流能力	$14 \text{ m}^3/\text{s}$ (L.W.L)
移転家屋数および取得用地	
移転家屋数	200戸
取得用地面積	3,100 ka
付替道路延長	17.3 km
1-2 マブタブットーサタヒップ	パイプライン システム
<u>マブタブッドの増圧ポンプ場</u>	
ポンプ型式	横軸渦巻きポンプ
設計流量	$1.09 \text{ m}^3/\text{s}$ ($32.7 \text{ m}^3/\text{min}/\text{unit}$)
ポンプ台数	3台 (予備1台を含む)
ポンプ全揚程	11 m
モーター出力	150 KW

パイプライン

設計流量	1.09 m^3/s
総延長	21.9 km
スチールバルブ	ϕ 1,000 mm , t 8.7 mm

受水施設

位置	サタヒップ東約 5 km
容量	350 m^3

1-3 ラヨンへの導水

堰

位置	ラヨン川バンカイ頭首工上流
洪水ゲート	20 $m \times$ 2.5 $m \times$ 2門
調整ゲート	10 $m \times$ 3.0 m

取水および導水システム

設計流量	1.01 m^3/s
パイプ長	1.0 km
コンクリートパイプ	ϕ 1,500 mm

受水施設

位置	バンカイ
受水槽容量	300 m^3

1-4 かんがいおよび排水システム

かんがいシステム

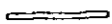
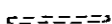
かんがい面積	3,650 ha
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作付率	雨期 100 %
	乾期 80 %
作付体系	雨期：水稻
	乾期：水稻，落花生
予想収穫高	水稻：雨期 4.0 t/ha
	：乾期 4.5 t/ha
	落花生：乾期 1.9 t/ha
かんがい用水	$69.4 \times 10^6 \text{ m}^3/\text{年}$
頭首工位置	バンノンバウ
かんがい水路延長	
幹線水路	46.2 km (コンクリートライニング)
支線水路	20 km (コンクリートライニング)
<u>排水システム</u>	
排水面積	
地区内	21.3 km ²
地区外	14.9 km ²
計画排水量	20.4 m ³ /s
幹線排水路延長	6.5 km

表-2 ドックライナーマブタブット ハイブラインプロジェクト工程表

項目	年																	
	1981			1982			1983			1984			1985					
	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Feasibility Study																		
Detailed Design																		
Supervision																		
Advertisement for Pre-qualification Tender																		
Pre-qualification Tendering																		
Evaluation of Pre-qualification and Listing																		
Concurrence of List																		
Tender by qualified Tenderers																		
Evaluation of Tender/Reporting																		
Negotiation/Contracting with Tenderer																		
Approval/Concurrence of Contract Document																		
Preparatory Work																		
Intake Facilities																		
Pipeline																		
Head Tank																		
Receiving Facilities																		
Control System																		
Housing																		
Test Run																		
Training																		
Commissioning																		

表-3 WHOLE CONSTRUCTION SCHEDULE

NOTE  CONTINUOUS ACTIVITIES
 INTERMITTENT ACTIVITIES

ITEM	UNIT	QUANTITIES	1983												1984							
			DRY SEASON				WET SEASON				DRY SEASON				WET SEASON							
			MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
現場乗込, 資機材搬入及び一般仮設工事																						
準備工																						
用地取得																						
取付道路																						
請負人キャンプ																						
バッチャープラント																						
取水施設																						
整地																						
盛土工	Cum	23,000																				
仮橋及びケーソン沈設用設備	LS																					
貯水池内掘削	Cum	7,000																				
基礎コンクリート, ケーソン沈設	Cum	1,200																				
ドライドック (30×24×66m)	No.	1																				
ケーソンコンクリート	Cum	3,800																				
操作室	Sqm																					
ポンプ施設	LS	1																				
管理橋 (長さ160m)	LS	1																				
エアチャンバー	LS	1																				
パイプライン																						
材料手配																						
パイプ製作	t	10,400																				
整地及び仮設工事	LS	1																				
パイプ布設	Km	261																				
バルブ室及びバルブボックス (メインパイプφ1350)	Pieces	17																				
泥吐き管	no	23																				
道路横断部 (ジャツキング) (28m+20m)	no	2																				
同上 (バイパス及び切換え工法)	no	2																				
キャサバ工場のパイプライン付替 (φ150)	Km	2.8																				
その他 (技管, 空気弁 etc)																						
ヘッドタンク																						
整地	Cum	1,000																				
掘削	Cum																					
PCタンク (φ16m×251m)	Cum																					
余水吐	LS																					
銅材工	LS																					
受水施設																						
掘削	Cum	9,400																				
盛土工	Cum	24,100																				
埋戻し	Cum	4,700																				
ライニングシート	Sqm	12,400																				
コンクリート工	Cum	1,300																				
パイプ, ゲート及びバルブ据付	LS																					
建築																						
ドックライ (管理事務所, キャンプ, 駐車場, 倉庫, コンプレッサー室, 受変電所)	Sqm																					
ヘッドタンク (管理人詰所)	Sqm																					
マブタブット (本部, 発電機室, 修理工場, 駐車場, 倉庫, キャンプ)	Sqm																					
電気設備	LS																					
検査及び試運転																						
解体・撤去																						

表 - 4 資 金 計 画

THE WATER PIPELINE SYSTEM AT EAST COAST
DISBURSEMENT SCHEDULE OF FUND REQUIREMENT

Description	Amount Foreign (Local)	1982				1983				1984			
		3/4	4/4	1/4	2/4	3/4	2/4	1/4	4/4	1/4	2/4	3/4	4/4
1. Construction Works (Dok Krai Pipeline System)	616,325 (263,211)			6,002 16,577		31,543 19,662	131,706 51,134	123,226 47,787	150,538 57,318	149,047 51,445	24,263 19,88		
2. Supervisory Consulting Services (Dok Krai Pipeline System)	52,600 (6,400)		9,000 600	4,100 700	7,500 900	7,500 900	7,500 900	7,500 900	7,500 900	7,500 900	5,000 600		
3. Detailed Design Services (from Mab Yu Pad to Sattahip	17,500 (3,800)	1,000 400	6,000 1,200	8,000 1,200	2,500 1,000								
4. Land Acquisition	- (1,500)		900 600										
Foreign	686,425	1,000	12,000	18,102	41,543	139,206	130,726	158,038	156,547	29,263			
Local	(274,911)	(400)	(2,700)	(19,077)	(21,562)	(52,034)	(48,687)	(58,218)	(52,345)	(19,888)			
Total	961,336	1,400	14,700	37,179	63,105	191,240	179,413	216,256	208,892	49,151			

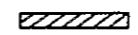
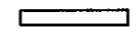
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団	長	片山祐一
副団	長 (土木)	若本修
副団	長 (書類)	樋口昭一郎
水需給	計画	朝田真弘
地質・土質		中島史樹
測	量	石塚一啓
水道施設	計画・設計	富岡慶行
ポンプ場	計画・設計	榎本文勇
パイプライン	計画・設計	西田佳三
施工	計画	高橋親一
電機	機械	中尾英明
積算		柴田悟
入札	条件	佐藤鎮夫
		柿崎崇
Spec. Writer		天久保允文
Spec. Writer		門脇達
建	築	久保田明
水道施設	設計	三宅昭博
ポンプ場	設計	横倉順治
パイプライン	設計	津川智明

付録-2 タイ国 東部海岸 パイプライン建設実施設計

要員計画

	担当業務	氏名	1981		1982												
			11	12	1	2	3	4	5	6	7	8	9	10			
1	団 長	片山 祐一	19	17		14	28		2	16		15	1	15	17	31	
2	副 団 長 (土木)	若本 修								16	17						
3	副 団 長 (書類)	樋口 昭一郎						18									
4	水 需 給 計 画	朝田 真弘		1			28										
5	地 質 ・ 土 質	中島 史樹															
6	測 量	石塚 一啓	18				15										
7	水道施設計画・設計	富岡 慶行			16		3		16		15	1	15				
8	ポンプ場計画・設計	榎本文 勇				15		29	27								
9	パイプライン計画・設計	西田 佳三		18				18	16								
10	施 工 計 画	高橋 親一		17			16		16								
11	電 機	中尾 英明			17		15										
12	機 械	柴田 悟															
13	積 算	佐藤 鎮夫			18	16		18	16		15						
14	入 札 条 件	柿崎 崇	18	17		17											
15	Spec. Writer	大久保 允文			18	16		18		2	15	1	30				
16	Spec. Writer	門脇 達						3									
17	建 築	久保田 明															
18	水道施設設計	三宅 昭博		18	16			18									
19	ポンプ場設計	横倉 順治						3									
20	パイプライン設計	津川 智明							17								
報 告 書	Inception report		⊙														
	Progress report			○I					⊙II								
	Engineering report						○					⊙					
	Design report											○	⊙				
	Tender document											○	⊙				
	月 数		1	2	3	4	5	6	7	8	9	10	11	12			

 現 地
 国 内

1. タイ国王室かんがい局

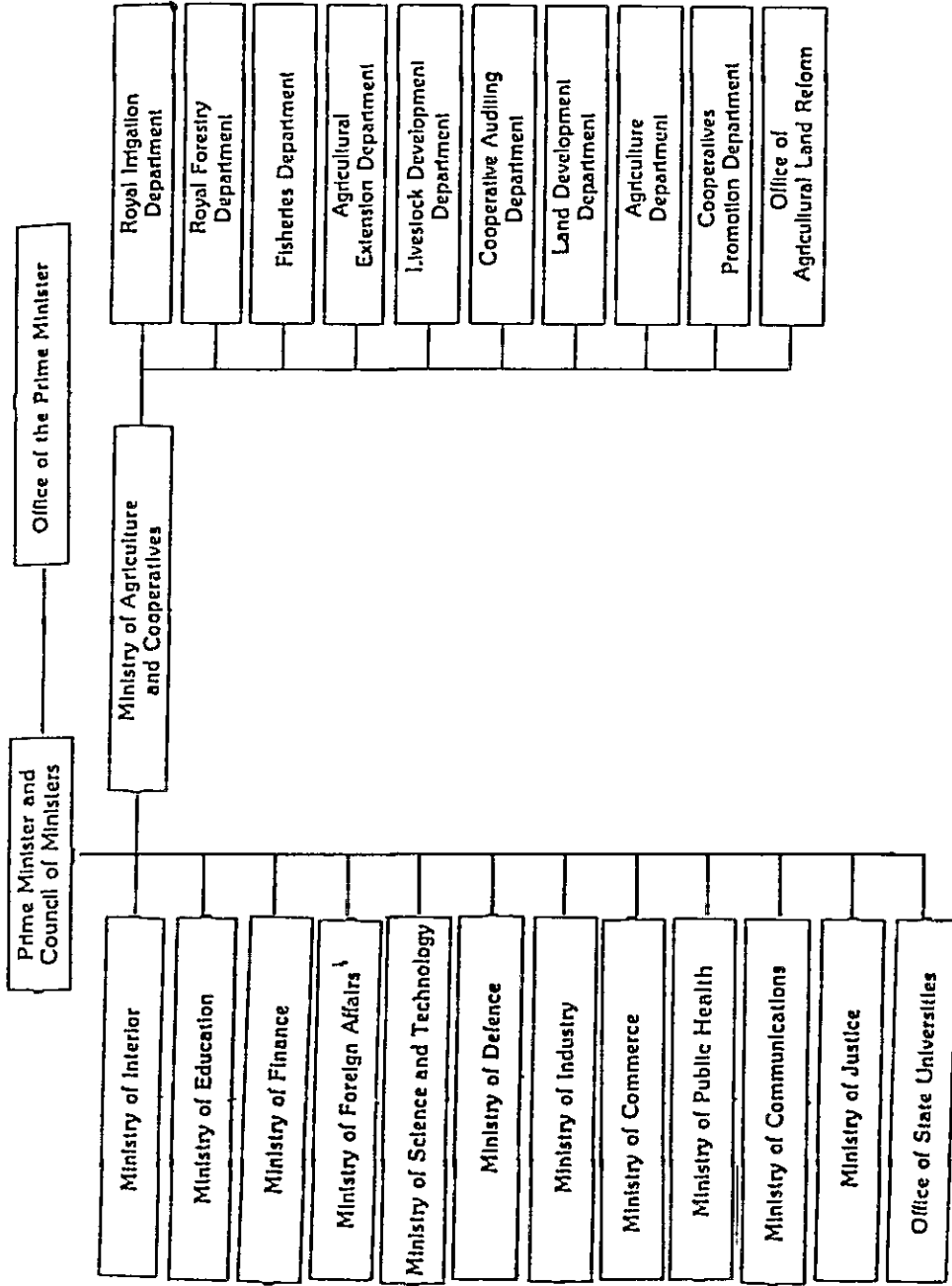
プロジェクト実施の全期間を通じて関与した王室かんがい局職員は下記の通りである。

Mr. BOONTHAI	OTAGANONTA	Chief Engineer for Civil Engineering
Mr. PHYOOL	CHANTASIRO	Director, Survey Div.
Mr. PRASARN	LEELASORN	Director, Soil & Geo. Survey
Mr. SUPHON	CHIRAPUNTU	Chief, Soil Engineering Investigation Branch
Mr. SUTHEP	TINGSABAHT	Director, Programme & Budget Div.
Mr. CHAREUK	NONTHATHUM	Director, Region Office
Mr. DAMRONG	JARASWATHANA	Director, Hydrology Div.
Mr. SHOOMBHOL	CHAVEESUK	Director, Design Div.
Mr. CHAROON	KAMOLRATANA	Chief, Design Region 10 Section Design Div.
Mr. PRAKAI	SASTRAVAHA	Large Project Construction Div.
Mr. KAMOL	CHITARKON	Large Project Construction Div.
Mr. JUMROEN	RANITYING	Medium Project Construction Div.
Mr. RUONGRIT	AMMAWAT	Chief Dam Design Branch
Mr. CHALERMTHEP	RATANAPRAYOON	O & M Div.
Mr. PAIROJ	NANONGKAI	Law & Land Div.
Mr. SUTHI	SONGVORAVIT	Chief, Policy Planning Branch, Planning Div.
Mr. DHONGCHART	CHULLASUK	Economic Branch, Project & Planning Div.
Mr. THANEE	KHEOSIPALARD	Architect 6
Mr. SOMCHIT	PUNTOOMSUIT	Legal Section
Mr. CHAMNONG	HIRANPRADIT	Chief, Specification Design Div.
Mr. DIBHYARAKS	SUKHUM	Loan Financed Project Center

2 管理委員会

管理委員長	東京都衛生局水道課長	芳 賀 秀 寿
管理委員	水資源公団企画部計画課長	三 島 勇 一
	建設省国際課海外協力官	武 内 遼 夫

タイ政府関係機関組織図



調査業務の概要

1. 調査期間

調査期間は1981年11月より1982年8月迄であり、この間の調査団員の業務工程は付録2の業務実施工程計画（アサイメントスケジュール）に記載した。

2. 調査概要

2－1 測量

外業、内業の実施は王室かんがい局測量部門の職員により行われ、チームの測量担当者はこれを監督した。測量内容はドックライ貯水池内深淺測量、取水施設予定地付近、平面測量、パイプライン予定地の平面測量と横断測量、ヘッドタンク予定地平面測量、受水施設平面測量である。

成果品は王室かんがい局に納められ、成果品目録はエンジニアリングレポートに収録された。

2－2 地質調査

地質調査の担当者はチームよりやや遅れて、1981年12月に現地入りし、2月末迄滞在した。

測量と同様、実作業は王室かんがい局地質調査部門職員がこれにあたりチームの地質担当者はこれを監督し、報告書をまとめた。

調査内容は導水施設沿いに機械ボーリング24ヶ所、オーガーボーリング9ヶ所、テストピット掘削3ヶ所を行った。これらのボーリング孔より合計48ヶの試料を採取し、王室かんがい局土質試験所にて室内試験を行い、調査結果、試験結果はエンジニアリングレポートに収められた。

2-3 フィージビリティ・スタディ検証

次の3項目について、検証がなされた。

(1) 施設計画

フィージビリティスタディに於いて計画された取水塔、パイプライン、ヘッドタンク、着水井、等の諸施設についてその位置、構造等を再検討して施設計画を決定した。その結果、ヘッドタンクの位置、規模、数、着水位及び取水ポンプのポンプヘッドについて修正がなされ、また受水池を新たに設ける事とした。

(2) 水需給計画

計画対象地区及びその周辺における気象水文資料を新たに収集した。収集資料は気象資料として月平均気温、相対湿度、年間蒸発量、水文資料としては月平均雨量、流量が得られた。これらの資料を基に水需給計画を再検討した結果、フィージビリティスタディでの調査結果を確認した。収集資料及び検討結果はエンジニアリングレポートに収められた。

(3) 浄水場

浄水場について位置、規模を王室かんがい局と協議した。

2-4 実施設計、入札書類

本プロジェクトは設計工期が限られている事、高度な設計技術を要する事、電子計算機を身近で自由に使える必要がある事などの事情より実施設計業務は国内で短期間に集中的に行われた。

1981年11月から1982年4月迄の間に現地及び国内においてパイプラインシステムの構成、各施設基本設計、パイプラインコントロール方法など基本事項を詰め、また入札関係書類の原案を作成し、それぞれ王室かんがい局と協議し基本事項を確認した。確認結果はプログレスレポートⅡにま

とめてある。

プログレスレポートⅡにより確認された基本事項に従って設計、書類共、各担当者が詳細設計業務を6月中旬迄国内で進めドラフトファイナルレポートを作成した。

ドラフトファイナルレポートは7月に王室かんがい局へ提出され、同時に内容を説明し、王室かんがい局と調査団の間で質疑応答がなされ、7月末には王室かんがい局はレポートの内容について完全に了解し、受入れた。

その後、調査団は帰国し協議結果に基づいて原稿、図面に若干の修正を加え、8月末にファイナルレポートが作成されJICAへ提出された。

なお職員用住宅については、王室かんがい局と協議した結果住宅地レイアウトのみ作成し、各住宅の設計図は王室かんがい局のスタンダードを使用することとなった。

各施設の設計に当ってはタイ国の規準に準拠し、タイ国の規準にないものについては日本の規準を参考とした。

設計に当って実際に使用した基準、指針は下記の通りである。

1. タイ工業規格 (T I S)
2. Metropolitan Water Works Authority (M W W A)
3. 日本工業規格 (J I S)
4. 水道施設設計指針 (日本水道協会)
5. 水道用プレストレストコンクリートタンク標準仕様書 (#)
6. コンクリート標準示方書 (土木学会)
7. プレストレストコンクリート標準示方書 (#)
8. 道路橋示方書 (日本道路協会)
9. A A S H O (参考)

2-5 入札資格審査

入札資格審査のための書類作成を行った。

なお、入札資格審査は1982年8月～9月に行われた。

2-6 実施計画書（案）作成

1982年1月～2月に亘り、王室かんがい局が本プロジェクトを実施するのに当り必要な実施計画書（Implementation Program）案を作成した。

2-7 技術移転

1982年6月、王室かんがい局より土木設計、建築設計、法律、積算の各部門チーフ4人が日本へ派遣され国内に於ける作業を共同して行う事により技術移転がなされた。

また、現地においても現地作業を通じて各部門の担当者へ業務の遂行を通じて、技術移転がなされた。

3. 報告書の提出

本プロジェクトで提出された報告書は下記の通りである。

報告書の提出先、部数は末尾にまとめた。

3-1 Inception Report（1981年11月提出）

調査作業開始に当り、調査方針を説明した。

3-2 Progress Report I（1981年12月提出）

内容は、設計関係については設計基本方針、設計条件、入札書類については契約形態、入札書類の構成、仕様書の内容等について王室かんがい局と協議した結果及び業務開始後1ヶ月間の作業の概要を記した。

3 - 3 Draft Engineering Report (1982年2月提出)

報告書には2月迄に終了している測量、地質調査の結果及び業務開始以来、3ヶ月半の設計上の検討結果が収録されている。

3 - 4 Final Engineering Report (1982年3月提出)

本レポートは Draft Engineering Report 提出後、1ヶ月間の検討結果が追加されて設計上の基本事項検討結果が全て収められた。

3 - 5 Progress Report II (1982年4月提出)

報告書の内容は、各施設主要諸元、設計条件、仕様書等の調査団の考え方を最終的に確認したもので、詳細設計を行う基礎となるものである。

3 - 6 Draft Final Report (1982年7月提出)

これは4月～6月に国内で行われた詳細設計と入札書類作成の作業結果であり、これを7月中旬に王室かんがい局に説明した。

3 - 7 Final Report (1982年8月提出)

1982年8月に Draft Final Report について、王室かんがい局より内容を完全に理解し、これを受入れる旨の approval letter を受取り、これによって Final Report を作成した。

報告書提出先・部数一覧

報告書名		提出先・部数	
		王室かんがい局	JICA
Inception Report		30 部	10 部
Progress Report I		30 部	10 部
Draft Engineering Report		30 部	10 部
Final Engineering Report		35 部	15 部
Progress Report II		30 部	10 部
Draft Final Report	1. ドラフトデザインレポート (メインレポート)	21 部	9 部
	2. ドラフトデザインレポート (サポーティングレポート)	3 部	7 部
	3. 図面集	21 部	9 部
	4. 仕様書(ゼネラル)	36 部	9 部
	5. 仕様書(パティキュラー) 数量表	36 部	9 部

報 告 書 名		提 出 先 ・ 部 数	
		王室かんがい局	J I C A
Final Report	1. デザインレポート (メインレポート)	20 部	1 部
	2. デザインレポート (サポーティングレポート)	10 部	1 部
	3. インストラクションズ ツ- テンダラ-ズ	70 部	1 部
	4. コンディショ-ズ オブ コ-トラクト	70 部	1 部
	5. 仕様書 (ゼネラル)	70 部	1 部
	6. 仕様書 (パ-ティキュラー)	70 部	1 部
	7. 数 量 表	70 部	1 部
	8. 函 面 集	70 部	1 部
	9. 工事費積算書	2 部	1 部
	10. 概要版 (日本語)	—	15 部

付 録 - 6 調 査 項 目

DEPARTMENT OF TECHNICAL AND ECONOMIC COOPERATION

Krung Kasem Road, Bangkok, Thailand

Cable: DTEC

TEL 817555

URGENT

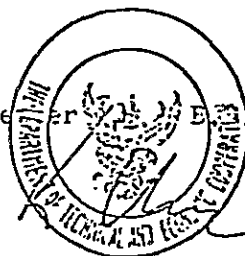
No. 1804(1)/25321

The Department of Technical and Economic Cooperation presents its compliments to the Embassy of Japan and has the honour to request, on behalf of the Royal Irrigation Department, Ministry of Agriculture and Cooperatives, an assistance for the Detail Design of Pipe Line Installation with Bidding Document for Water Transmission from Dok Krai Reservoir to Mabatput, under the Technical Cooperation Scheme of the Colombo Plan.

Detailed information on the request is enclosed herewith for the Embassy's consideration.

The Department of Technical and Economic Cooperation avails itself of this opportunity to renew to the Embassy the assurances of its highest consideration.

September 25 1981 2534



Encl.

The Embassy of Japan,
Bangkok.

DEC-II/CP
Tel. 2311031

DEPARTMENT OF TECHNICAL AND ECONOMIC COOPERATION

Krung Kasem Road, Bangkok, Thailand

Cable: DTEC

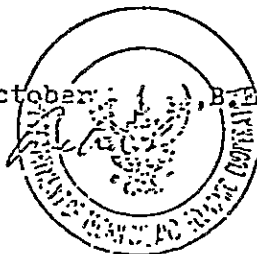
TEL. 817555

No. 1804(1)/24425

The Department of Technical and Economic Cooperation presents its compliments to the Embassy of Japan and, with reference to the Department's note No. 1804(1)/23321 dated September 21, B.E. 2524 concerning the request for an assistance for the Detail Design of Pipe Line Installation with Bidding Document for Water Transmission from Dok Krai Reservoir to Mabtaput, has the honour to inform the Embassy that the Royal Irrigation Department agrees that the responsibility on all documents and drawings of the detail design shall be taken by the Royal Irrigation Department.

The Department of Technical and Economic Cooperation avails itself of this opportunity to renew to the Embassy the assurances of its highest consideration.

October 1, B.E. 2524



The Embassy of Japan,
Bangkok.

DEC-II/CP
Tel. 2811031



Request for Technical Assistance Project

Project Title: Technical Cooperation in Detail Design of Pipe Line Installation with Bidding Document for Water Transmission from Dok Krai Reservoir to Mabtaput

Request Agency: Royal Irrigation Department
Ministry of Agriculture and Cooperatives

Proposed Source of Assistance: JICA, Government of Japan

I. Background:

The Thai government wants to promote the eastern coast for industrial area. The increasing demands of water for various uses are greatly augmented. Therefore, the water supply for industrial and domestic consumption should be developed to accomplish the National Development Plan. Owing to the resolution of the Cabinet, RID should be responsible for the investigation, design and construction of pipe line installation for water transmission from Dok Krai Reservoir - Mabtaput - Sattahip project.

II. Detail of Project:

This requested assistance is for the urgent needed detail design of pump house and pipe line installation for water transmission from Dok Krai Reservoir to Mabtaput together with bidding document. This project will be performed for the purpose of industrial use as well as for domestic use in this area. The construction of the pump house, pipe line (about 22 km.) have to be completed at the end of B.E. 2526 (1983).

The objective of this completed project is to distribute water from Dok Krai reservoir for the uses of heavy industrial projects at Mabtaput, deep sea port in Sattahip and people concentrations in the industrial area.

This pipe line from Dok Krai - Mabtaput - Sattahip should be installed along the highway No. 3191 and highway No. 3. This installation will be cooperated between RID and the Department of Highway, Ministry of Communication and other agencies concerned.

Quantity of water for the completed project required (not including Industrial Settlement and Laem Chabang Harbour) is about 57.34 Million m³ per year.

The detail design and bidding document preparation requires about 20 experts to be engaged in the study and about seven months period.

III. End of Project Status:

The detail design and bidding document preparation of pump house, pipe line for water transmission from Dok Krai Reservoir to Mabtaput project.

Prepared by: Project Planning Division
Royal Irrigation Department
Tel. 2413356

August 20, 1981

RECORD OF DISCUSSIONS
TECHNICAL COOPERATION
FOR
DETAILED DESIGN FOR THE PIPE-LINE SYSTEM
FROM DOK KRAI TO MAB TA PUT
IN THE EAST COAST

1. A preliminary study team (The Team) was despatched by the Government of Japan from 16 to 25 of September, 1981 through the Japan International Cooperation Agency (JICA), to finalize, in consultation with the Thai Government agencies concerned, a technical cooperation (the Cooperation) on the detailed design for the pipe-line system from Dok Krai Dam to Mab Ta Put in the East Coast (the Study).

The Team carried out a field survey and held a series of discussions on the Study with officials of the Royal Irrigation Department (RID) and other Thai Government agencies concerned, during their stay in Thailand. The final meeting between RID and the Team was held on 23 of September, 1981. A list of participants in the final meeting is attached as Appendix I.

2. Subject to submission of the formal request by the Government of Thailand and its acceptance by the Government of Japan, RID and the Team reached the following agreement and understanding on the framework of the Cooperation and the various arrangements to be made for the implementation of the Study.

Executing Agency

3. RID will be the Executing Agency for the Cooperation and shall be responsible for the detailed designs and tender documents for the pipe-line system through the implementation of the Study in cooperation with the Japanese Study Team (The Study Team).

4. The Director of Design Division, RID will be the Study Director and will be responsible for the overall administration and coordination of the progress of the Study.

5. The Team recommends that the Government of Thailand will make efforts to realize the water supply system for the suitable utilization of the pipe-line system.

Objective of Study

6. Objective of the Study is to prepare detailed designs and tender documents for the pipe-line system for the industrial and municipal water in the East Coast, which consists of the following main facilities and other related structures.

1) Intake and Pumping Station

Location: Dok Krai Dam (Right Bank)

Appurtenant Facilities

2) Pipe-line

Route: from Dok Krai Dam to Mab Ta Put
along the Route 3191
(Length: 27 km. approx.)

2

Appurtenant Facilities:

3) Head Tank

Location: Top of the Highest Hill near the Route 3191
(About 7.0 km. away from the Pumping
Station)

4) Receiving Well

Location: Neighborhood Area of Ban Chak Luk Ya

5) Control System Facilities

Scope of Works

7. The details and procedures of the Cooperation are set out in the Scope of Works between the Thai Government and the Team as attached as Appendix II.

Undertaking of the Government of Japan

8. The Government of Japan will dispatch Japanese Consultants as the Study Team through JICA in accordance with the internal procedures.

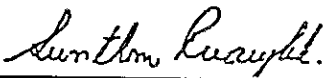
9. The Government of Japan bears the expenses for the dispatch and the engineering services of the Study Team.

Undertaking of the Government of Thailand

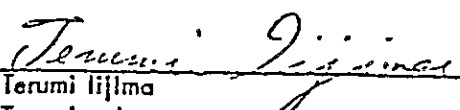
10. The Government of Thailand shall, in accordance with the relevant laws and regulations in force in Thailand, take necessary measures attached Appendix III, to facilitate the smooth performance of the Study.

23 September, 1981

For RID


Sunthorn Ruanglek
Director General
Royal Irrigation Department

For the Team


Terumi Iijima
Team Leader
Director, Social Development Cooperation
Department
JICA

APPENDIX I

LIST OF PARTICIPANTS

Royal Irrigation Department

1. Sunthorn Ruenglek
Director General
2. Boonthai Otaganonta
Director, Design Division

Japan International Cooperation Agency

1. Terumi Iijima
Team Leader
2. Hidetoshi Haga
Water Supply Engineer
3. Yuichi Nishima
Dam Engineer
4. Koichi Miyoshi
Coordinator

APPENDIX II
SCOPE OF WORKS ON THE TECHNICAL COOPERATION
FOR DETAILED DESIGN
FOR THE PIPE-LINE SYSTEM FROM DOK KRAI DAM TO
MAB TA PUT IN THE EAST COAST

I. Objective

The objective of the Study is to prepare the detailed designs and tender documents for the pipe-line system for the water transmission from Dok Krai Reservoir to Mab Ta Put.

II. Scope of Works

The Japanese Study Team will work in close coordination with the Thai counterparts to ensure consistency in criteria and policies. The scope of works will be as follows:

- a) Review of the feasibility study on the Water Resources Development Project in the East Coast (The Interim Report on East Coast Water Resources Development Project October 1981), especially concerning the part of the pipe-line system.
- b) To instruct and supervise additional investigations and surveys, if necessary for the Study.
- c) To prepare an engineering report.
- d) To prepare detailed designs.
- e) To prepare tender documents in the form of International Competitive Bidding.
- f) To prepare cost estimation.
- g) To prepare draft of implementation program.

III. Reports and Drawings

The following reports and drawings in English will be prepared and submitted to the Government of Thailand.

- Inception Report

Inception Reports will be required at the commencement of the Study and will contain the program for the Study with its schedule.

- Progress Report I

Within one and half month after the commencement of the Study, the progress report will be submitted. The report will contain the study performance including the basic design criteria, basic idea for the manner of tendering and etc.

- Draft Engineering Report

Within three and half months after the commencement of the Study, draft engineering report will be submitted.

- Progress Report II

Within five and half months after the commencement of the Study, the progress report will be submitted. The report will be a discussion note on detailed design and tender documents.

- Draft Detailed Designs, Tender Documents and Cost Estimation.

Within eight months after the commencement of the Study, draft detailed designs, tender documents and cost estimation will be submitted.

- Final Reports and Documents

Within one month after the written approval of the Government of Thailand, final reports and documents will be submitted.

IV. Tentative Work Schedule

Description	1981		1982									
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
I. Study												
1. Survey and Geological Investigation												
2. Review of Feasibility Study												
3. Engineering Study												
4. Detailed Design												
5. Preparation of Tender Documents												
II. Reports (Interim Report of Feasibility Study)	*											
Description Report		*										
Progress Report I												
Draft Engineering Report					*							
Progress Report II								*				
Draft Detailed Designs, Tender Documents and Cost Estimation												
Final Reports and Documents												
III. Periodical Meeting												*

APPENDIX III

UNDERTAKING OF THE GOVERNMENT OF THAILAND

To facilitate the smooth performance of the Study, the Government of Thailand will take necessary measures:

1. To provide the data and information necessary for the Study;
2. To provide topographic maps available in RID and other agencies;
3. To conduct profile survey along the pipe-line and topographic survey of main structures;
4. To conduct water quality test at the Dak Krai Reservoir, if necessary;
5. To conduct survey of embedded public facilities crossing the route of the pipe-line;
6. To conduct geological exploration including several core borings, test pit excavation and soil tests;
7. To conduct material tests of sand bed and aggregate;
8. To conduct land procurement survey such as area of lot, number of trees, etc.;
9. To exempt the Study Team from taxes and duties normally extended to Colombo Experts Plan for the equipment, materials and personal effects to be brought into Thailand by the Study Team.
10. To arrange the necessary computer machines and other equipment;
11. To designate the counterpart personnel in the following fields to cooperate with the Study Team in conducting the Study effectively:
 - 1) General Planning
 - 2) Civil Engineer
 - 3) Electronic Engineering
 - 4) Mechanic
 - 5) Land Consolidation
 - 6) Foundation and Soil Mechanical Engineering
 - 7) Surveying
 - 8) Hydrology
 - 9) Legal matters for tendering
 - 10) Specifications
 - 11) Cost estimate

The number and field of counterpart personnel and their respective assignment periods should be decided by prior consultation by the Study Team with RID at the commencement of the Study.

12. To provide the Study Team with a suitable space, necessary office equipment and service for the Study.
13. To make the necessary arrangements to obtain the permission of the authorities concerned for the Study Team to conduct the survey in the objective areas.

付 録 - 7 会 議 々 事 録

MINUTES OF MEETING FOR
EXPLANATION OF DRAFT PROGRESS REPORT I

(December 15, 1981)

Copies for:

NESDB, RID, PTT, IEAT, MWWA
Embassy of Japan, JICA, OECF

December 1981

Prepared by O. WAKAMOTO
Assistant Leader, Civil Works
Detailed Design Team

1. Place, Date and Participants

The meeting was held in the conference room of building of RID, on Dec. 15, 1981. It was commenced from 3:00 p.m. following a similar meeting about the Feasibility Study. The participants' list is attached herewith at the end.

2. Preparation for Meeting

The Detailed Design (hereafter called D.D.) team had prepared copies of the draft of Progress Report (hereafter called P.R.) 1 and hand-written memorandum which excerpted the important parts of P.R.1. The copies of P.R.1 had been distributed to the participants one day before the meeting to help preparatory understanding. The copies of memorandum was also distributed at the beginning of the meeting.

3. Minutes of Meeting

The meeting began after Dr. Savit's arrival and taking his seat at the table.

Mr. Boonthai of RID commented on some points of the recommendation made by the Feasibility Study team at the end of preceding meeting. Dr. Savit took the meeting here and raised the question of temporary pumping station and after being explained by Mr. Wakamoto, D.D. team, about situation surrounding it, agreed to let it leave for later discussion. Mr. Wakamoto told the table about the two books.

The one covered, bound book of the draft and the other 5 pages' memorandum and suggested to proceed on explaining the memorandum instead of reading the draft page by page.

The procedure was agreed.

The following is the speeches of major participants as spoken in that order.

3.1 Thai Requests and Japanese Response

Mr. Wakamoto

At the previous meetings held on Nov. 25 at Japanese Embassy and on Dec. 2nd at NESDB.

Thai Government requested that the D.D. team had to consider earnestly about five issues. They were; Thai participation or local resources utilization as much as possible, shortening the construction period including supply by temporary pumping, decreasing cost, reliability of the system and the foreign-local ratio.

(1) Local supply. The steel pipes' quality is generally acceptable except the inside lining, however, the quantity appears rather too large to be supplied by single supplier and some means must be found. Other construction materials are satisfactory also.

Foreign materials will be limited to the machinery like pumps, valves

and other appurtenances. Although we recommend that the prime contractor shall be foreign one with good reputation and experience, the most of sub-contracts will be practically done by local sub-contractors.

(2) Shortening the period. We recommend that the whole project shall be put on a single, package contract. It is one possible way of shortening, or making it completed within the scheduled period.

(3) Decreasing Cost. The Feasibility Study team had to do it at the stage, assuming the pipes were imported from overseas. The D.D. team has its own judgement about it regarding the Thai request. The local supply will be utilized as far as possible, thus decreasing the cost. Severe cutting, however, may cause the cost overrun and we have to find a compromise of saving the cost and avoiding the overrun.

(4) Reliability. A package contract will attract 1st class contractors. They only can make overall management, including the quality control and coordination of procurement and construction. As was mentioned before reliable, mechanical goods must be imported.

(5) Foreign - Local ratio.

The cost estimate of the local portion, matters such as land, local labor, local materials, local contractors' overhead, is the first priority to be prepared for the domestic budget of the next fiscal year.

Findings and reasonings leading to the above discussion can be referred to 4.5.1. Findings, 4.2.2. Recommended Manners of contract etc. in the book of P.R.1. Information sources are pipe manufacturers, concrete and aggregate suppliers, civil works contractors for both technical and legal matters, machinery's rental agents and dealers. The names of local firms we looked into can be referred to 2.2.4 of the book. RID divisions concerned helped us in collecting information.

3.2 Issues to be confirmed and/or to be decided

3.2.1 Confirmation

Receiving Well, Receiving Reservoir, Filtration Plant

The D.D. team has to recommend on the size and the treatment method of filtration plant, according to the agreement with JICA. The necessity of Receiving Reservoir must be discussed, considering two kinds of usage, industrial and potable, and cases of termination of the supply for a long time due to unexpected happenings.

The receiving well, receiving reservoir and filtration plant are better be operated to-gether within a control system.

Branches, where and what size from Demand Forecast

The D.D. team likes to know where and what size branches must be prepared, both from the pipeline and from the receiving reservoir.

Whole treatment or partial treatment

The issue must be judged on consideration about concentration of man-power, chemicals used for treatment, energy consumption versus autonomy of the municipalities and identity of other parties concerned.

3.2.2 Decision

Elevation of Receiving Well, How big land to be acquired

The elevation of receiving well is the most important factor, considering the conveyance capacity from Dok Krai to Mab Ta Pud and from Mab Ta Pud to Sattathip and also the residual pressure at the farther most points of the distribution system of Mab Ta Pud area. The choice of the lot comes also from what we think about the receiving well, receiving reservoir and filtration plant as discussed previously.

We are now surveying three possible lots within approximately 45 to 60 meter elevation range.

The extension to Sattathip will almost certainly need boosting by pump.

Location of Intake Tower

The Feasibility Report recommend a location 400 m upstream of the dam axis. The location seems to cause some inconvenience to the existing conditions and another location, 1.0 to 1.5 km upstream of the dam axis, is now under study.

In case of the new location, the pipeline route can make a short cut to the head tank, though it needs solving about land problems. Before reaching a decision, a comparative study of the two alternatives will be carried out.

Borrowing land for execution

Besides acquisition of land by IEAT, borrowing land along the pipeline route will be necessary to make construction easier.

It can be left to the contractors' option, a rough cost estimate being included in the Bill of Quantity or it can be included in the Tender documents with specific items. In case of the latter, we will have to specify about the construction method.

The method includes such things like handling the pipe by machinery from the side of road or from the opposite side.

3.2.3 Other issues to be confirmed and/or to be decided

Communication

When the pipeline is put into operation, three major points on the line should have means to communicate each other at any time of the day without interruption.

The points are the pump station, the head tank and the receiving well. A telephone or wireless system must be set up before completion of the construction work.

Between PTT and D.D. team

The construction method of which a brief discussion was already made (in 3.2.2 Borrowing land for execution), must be discussed and decided.

Between IEAT & D.D. team

The D.D. team's survey is now underway.

The land for the head tank, receiving well, receiving reservoir, filtration plant will be decided with completion of the survey and the preliminary design of above mentioned structures.

On the pipeline route, where the water pipe runs parallel closely to the existing gas pipe, 5m width outside of ROW (Right of way) is going to be purchased, as we understand.

For the execution of construction work, some more width might be needed, not for permanent use but for construction stage. Preferably this extra part can be borrowed during a limited period.

Between Highway Dept. and D.D. team

It appears that between the local office and the central office of Highway Department, there is some division of authority.

What we have learnt is that the local can decide about the matters within 2m at the end of ROW.

We like to get the matters decided speedily when we determine the alignment of pipeline, being not much affected by the authorization problem. About the road crossing we will prepare materials for discussion.

Between Provincial Electricity Authority and D.D. team

Relocation of the poles of power supply might become necessary at some places.

After deciding the pipeline alignment and finding such places we will inform immediately to PEA.

Mr. Wakamoto presented as above and asked Mr. Ohkubo to take over and give his speech on the matters about tender and contract.

3.3 Issues on Tender and Contract

Mr. Ohkubo

Our first consideration is in your benefit. Thais' priority are reliability, shortening the construction schedule, project cost, local resources.

The special features about the detailed design work is that within a very tight schedule we have to prepare for various kinds of works, in both technical matters and document matters of tender and contract. We must also point out that it is quite a large project with the current estimate cost of 1.5 billion bahts, the monthly average output of 85 million bahts when the figure is divided by 18 months' construction period.

The pipeline part makes about 30% of the total cost and it means a supply of big number of pipes shall be continuously done, well fitted to the construction schedule.

Taking consideration of other problems and the above features, we strongly suggest a package contract headed by a best class civil contractor as the prime contractor.

The pipe supplier shall be under the management of the prime, even though they are nominated.

The proposed temporary pumping facility will mean additional cost, 2 to 3 stages pumping, additional pipes. The cost will be over millions of bahts. It also causes problems in testing and taking over after completion of the system and switching from the temporary to the permanent system.

Mr. Ohkubo made his presentation about important matters.

4. Thai Sides' Comments

Dr. Savit thanked and congratulated the D.D. teams work, especially what they had done taking account of the discussion held at Japanese Embassy. He also thanked for the briefing for clearing explanation and coverage of the problems concerned.

Dr. Savit

In general we have no objection to the approach and the design. On the local supply, why the lining and coating of pipes are not satisfactory?

Mr. Wakamoto

With cement lining your quality is acceptable but as it cut the flow capacity by 5 to 7% when compared with epoxy lining, our choice is the latter. For epoxy lining sand blasting or shot blasting is indispensable for cleaning the steel surface of plate to have strong bondage between steel and epoxy. The blasting equipment does not cost much.

Dr. Savit

On shortening the construction period I have a good news. The gas separation plant will be completed in June instead of April. So the gap between it and the completion of pipeline is now 2 months. So considering the difficulties arising from technical and other sides, we better go for the permanent system.

Dr. Savit

On decreasing the cost. While full consideration on the local supply is taken in, the reliability is also important. I will admit that your effort is well done here.

On the foreign-local ratio. You submit the final documents to RID in August next year and when it is put on the tender, the local

portion must be well prepared. It must be included in the year's budget or be prepared as a special budget. For it, we like to request the Japanese team to send the information as soon as possible.

It will set up a target date and inform about it.

Dr. Savit

On the issue of the receiving well, receiving reservoir, filtration plant and on the issue of the whole treatment or partial treatment. As I now understand the scope of work agreed between JICA and the team, the receiving well and the receiving reservoir are in your responsibility and you work on the design. But the filtration plant needs only analysis and not designing. For possible filtration plant, prepare the size of land and the size of major structure. On the issue of branching out. We will discuss among us about the demand, both industrial and urban, and inform you about it, taken either from the pipeline or from the reservoir.

On the land. It is importance but the required area does not amount very much and also some are in possession of governmental agency.

On the intake tower. It is up to you and RID to decide about the two alternatives.

On the other issues. Communication, power supply, relocation of the electric poles, etc. shall be informed as soon as possible with possibly good details as many governmental agencies are not fast in processing these matters. The same things can be said about the road. Coordination with other agencies through RID or through RID and NESDB shall be done to promote the project.

Dr. Savit

Tendering of Contract. We have no problem if you feel that to ensure the reliability and the control of works you have to choose a big contractor with sub-contractors, and with designated sub-contractors if necessary. The responsibility is under one team.

Mr. Wakamoto

We will observe the basic principle of using local materials and local sub-contractors as much as possible.

LIST OF PARTICIPANTS, THAILAND

CIPO

DR. SAVIT PHOTIVIHOK
MR. MANAS SANGUANDIKUL
MR. KUMROPLUK SURASWADI

RID

MR. KATSUHIKO KIMURA Colombo Plan Expert, Project Planning Div.
MR. TAKASHI MIYAZAKI Colombo Plan Expert, Design Div.
MR. BOONTHAI OTAGANONTA Chief Engineer for Civil Engineering
MR. PHYOOL CHANTASIRO Director, Survey Div.
MR. PRASARN LEELASORN Director, Soil & Geo. Survey
MR. SUTHEP TINGSABAHT Director, Programme & Budget Div.
MR. CHAREUK NONTHATHUM Director, Region Office
MR. DAMRONG JARASWATHANA Director, Hydrology Div.
MR. SHOOMBHOL CHAVEESUK Director, Design Div.
MR. SUHA THANOMSINGHA Director, Region Office
MR. PRAKAI SASTRAVAHA Large Project Construction Div.
MR. KAMOL CHITARKON Large Project Construction Div.
MR. RUONGRIT AMMAWAT Chief Dam Design Branch
MR. JUMROEN PANITYING Medium Project Construction Div.
MR. CHALERMTHEP RATANAPRAYOON O & M Div.
MR. PAIROJ NANONGKAI Law & Land Div.
MR. SUPHON CHIRAPUNTU Chief, Soil Engineering Investigation Branch
MR. DHONGCHART CHULLASUK Economic Branch, Project & Planning Div.
MR. SUTHI SONGVORAVIT Chief, Policy Planning Branch, Planning Div.

MINUTES OF MEETING FOR EXPLANATION

OF DRAFT PROGRESS REPORT 1

(December 17, 1981)

Copies for:

NESDB, RID, PTT, IEAT, MWWA

Embassy of Japan, JICA, OECF

December 1981

Prepared by

O. WAKAMOTO

Assistant Leader, Civil Works

Detailed Design Team

1. Time, Place, Attendance

The meeting was held at 11:00 a.m. Dec. 17, 1981 in the conference room of RID building second floor.

The attendants' list is attached herewith.

2. Purpose

At the previous meeting held on Dec. 15, 1981, the draft of Progress Report 1 had been discussed. There the approach and the principle of design, after explanation by Japanese side and discussion between the two sides, had been accepted by Thai side.

The Detailed Design team wished the draft to be examined fully about the content, before it was panted as complete one and submitted.

3. Minutes

As the meeting was carried out with the participants lively speeches and elaborate discussions, they are not quoted here in detail.

Only the major issues and conclusions are recorded here.

3.1 Shortening of Schedule

Although the starting up of gas separation plant is postponed until July, 1984, it still is two months before the expected completion of the pipeline, that is, August 1984.

Thai side suggested that 16 months instead of 18 months might be designated in the tender document and Japanese side objected, reasoning about technical and procedural matters.

The argument was finalized by that the both parties would seek means to shorten the whole term before completion of the work, not only in the construction stage but also in the preceding works.

3.2 Seismic Coefficient & Related Issues

The discussion started from the seismic coefficient K's validity and extended further into more details, theory, reasonings etc.

It was concluded that the design of intake tower, where the discussion had started from was important enough to be examined by the both parties, and at the stage of conceptual design a meeting was to be held.

3.3 Concrete Strength (refer to 3.2.2)

According to RID standards, the design compression strength is 210 kg/cm^2 and the allowable strength is 0.45 times of the said 210 kg/cm^2 , namely 94.5 kg/cm^2 .

The reinforcement bar of deformed shape uses $1,400 \text{ kg/cm}^2$ as allowable. The draft was corrected as above.

3.4 Head Tank

The part of Feasibility Study Report concluding as Not Acceptable for R.C. tank (Table 4-8 Comparative Study of PC, RC, and Steel Head Tanks) is not agreed and must be deleted.

Ordinary reinforced concrete tank can be used and usage of earth dam basin shall be studied as an alternative.

As for the other parts of the draft, RID will give comments on Dec. 21 (Monday), 1981 and then the draft will go into printing for submission.

LIST OF PARTICIPANTS

Place : RID Conference Room

Date : Dec. 17, 1981

	NAME	POSITION
1.	MR. BOONTHAI OTAGANONTA	Chief Engineer for Civil Engineering RID
2.	MR. PRAHAS MASAMONDANA	Chief Design Section 6th, Design Div. RID
3.	MR. PRAKAI SASTRAVAHA	Large Scale Construction Div. RID
4.	MR. SUWIT THANOPANUWAT	Civil Engineer, Project Planning Div. RID
5.	MR. SIRIPONG HUNGSPREUG	Civil Engineer, Design Div. RID
6.	MR. YUICHI MISHIMA	Advisory Team, JICA
7.	MR. KOICHI MIYAKE	Staff, JICA
8.	MR. YUICHI KATAYAMA	Team Leader, D.D Team
9.	MR. OSAMU WAKAMOTO	Assit. Leader, D.D. Team
10.	MR. YOSHIYUKI TOMIOKA	Staff D.D. Team
11.	MR. FUMIO ENOMOTO	-do-
12.	MR. FUMIKI NAKAJIMA	-do-
13.	MR. MASAHIRO ASADA	-do-

MEMORANDUM FOR MEETING
ATTACHED WITH MINUTES

January, 1982

Prepared by OSAMU WAKAMOTO
Co - Leader
Detailed Design Team, JICA

1. Reports

The following reports have been allocated to each member of the detailed design team, considering his role in the team.

The given titles are tentative, rather true to the content, and the readiness is classified into four, ready for typewritten and completed, almost ready for typewritten but not completed yet, prepared for draft in Japanese and expected for informations collected but unwritten.

List of Reports

<u>No.</u>	<u>Title</u>	<u>Author, Role</u>	<u>Readiness</u>
1.	Water Demand	WAKAMOTO, Co Leader	ready
2.	Facilities	"	"
3.	Filtration Plant	"	"
4.	Organization for Operation and Maintenance	"	"
5.	Water Supply	ASADA, Water Supply	prepared
6.	Limit of Low Water for Intake from Dok Krai	"	"
7.	Control of Pipeline System	TOMIOKA, Facilities	almost ready
8.	Head Tank	"	"
9.	Overall Comparative Study, Dok Krai - Mab Ta Pud-Sattahip	"	"
10.	Pumping System	ENOMOTO, Pumping	"
11.	Method of Pressure Reduction	NISHIDA, Pipeline	prepared
12.	Thickness of Pipe	"	"
13.	Receiving Well, Receiving Reservoir	MIYAKE, Facilities	almost ready

2. Review of Feasibility Study

The scope of work which was agreed between JICA and the detailed design team included the demand and supply of water, the facilities and the filtration plant.

No. 1, 2, 3, 5 of the reports named before cover the scope and the detailed design team can go forth to design work.

3. In Relation with Progress Report 1st

The problems left undecided in Progress Report 1st are raised here again to be added with some explanation.

3.1. Intake Tower and Pumping Station

(1) Location (3.1.3.)

The alternative, 1.0 to 1.5 km upstream of the dam, was given up as it is apparently disadvantageous.

(2) Type (3.1.3.)

A type conceived in the Feasibility Study but discredited there is taken up again, with a new approach.

The new approach shall be done more from the marine - structural engineering than civil engineering and more use of steel than in the Feasibility Study. Needless to say, the type will have to use another type pump.

Of the type proposed in the Feasibility Study is explained in details by No. 10 report.

(3) Control of Pumps (3.1.2) (3.1.3)

The control of pumps is the control of flow of the pipeline system as a whole.

The detailed design team has decided almost every matters here, after considering the basic principles and design concepts.

It will be elaborated in No. 7, 4, 10 reports.

(4) Pump Head (3.2.1)

After No.6 report's completion, the lowest level to draw water in Dok Krai Reservoir must be decided. So far, it is 42.00.

(5) Bridge from Intake to shore (3.2.3)

The detailed design team is undertaking two alternatives and one more of worth studying is going to be worked in Japan.

3.2. Head Tank

The necessity of head tank is discussed in No.1, 10 reports. The design concepts and more details are in No.8 report. The location has been changed from the conceived one to the road side of Route 3191 with about 2 km saved length of pipe. The capacity needed for the pumps operation and the emergency is reasonably analysed. (No.8 report)

3.3. Receiving Well, Receiving Reservoir, Purification Plant

The purification plant, a subject in the scope of work, is discussed in No.3 report.

The receiving well and the receiving reservoir are discussed in principle and with design concepts in No.13 report. the most possible location has been selected.

3.4. Dok Krai - Mab Ta Pud - Sattahip System

Even though the diameter of the pipeline between Dok Krai and Mab Ta Pud was decided from the demand and supply requirements in the Feasibility Study, comparative study has been made to see about the system from Dok Krai to Sattahip through Mab Ta Pud.

It found;

- * 1.35 m diameter for the project was most reasonable.
 - * 0.8 m diameter pipeline to Sattahip is recommended.
 - * The receiving well's water level close to 60 m is desirable.
- The above is elaborated in No. 9 report.

3.5. Pipeline and Pipe Material

(1) Pressure Reduction and Cavitation

In the earlier stage of operation when the flow is still small, a large part of the effective head between the head tank and the receiving well must be reduced by throttling at the receiving well.

Sudden reduction of pressure in water causes very fine bubbles occurrence and the bubbles floating in very fast flow collide on and scour the surface of metal of pipe and valve. It is called cavitation.

The detailed design team has to solve it both technically and economically.

It is discussed in No. 11 in detail and has to be studied further.

(2) Pipe Wall Thickness.

It is 11.9 mm in the Feasibility Study.

The detailed design team is studying under what condition 10 mm thickness will become possible from every angle.

It will be reported in No. 12 report.

3.6. Organization for Operation and Maintenance

No.4 report.

It discuss about the system, number of personnel required for the operation and maintenance, reasoning from technical view and other consideration.

About the technical matters it is coordinated with No.7, 10.

4. Field Work

(1) Surveyor

Keeping contact with the surveyor, the detailed design team chose the most possible site for Receiving Well and Reservoir. The head tank's alternative site at the roadside.

The total length of pipeline will become shorter than Feasibility Studys.

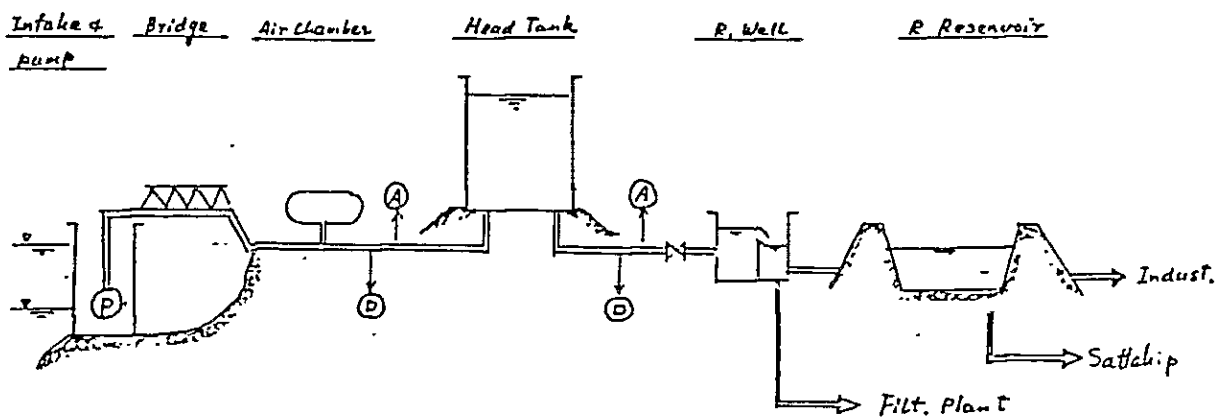
(2) Geologist

The new site of head tank is reported to have sufficient bearing strength for the tank.

Some more works will be needed before the investigation around intake tower site is completed.

5. Decided and Undecided Matters

We will see what are the matters decided and undecided.



5.1. Decided or Nearly decided

(1) Location & Elevation of Site

- * Dok Krai Res. HWL 54.10
 LWL 42.00
- * Intake Tower Close to dam, same as before
- * Head Tank Roadside Route 3191
 EL. 82.00
- * R. Well Roadside Route 3
- * R. Reservoir EL. 60.00 - 57.00
- * Filt. Plant

All above decided.

(2) Control of System

- * Flow Control On-off of pump
- * Hydraulic Condition R. Well's level between 60.00- 57.00
 Head Tank's level " 105.00-102.00
 Pump Head " 81.00- 78m including every loss
- * Organization

As the flow control system was decided, a proposal of the organization for operation and maintenance has been made and submitted. The range of water level and pump head is narrowed to 3m. The decision shall be made on the result of detailed survey of the Receiving Well - Receiving Reservoir- (Filtration Plant) site.

(3) Pipeline to Sattahip

- * 0.80 m diameter is most recommendable.
- * Pumping is necessary

(4) Supply to Industries in Mab Ta Pud

- * The supply can be made with no pumping, by gravity.

(5) Head Tank

- * The capacity, size and other details are decided.
- * Prestressed Concrete is most possible.

(6) Receiving Well, Receiving Reservoir

- * The capacity, size and other details are decided.
- * The receiving well is made of rainforced concrete and the receiving reservoir is most possibly of earth dam type.

5.2. Undecided and Alternative

(1) Intake Tower and Pumping Station

- * The original plan is now under way of detailed design stage.
- * An alternative plan is going to be studied shortly.
- * The two shall be compared at possibly earlier date.

(2) Bridge

- * Besides the original, two more alternatives are conceived.
- * The two are going to be studied shortly and the three, including the original shall be compared at possibly earlier date.

(3) Air Chamber

The air chamber shall be designed after comparing the two concepts of intake tower and pumping station.

(4) Pipeline

- * The air valves and drain valves location will be decided before the end of January 1982.
- * The thickness of pipe also before the end of January '82.
- * The pressure reduction gadget will be decided later because of technical and economical reasons.
- * The alignment of pipeline, without waiting the final survey drawing, shall be tentatively decided. Then meetings will be held with authorities concerned to discuss the details. The details are about river and road crossings, branches, construction methods about moving earth and pipe laying, relocation of electricity poles etc. In case these matters cannot be decided within the stay of pipeline engineer, they will be taken care by Co-Leader

6. Handing Over to Following Group, Technical

(1) Leaving Schedule

Water Facility Engineer and Structural Engineer of Water Facilities are leaving on 16th. January.

As their matters are already decided, they can go into the detailed design work in Japan.

Technical matters to be handed over to the coming group are mostly about the control of flow.

Pipeline Engineer is leaving at the end of January.

As mentioned before, his work must be assisted by Co-Leader both during and after his stay.

Technical matters to be handed over to the coming group are practically nil.

Pumping Engineer is scheduled to leave at the middle of February.

Though his stay for another month is overlapped the coming Mechanical and Electrical Engineers by one month, a very good cooperation and hard work will be required because of importance of the intake and pump, and of many details involved.

(2) Coming Schedule

On 17th January two engineers, Mechanical and Electrical, are coming to stay and work for one month.

7. Handing Over to Following Group, Non-technical

On 18th , Specification Writer and Cost Estimator are coming with schedule of one month stay.

Co-Leader will discuss the matters with them on their arrival.

MINUTES OF MEETING

1. Date, Place, Attendant

Date ; Jan: 14, 1982

Place ; Conference room in RID

Attendant ;	MR. BOONTHAI	OTAGANONTA, RID
	MR. SIRIPONG	HUNGSPREUG, RID
	MR. WAKAMOTO	JICA
	MR. TOMIOKA	JICA
	MR. ASADA	JICA
	MR. ENOMOTO	JICA
	MR. MIYAKE	JICA

2. Mr. WAKAMOTO's Briefing

Mr. WAKAMOTO, having prepared Memorandum for Meeting, explained about it at the beginning and later some issues were raised to be discussed.

3. Decided Issues

At the meeting following issues were decided;

- * The bridge from the intake to the shore is going to be constructed with prestressed concrete beam which is available locally. The bridge will consist of a steel pipe bridge and a prestressed concrete road bridge, supported by a row of piers. The type is simple in structure and less costly in maintenance. Further study shall be made to find optimum span of the piers.
- * The intake is to be located close to the dam, following the original plan of Feasibility Study.
- * As for the filtration plant, the team has made a report which was specified by JICA. No further elaboration is needed and it will not be taken up any more.

4. Agreed Issues

- * As for the intake tower - pump station, an alternative employing marine structure engineering and using more steel than concrete must be studied in haste.

It shall be done before the end of February 1982 and then a comparison shall be made with the original and the alternative.

The original plan shall proceed to the detailed design work while the alternative plan is studied.

- * The pipe wall thickness is going to be examined to learn the possibility of making it thinner.

5. Next Meeting

The original plan of intake tower - pump station has problems to be solved. The next meeting possibly in early future must be held to see the progress of solving them.

MINUTES OF MEETING

PRESENTING DRAFT ENGINEERING REPORT

FEBRUARY 1982

Prepared by

OSAMU WAKAMOTO
Assistant Leader
Detailed Design Team
JICA

1. Time, Place, Attendance

The meeting was held at 9:00 a.m. Feb. 26, 1982 in the conference room of RID building second floor, attended by the persons whose names and titles are shown on the attached list.

2. Purpose

According to the inception report, JICA team was to submit Engineering Report at the end of February 1982.

The team, with the arrival of an advisory member and a JICA staff, has prepared the report and presented it on the meeting, in the form of draft.

3. Content of Reports

The report consisted of five parts:

- a) Water Demand and Supply
- b) Meteorological and Hydrological Data
- c) Report on Surveying with 30 drawings
- d) Report of Geological Study and Geological Data
- e) Compilation of Series of Technical Reports

These reports were presented and explained in the order.

4. Minutes of Meeting

After presentation of each part of the reports, questions and comments were given from RID, being followed by additional explanations from the team.

After the discussion, the part was received by RID.

4.1. Water Demand and Supply

About the estimate of future demand different opinions were raised and discussions were followed. Eventually the Chief Engineers view that it would better be left to be seen in the future as no decisive forecast could be made was conclusive about it.

Mr. Katayama opined that some figure might be modified as the feasibility study was being examined in Japan.

4.2. Meteorological and Hydrological Data

Raw data from several sources were edited and presented, for possible use of a part of the tender documents.
No discussion was followed.

4.3. Report on Surveying

The report was mostly to explain about the maps.
More informations will be put on the maps in order to be used for tender documents. Not much discussion was made about the survey.

4.4. Report of Geological Study and Geological Data

The study dealt with the soil geology concerning the earthwork, foundation and construction material and the groundwater concerning pipelaying and corrosion.
The report was accepted without much discussion.

4.5. Series of Report

Following matters were discussed and decided.

- * The pipe bridge, instead of supporting itself, shall be put on the prestressed girder (or beam) so that the future maintenance will be ensured.
- * The number of head tank is one.
- * For the land of receiving reservoir, sufficiently wide land must be purchased at this stage.
- * The wall thickness of pipe is a matter to be decided by the detailed design team with reasoning.
- * Thai standards for office and personnel's living quarter shall be shown to the team.

5. Comments from Thai Side

Within about two weeks after the presentation,
Thai Side will give the comments of Draft Engineering Report
to the team.

The team will then rivise, finilize and submit 30 copies as
Engineering Report.

ATTENDANCE LIST

PIPELINE DETAILED DESIGN TEAM OF JICA

DATE : 26th FEB. 1982

PLACE : CONFERENCE ROOM OF RID

- | | | | |
|-----|-----------|-------------|---|
| 1. | BOONTHAI | OTAGANONTA | Chief Engineer for Civil Engineering, RID |
| 2. | PRAHAS | MASAMONDANA | Engineer, Design Division |
| 3. | SIRIPONG | HUNGSPREUG | Engineer, Design Division, RID |
| 4. | KUMROPLUK | SURASWADI | CIPO, NESDB |
| 5. | YUICHI | MISHIMA | JICA, Advisory Team |
| 6. | YUICHI | KATAYAMA | JICA, Team Leader |
| 7. | OSAMU | WAKAMOTO | JICA, Co-Leader |
| 8. | FUMIKI | NAKAJIMA | JICA, Survey Team |
| 9. | MASAHIRO | ASADA | JICA, Study Team |
| 10. | KOICHI | MIYOSHI | JICA, Coordinator |

Minutes of Meeting

on

July 8, 1982

prepared by JICA Detailed Design Team

1. Date, Place, Attendants

(1) Date

From 09.30 to 12.00 July 8, 1982

(2) Place

Conference room, RID

(3) Attendants

The lists are attached herewith

2. Aim of meeting

The leader of JICA Team stated that the aim of the meeting is to transmit the draft of the following documents to RID for checking:

- detailed design drawings
- design reports, main and supporting
- specifications, general and particular
- bill of quantities

The leader also explained that the actions to be followed before the end of August would be:

- RID sends JICA Team any comments on the above documents before August 10, 1982.
- Upon receiving the comments, JICA Team works on finalization of the documents until the end of August.
- JICA Team, upon finalizing the documents, submit them to JICA headquarter in Tokyo
- JICA headquarter will officially transmit the documents to the Thai Government.

Thus the meeting was to check the documents by the personnel concerned of RID and JICA.

3. Meetings to be held

Because of the limited time schedule and in order to promote efficiency, a proposal was presented and agreed upon:

- The participants are divided into two groups - design group and tender group.

- . The groups will hold the meeting independently and separately to discuss the issues of importance for its own and conclude them.
- . The two groups, at the same time, find the issues which are to be discussed in the general meeting where all personnel are present.
- . The general meeting, besides the one on July 8 morning, will be held on July 14th, the day before JICA Team's departure on the 15th.

There and then, the findings and issues raised in the two group meetings are to be reported and discussed and finalized.

- . The Chief Engineer ordered the formation of the two groups as shown in the attached list No. 2.

4. Issues at General Meeting on July 8th

The issues raised are:

- (1) provision of office residence, transportation, and other services for consultants before the official award of contract.
- (2) provisional take-over of the completed parts of the camps by the Employer for the ease of operation and maintenance staffs who participate at the stage of construction. Responsibility of the contractor on maintenance of the above after the provisional take-over.
- (3) provision of the facilities and services like (1) for the staffs identified in (2).
- (4) staff members to be assigned for overseas training. The expenses shall be covered by the Contractor for 15 persons of C-6 rank on the average and two months duration of training including per-diem.

ATTENDANT LIST

	Name	Designation
RID:		
	1. Boonthai Otaganonta	Chief Engineer for Civil Engineering
	2. Chareuk Nonthathum	Director, Large Scale Const. Div.
	3. Prahas Masamondhana	Chief, Design Section 6
	4. Charoon Kamolratana	Chief, Design Section 10
	5. Dibhyaraks Sukhum	Director, Foreign Financed Project
	6. Thanee Kheosipalard	Architect
	7. Pichai Phongnugul	Specification Officer
	8. Thaweevong Thainseree	Legal Officer
	9. Prakai Sastravaha	Construction Engineer, LSCD
	10. Siripong Hungspreug	Design Engineer, Des. Sect. 6
JICA:		
	1. Yuchi Katayama	D/D Team Leader
	2. Shoichiro Higuch	D/D Team Manager
	3. Osamu Wakamoto	D/D Team Co-Leader
	4. Masafumi Okubo	D/D Specification Writer
	5. Tomioka Yoshiyuki	D/D Design Engineer
	6. Fumio Enomoto	D/D Design Engineer
	7. Yoshikazu Nishida	D/D Design Engineer (Pipeline)

Organization of Groups of Discussion

General Meeting

Chairman: Boonthai

Design Group

RID:

Chairman: Charoon
Representatives: Prahas
Thanee

Secretary: Siripong

JICA: Wakamoto
Tomioka
Enomoto
Nishida

Tender Group

RID & CIPO:

Chareuk
Dibhyaraks
Chamnong
Somchit
Prakai
Manas

JICA: Higuchi
Okkubo

Minutes of Meeting of

Design Group

on

July 8, 1982

prepared by Design Group

JICA Detailed Design Team

✍

1. Date, Place, Attendants

- from 13.30 to 16.30, July 8, 1982
- conference room, RID
- attendant list: Charoon, Thanee, Prahas, Siripong
Wakamoto, Tomioka, Enomoto, Nishida

2. Issues

(1) Design Reports

Some parts of Design Reports were corrected on both sides' consent.

(2) RID signature on drawings

The original drawings need the signatures of RID during JICA team's stay until July 15, and some of them shall be corrected thereafter. The contradictions must be solved by the team's promise that:

- leaving the copies on which JICA Team shows the part and details of correction
- In Japan, JICA Team makes correction as mentioned above
- Corrected originals are transmitted to RID

(3) Intake Tower

RID requested the drawings concerning the additional reinforcing bars during various construction stages. The JICA Team agreed on sending them to RID.

(4) Temporary Bridge

JICA Team explained its method of using the temporary bridge in constructing the intake tower, adding that the method can be altered by the contractor. RID will have to study about the means of measurement for payment if other temporary works are to be employed.

(5) Head Tank

RID would like to have the material relating the design calculation. JICA Team will provide RID as a memorandum.

Minutes of Meeting of

Design Group

on

July 12, 1982

prepared by Design Group

JICA Detailed Design Team

1. Date, Place, Attendants

- from 13.30 to 16.00, July 12th, 1982
- conference room, RID
- Attendant list: Charoon, Prahas, Thanee, Siripong
Mishima, Wakamoto, Tomioka, Enomoto, Nishida

2. Issues

The following drawings were examined with reference to some parts of the particular specification.

No. of drawing	Subject
2103, 2105	SGP (steel gas pipe) to be used wherever GP is used
2102	waterproof membrane - should use the one recommended by JICA
2201	soil type be classified
2205	dimension of weld is specified by the size of "throat" and will be mentioned in the drawing
2401	location of boring be footnoted "reference only"
4101	water level gauge to be relocated close to the ladder.
4101	metal insert for support of overflow pipe should be the type suggested by JICA D/D team (catalog is also given)
5105	all stairs must be reinforced and shown.
5201	stairway "No. 2" be filled
7106	all sections with cut-off bars must show the position of cut-off points
7107	SECTION B: B ₄ instead of B ₃ weld size must be shown M 15 means bolt size of 15 mm diameter
7107	temperature difference used in the design of the roof should be informed to RID "CB3" shall be filled "connection between column and slab at 4th floor" be filled. Also dotted line shall be drawn to show wall below.

No. of drawing	Subject
2101	Note 1 change from "care to" to "measuring from" Note 3 clear description be given
2201	no problem with cambering (M), (F) be explained
2204	no-shrinkage mortar to control displacement after adjustment
2204	"throat" weld size is to be footnoted
7106	U.N.O. ? must be explained and footnoted
7110	details of toilet shown on 7104 and 2106
7406	location of cesspool and sewer line from intake to cesspool be filled.

Other corrections to the drawings will be listed and left at RID as it is explained in the minutes of meeting of Design Group on July 8.

MINUTES OF MEETING

ON JULY 14, 1982

Prepared by JICA Detailed Design Team

JAPAN INTERNATIONAL COOPERATION AGENCY
TECHNICAL COOPERATION FOR DETAILED DESIGN FOR THE PIPELINE SYSTEM
IN THE EAST COAST

To: Mr. Boonthai Otaganonta
Chief Engineer for Civil Engineering
Royal Irrigation Department

Ref.No.: P-28

Date: July 14, 1982

Re: Submission of Minutes of Meeting

Dear Sir,

I am pleased to submit the minutes of meeting which were held between July 8 and 14, 1982, attended by CIPO, RID and JICA Design Team. Those meetings were intended to exchange the views on the draft of Design Reports. General and Particular Specifications, Bill of Quantities and Design Drawings. I am grateful for your cooperation since the commencement of our works in November 1981 and happy about that our mission has almost been completed.

The issues raised during the meetings can be classified into two:

- * Matters on which amendment and/or addition will be undertaken in Japan, upon the understanding and consent of RID.
- * Matters on which Thai agencies will decide and later inform JICA team, in order to make amendment and/or addition for payment condition of Particular Specification.

Considering that JICA team has to submit all Documents in the end of August to JICA Head Office in Tokyo, your information on the aforementioned matters and written approval shall reach us before the end of July very desirably.

Again I thank you for your friendship and assistance endowed upon us at every stage of our works and I wish RID's successful accomplishment in the further implementation of Project.

accepted by

Very truly yours,



Leader
JICA Detailed Design Team

cc: JICA in Bangkok and Tokyo
Japanese Embassy in Bangkok
CIPO, NESDB



WITNESS: YUICHI MISHIMA
JICA ADVISER

1. Date, Place, Attendants

09:30 - 14:00 , July 14, 1982

RID Conference Room

The list of attendants is attached herewith.

2. Explanation of Presented Papers

The followings were presented at the beginning of meeting:

Minutes of meeting on July 8	prepared by JICA Detailed Design Team
Minutes of meeting of Design Group on July 8 and 12	prepared by Design Group, JICA Detailed Design Team
Untitled proposal concerning documents	prepared by Document Group, JICA Detailed Design Team

3. Proceeding of Meeting

(1) Minutes of meeting on July 8

As the meeting had been attended by all personnel concerned, and the minutes included no issues needing serious consideration, it was accepted.

(2) Minutes of meeting of Design Group on July 8 and 12.

As the drawings were signed on July 13 and no significant matter was left unsolved, it was accepted.

(3) Untitled proposal concerning documents

The following issues were raised and decisions were made as shown on the attached sheets.

a) Final Reports

The style of cover is shown on the attached sheets.

The color of the reports and other documents shall be green, the color of RID.

The book shall contain the preface, letter of transmittal and written approval by RID, at the top.

b) Documents

The tender documents stated in the attached sheets shall have the covers of RID standard, having RID symbol at the top. However in the case, the consultants name at the bottom shall not be shown.

The drawings are to be titled "contract drawings"

c) No. of Documents to be presented

- * Main reports 20 sets
- * Supporting reports 10 sets
- * Tender Documents 70 sets

d) Deadline of Comments and Instructions by RID

The deadline was set at the end of July, 1982.

e) Transmittal of Documents

JICA Tokyo is to mail them to the Embassy of Japan in Bangkok, to be transmitted later to RID.

f) Take over

Different from other facilities, the take over of office and residential buildings is to be made 12 months after the contract signing.

g) Liquidation of damage

The practicability of transporting 12,000 cu.m/day water by truck shall be reconsidered.

h) Canteen facilities

To be reconsidered.

i) Measurement and Payment

- * Temporary works clause needs rechecking and shall be modified.

1. Tender Documents

- (1) Final Tender Documents of the Project will consist of following separate documents and drawings.
 - a) Instructions to Tenderers
 - b) Conditions of Contract
 - c) Particular Specifications
 - d) General Specifications
 - e) Bill of Quantities
 - f) Contract Drawings
- (2) Title of coverings of each document shall be as attached sheet.
- (3) Number of each document to be submitted shall be as followings:
 - a) 70 sets of printed and booked documents and drawings (A-2 size)
 - b) One (1) complete set of reproducible documents
 - c) One (1) complete set of reproducible A-1 size drawings
- (4) All comments and instructions on Draft Tender Documents will be made by RID up to 31st July 1982.
Comments and instructions shall be in written form.
- (5) All the Documents shall be corrected in accordance with the comments and instructions of RID, and Final. Tender Documents will be prepared and booked up to 31st August 1982 or 3 weeks after receiving of comments by RID whichever later.
- (6) All the Final Tender Documents shall be mailed by JICA to Embassy of Japan and be delivered to the Director General of RID.

2. Take-over of Works

- (1) All office and Residential buildings shall be completed and be taken-over within 12 months from the date signing of contract.
- (2) Therefore, the clause 44 of Special Stipulations of Contract shall be revised to as followings.

44. The take-over of works in present contract will be performed in two stages as below:

Stage One : All Office and Residential Buildings within 12 months from the date of signing of contract.

Stage Two : Other facilities of project within 18 months from the date of signing of contract.
This period is including 2 months of Test Run Period.

- (3) Revision mentioned above shall be also informed to Public Prosecution Department.

3. Blanks on Special Stipulations of Contract

- (1) A blank remained in clause 46 of Special Stipulations of contract shall be instructed by RID.
- (2) RID will inform to JICA the names of insurance companies as well as figures of percentage to be filled in the blanks of clause 31 and 51 of Special Stipulations of Contract.

4. Employer's Facilities

- (1) Approximate 20 persons of RID will stay at site during construction period. They will not be accompanied by their families.

- (2) Particular Specifications as well as Bill of Quantities shall be revised so as to satisfy the followings:
- a) Employer's site office space for 20 persons in together and in addition with Engineer's site office is provided and maintained by the contractor during contract period.
 - b) Employer's site residences for 20 persons in together and in addition with Engineer's site office are provided and maintained by the contractor during contract period.
 - c) Canteen facilities (mess hall) shall be provided and meal shall be supplied by the contractor.
 - d) One saloon car of 2 liters, two microbus for ten persons and one pick-up of 1 ton are provided and maintained by the contractor for transportation of 20 persons of RID in addition to the transportations for the Engineer.
- (3) Operation and Maintenance (O/M) people will start to stay at site from 13th month after the date of signing of contract.
- (4) Particular Specifications as well as Bill of Quantities shall be revised so as to satisfy the followings:
- a) Office and residential buildings shall be completed and taken-over to the Employer within 12 months after signing of contract.
 - b) The contractor shall start the training Programe.
 - c) Period of Oversea's training will be 30 man-months
 - d) New five pick-up (1 ton) and three moter-cycle (100 cc) shall be supplied by the contractor at 13th month after signing the contract.

5. Measurement and Payment

- (1) All kind of temporary works shall be, as a general rule, paid by Lump Sum.
- (2) Payment for major supplies such as pumping plant, electrical equipment, steel pipe, valve, coupling, EPT sheet, etc. shall be, as a general rule, as followings.
 - a) Payment for supply works shall be itemized separately to installation works.
 - b) 50% of total payment for supply items, which will be imported from foreign country, shall be made at the time of delivery of materials at site. Materials shall be insured under the name of the Contractor.
 - c) Remaining 50% of the payment for supply shall be made at the time of completion of installation works.
 - d) Payment for installation works shall be made at once at the time of completion of installation works.
 - e) 50% of total payment for supply items, which will be manufactured in Thailand (such as steel pipe), shall be made at the time of delivery of material at site and approved by the Engineer.
 - f) Remaining 50% of the payment shall be made at the time of completion of installation works.
- (3) Payment for excavation, fill and backfill, rock excavation, rip-rap, etc. will be made in accordance with the quantities executed.

- (4) Measurement for payment for earth works of pipeline will be the length in meter.
- (5) Formworks and Reinforcing bar will be separately measured and paid from the reinforced concrete for usual structure.
- (6) Payment for concrete works of caisson tower of which the requirement of formworks and Reinforcing bars will be differed depending upon the method of construction, shall cover all the concrete, formworks, reinforcing bar, etc.
- (7) Payment for concrete works of P.C concrete of Head Tank will be made under calculation of Empty-cubic meter.
- (8) Measurement for payment for building works will be the floor area in squar-meter or unit and the payment will be made after the completion of the building.
- (9) Measurement for payment for steel pipe shall be the length in meter, not by ton.

6. Other Particulars

- (1) Exploration Pit works shall be performed by the contractor, but shall not be paid.
- (2) All miss-typing shall be checked carefully and corrected for the final document.

7. Final Cost Estimate

- (1) Two sets of Final Cost Estimate shall be sent to the Director General of RID by sealed and registered mail at same time as of the mail of Final Tender Documents.
- (2) Item of Provisional Sum for contingency of the Projected Works shall be provided in the Bill of Quantities.

TECHNICAL COOPERATION FOR DETAILED DESIGN
FOR THE PIPELINE SYSTEM FROM DOK KRAI TO MAB TA PUD IN THE EAST COAST

ATTENDANT LIST

Date:

Place:

	NAME	DESIGNATION
1.	BOONTHAI OTAGANONTA	CHIEF ENG. FOR CIVIL ENGINEERING
2.	CHAREUK NONTHATHUM	DIRECTOR, LARGE PROJECT CONST. DIV.
3.	CHAROON KAMOLRATANA	CHIEF, DESIGN REGION 10 SECTION DESIGN DIV.
4.	THANEE KHEOSIPALARD	ARCHITECT 6
5.	PRAHAS MASAMONDANA	CHIEF, DESIGN SEC.6TH, DESIGN.DIV.
6.	SIRIPONG HUNGSPREUG	ENGINEER, SEC.6TH, DESIGN DIV.
7.	OSAMU WAKAMOTO	JICA
8.	KOICHI MIYOSHI	JICA
9.	YUICHI KATAYAMA	JICA D/D TEAM LEADER
10.	SHOICHIRO HIGUCHI	JICA
11.	MASAFUMI OKUBO	JICA
12.	YUICHI MISHIMA	JICA
13.	YOSHIYUKI TOMIOKA	JICA
14.	FUMIO ENOMOTO	JICA
15.	YOSHIKAZU NISHIDA	JICA
16.	PRAKAI SASTRAVAHA	LARGE SCALE CONST. PROJECT
17.	SOMCHIT PUNTOOMSUIT	LEGAL SECTION
18.	MANAS SANGUANDIKUL	CIPO, NESDB
19.	CHAMNONG HIRANPRADIT	CHIEF, SPECIFICATION DESIGN DIV.
20.	DIBHYARAKS SUKHUM	LOAN FINANCED PROJECT CENTER

ROYAL IRRIGATION DEPARTMENT
MINISTRY OF AGRICULTURE AND COOPERATIVE
GOVERNMENT OF THE KINGDOM OF THAILAND

FINAL REPORT

FOR

DOK KRAI - MAB TA PUD WATER PIPELINE PROJECT

IN

THE EAST COAST AREA

(MAIN REPORT)

(SUPPORTING REPORT)

AUGUST 1982

JAPAN INTERNATIONAL COOPERATION AGENCY



ROYAL IRRIGATION DEPARTMENT
MINISTRY OF AGRICULTURE AND COOPERATIVE
GOVERNMENT OF THE KINGDOM OF THAILAND

DOK KRAI - MAB TA PUD WATER PIPELINE PROJECT
IN THE EAST COAST AREA

- A) INSTRUCTIONS TO TENDERERS
- B) CONDITIONS OF CONTRACT
- C) PARTICULAR SPECIFICATIONS
- D) GENERAL SPECIFICATIONS
- E) BILL OF QUANTITIES
- F) CONTRACT DRAWINGS

AUGUST 1982

MINUTES OF WRAP UP MEETINGS

O N .

JULY 15 - JULY 28, 1982

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

P. O. BOX 216 MITSUI BLDG
2-1, NISHI-SHINJUKU, SHINJUKU-KU TOKYO
160 JAPAN

Mr. Boonthai Otaganonta
Chief Engineer for Civil Engineering
Royal Irrigation Department
Samsen Road, Bangkok

Date : July 28, 1982
Ref. No.: P-29

Re: Minutes of Wrap-Up Meeting

Dear Sir:

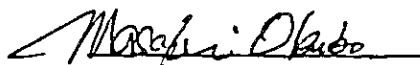
We are pleased to submit herewith the minutes of wrap-up meetings held for a period covering from July 15 to July 28, 1982 as attended by representatives of RID and JICA Design Team. Said meetings were held with our intention to work out the RID's final comments on the Draft Reports and Draft Documents submitted by the JICA Team.

It is understood, with this concern, that the comments summarized in this minutes are of final, and the Final Design Reports and the Final Tender Documents shall be compiled after amendments have been made in accordance with the comments.

The Final Design Reports and the Final Tender Documents for Dok Krai - Mab Ta Pud Water Pipeline project is scheduled to be submitted to JICA Head Office in Tokyo by the end of August 1982.

Thanking you always for your kind consideration and usual cooperation extended to us throughout this term of detailed design for the project, with our hope to realize the successful implementation of the project at an early date.

Yours faithfully,



for Yuichi Katayama
Team Leader
JICA Detailed Design Team

cc. : 1. JICA Head Office, Tokyo
2. JICA Bangkok Office

1. Date, Place, Attendants

(1) Date : From July 15 to July 28, 1982.

(2) Place : Head Office of RID.

(3) Attendants

* BOONTHAI OTAGANONTA	Chief Eng. for Civil Engineering
* CHAREUK NONTHATHUM	Director, Large Project Const. Div.
* CHAMNONG HIRANPRADIT	Chief, Specification Design Div.
* PRAHAS MASAMONDANA	Chief Design Sec. 6th
* DIBHYARAKS SUKHUM	Loan Financed Project Center
* SOMCHIT PUNTOOMSUIT	Legal Section
* MANAS SANGUANDIKUL	CIPO, NESDB
* PRAKAI SASTRAVAHA	Large Scale Const. Project
* SIRIPONG HUNGSPREUG	Design Sec. 6th
* THANEE KHEOSIPALARD	Architect 6
* MASAFUMI OKUBO	JICA Team

2. Aim of meetings

The meetings were held to work out the RID's final comments on Draft Report and Draft Documents submitted by the JICA Team.

3. Result of meetings

The result of meetings are summarized in attached sheets as "Comments on Draft Reports and Documents".

AMENDMENT

O N

DRAFT REPORTS & DOCUMENTS

I. DRAFT DESIGN REPORTS

Main Report & Supporting Report:-

- (1) No more comment upon the Main Design Report other than those comments made during July 8 to July 14, 1982 and summerized in the Minutes of Meetings.

II. DRAFT CONTRACT DRAWINGS

- (1) No more comment upon the Draft Contract Drawings other than those made during July 8 to July 14, 1982 and mark out on a draft contract drawings.
- (2) Figures and words on the Drawings should be reviewed by the JICA Team in order to avoid discrepancy between the Drawings and the Specification and/or Bill of Quantities.

III. TENDER DOCUMENTS FOR CONSTRUCTION

- (1) No more comment upon the Draft Documents.
- (2) Tender documents for construction should be independently compiled and be entitled "Instructions to Tenderers".

IV. GENERAL CONDITIONS OF CONTRACT
AND SPECIAL STIPULATIONS

(1) Final acceptance or comment by the Prosecution Office might be informed up to the middle of August 1982.

(2) Following amendments shall be made:-

a) GC clause 71 Settlement of Disputes

Instead of "final settlement under the Rules of Conciliation", following acts shall be made.

The notice of Contractor shall contain the name of the arbitrator he has appointed. The Employer then shall appoint an arbitrator within thirty (30) days from the date of receipt of such notice. Should the arbitrators fail within thirty (30) days after the appointment of the Employer's arbitrator to agree upon a decision of the dispute, or if no agreement is reached on the appointment of an umpire, they, or either of them, should the other refuse to act, shall apply within thirty (30) days to the proper Thai Court for the appointment of the umpire by the said Court, whose order shall be final in regard to the appointment applied for.

The arbitrators and umpire shall meet within thirty (30) days following the appointment of the umpire, and the dispute shall be finally settled. The decision shall be by the majority vote of the arbitrators and the umpire, and shall be final, conclusive and binding upon the parties there to. The arbitration proceedings shall be carried out in Thailand. Each party shall bear the cost of its own arbitrator. The proportion of which each party is to bear of the cost of the umpire, should one be appointed, shall be decided by the arbitrators, or, in case they disagree, by the umpire.

b) SS clause 31

No nomination by the Employer will be made for insurance companies.

c) SS Clause 44

Revised stipulations into two-stage take-over are agreed.

d) SS Clause 46

Amount of Liquidated Damage shall be as follows:-

- The Contractor shall deliver 12,000 cu.m/day of water to P.T.T. at 17th & 18th months during the period of test operation.
- In case the Contractor fail to deliver the water, the penalty shall be 360,000 ₪/day.
(Max. 360,000 ₪/day x 60 days = 2,160,000 ₪).
- In case the Contractor fail to complete the offices and residences up to the date of 1st provisional take-over, the daily amount of penalty shall be 0.1% of total contracted prices of such building works
- In case the Contractor fail to complete the whole works untill the date of 2nd provitional take-over, the daily amount of penalty shall be 0.1% of total contract amount.
- When the delay with respect to one or any of the date of provisional take-over exceeds one hundred and eighty (180) days, the Employer will be entitled to terminate the Contract for the Contractor's fault.

e) SS clause 51(2)

No percentage shall be indicated and the followings shall be written.

The Contractor declares himself fully acquainted with all that is related to the nature and location of the Project, the general and local conditions involved and all that may affect its execution, upkeep and cost, with particular reference to:-

- a. Pertinent Laws, Rules and Regulations of the Kingdom of Thailand;
- b. Geology at Site, and conditions of the terrain;
- c. Communication and access facilities on the Site;
- d. Meteorology and hydrology of the area;
- e. Availability of labour;
- f. Type of equipment and facilities required before and during construction;
- g. Local availability of construction materials, equipment and tools;
- h. Any other information that may in way affect the Project, its construction, operation, maintenance and cost.

Lack of knowledge of the above will not reduce the responsibility of the Contractor, or entitle him to receive extra compensation in addition to the Contract Price.

All the information on Local conditions given in the Contract Documents, and in documents issued by the Employer each time, are to be regarded as merely indicative, for the sake of information; responsibility for any conclusion drawn or decision made by the Contractor upon receipt of such information, shall rest entirely with the Contractor.

Import Duties The Contractor shall pay all costs of procuring the necessary permits and licenses for importation of goods into the Kingdom of Thailand, and shall pay all duties and taxes of any nature imposed on imported goods by the Kingdom of Thailand on equipment, machinery, materials and supplies. Which are to be imported for use under this Contract.

All duties and taxes shall be included in the local currency portion of the Contract Prices.

Export Charges Any tariffs, duties, and other taxes or charges levied by the country of origin of the goods required for the performance of this Contract shall be paid by the Contractor.

Income Taxes The Contractor shall pay the cost of all immigration fees, income and other taxes assessed or collected by the Kingdom of Thailand or any political subdivision thereof or any municipality therein on his employees who are not nationals of the Kingdom of Thailand. Such fees and taxes shall be included in the Prices.

f) SS Clause 53

No escalation shall be applied to this contract and stipulations should be so amended.

g) SS Clause 5

Increase of the total Contract Amount for any reason shall be subject to the approval of the Employer.

h) Others

Any claim or appeal of the Contractor will be addressed to the Engineer within ten (10) days from the date the need has arisen, stating clearly and in detail the grounds for the claim or appeal itself.

V. GENERAL SPECIFICATIONS

- (1) No particular comment upon the Draft General Specifications.
- (2) A few mis-typing found should be corrected.

VI. PARTICULAR SPECIFICATIONS AND
BILL OF QUANTITIES

- (1) Clauses "Construction Materials", "plants and Materials of Supply" and "Sub Contractos" shall be added to Section 1000 "SUMMARY OF WORKS" of the Particular Specifications.
- (2) Section 1300 "ENGINEER'S FACILITIES" of the particular Specifications shall be so revised as attached sheets.
- (3) Bill of Quantities should be revised as attached sheet.
- (4) Item numbers of the Bill of Quantities mentioned in the Clauses "Measurement and Payment" should be strictly corresponded to the revised Bill of Quantities.
- (5) A note "Numberings of clauses of the Particular Specifications are not corresponding to those of items of the Bill of Quantities" should be discribed in the Bill of Quantities.

- (6) A few amendments and/or additions and/or eliminations verbally pointed out from time to time should be so revised.
- (7) Mis-typings should be checked throughout the Specifications once again and be corrected by the Team in addition to those pointed out during the review of RID.



ROYAL IRRIGATION DEPARTMENT
MINISTRY OF AGRICULTURE AND COOPERATIVES
GOVERNMENT OF THE KINGDOM OF THAILAND

DOK KRAI - MAB TA PUD WATER PIPELINE PROJECT
IN THE EAST COAST AREA

PARTICULAR SPECIFICATION

1004 CONSTRUCTION MATERIALS

- (1) Principal materials to be supplied for the works shall be subject to the Engineer's approval.

The Contractor shall submit samples of materials and list of its supply sources and/or manufacturers to the Engineer for his approval within two months after signing of the contract. Principal materials being subject to the Engineer's approval include cement, aggregate and sand, water for concrete mixing, materials of rip-rap reinforcing bar, steel, etc.

- (2) All reinforcing bars for reinforced concrete shall be the deformed bars conformed to JIS G3112 or ASTM A615, except reinforcing bars for the concrete of building works which shall be the round bars.

- (3) Cement shall be supplied from following listed manufactures or approved equal.

- a. Jalaprathan Cement Co. Ltd.
- b. Siam Cement Trading Co. Ltd.
- c. Siam City Cement Co. Ltd.

1005 PLANTS & MATERIALS OF SUPPLY

- (1) Manufacturers of principal plants and materials to be supplied for the works shall be nominated by the Contractor and accepted by the Employer at the time of Contract.

- (2) Manufacturers of principal plants and materials to be supplied for the works shall include pumping plants, electrical plants and materials, steel pipes, valves and couplings, EPT rubber sheets, concrete P.C girders, etc.

1006 SUB CONTRACTORS

- (1) When and in case the Contractor intends to employ sub-contractor(s) for the major part of civil works, such sub-contractor(s) shall be nominated by the Contractor and accepted by the Employer at the time of contract and/or shall be nominated by the Contractor after obtaining of the Engineer's approval within two months after the date of signing of contract.

- (2) Construction works of Intake Tower, Intake Bridge, Head Tank, Receiving Reservoir and installation works of pipeline, etc. shall be deemed as the major part of civil works.

1007 WORK SCHEDULE

- (1) The Contractor shall submit the Detailed Work Schedule in accordance with the Work Schedule attached to the Contract to the Engineer for his approval, within one month after the signing of Contract. The Detailed Work Schedule shall include detailed schedules of labours requirements, material supply, plants and equipments requirements, etc..

The critical path method shall be applied for the Detailed Work Schedule.

- (2) The Contractor's construction planning network shall maintain or improve on the key dates listed below. Should the Contractor's activities be delayed to the point where the maintenance of key dates for the Works are jeopardized, the Contractor shall submit to the Engineer a detail report showing all corrective actions he proposes to adopt to retrieve the intended schedule status.

Completion of provisions of Engineer's Facilities	Within 13 months after signing of Contract
Completion of Supply of Electricity and water to Office & Residencial Buildings	12 months after signing of Contract
Completion of Intake Tower ready for installation of Pumps	13 months after signing of Contract
Delivery of water to the P.T.T. Gas Separation Plant	16 months after signing of Contract

1206 MEASUREMENT AND PAYMENT

- (1) Payment for all kinds of common temporary works shall cover the supply, installation, operation, maintenance and removal of all kinds of common temporary facilities and temporary works except otherwise particularly itemized works in the Bill of Quantities.
- (2) Payment for all kinds of common temporary works will be made in lump-sum under Item 1001 to 1009 inclusive of the Bill of Quantities. Thirty (30) percent of the lump-sum will become payable when the Engineer deems the common site preparation and the Contractor's

temporary facilities to be completed. The remaining seventy (70) percent of the lump-sum will be paid in equal monthly payments so that total sum shall be fully disbursed upon the Provisional Take-over of the Works.

SECTION 1300 EMPLOYER & ENGINEER'S FACILITIES

1301 EMPLOYER & ENGINEER'S OFFICE

- (1) The Contractor shall provide and maintain the Employer & Engineer's Office throughout the Construction Period.

This item shall consist of construction and/or the rent, maintenance and cleaning of the Employer and Engineer's Office as well as the furnishing and maintenance of the office furnitures including the air-conditioners for the sole use of the Employer and the Engineer and their staffs together with the provision, installation, maintenance and services. The building, furnitures and equipments shall remain the property of the Contractor. The building shall be approved in advance by the Engineer.

The building and services shall be available within three (3) months working order after signing of the contract and shall continue to be so available during progress of the Works until the Certificate of the second Provisional Take-over of the Works has been issued.

The Contractor shall be responsible for the security of the building and its contents at all times and shall employ watchman for this purpose.

- (2) Location of the Employer & Engineer's Office will be at Mab Ta Pud or in the vicinity of the Site which shall be proposed by the Contractor and approved by the Engineer.

The Building for the Employer and Engineer's office shall have following rooms and total area of this building shall not be less than 500 sq.m.

- a) Site Manager's Room (Employer)
- b) Site Engineer's Room for 6 persons (Employer)
- c) Resident Engineer's Room (Engineer)
- d) Supervisor's Room for 16 persons (Engineer)
- e) Drafting Room
- f) Administration Room
- g) Conference Room for 20 persons
- h) Conference Room for 8 persons
- i) Storage
- j) Kitchen
- k) Toilet

(3) The building shall be furnished with new furnitures and equipments. The followings are lists of the minimum basic furnitures and equipments to be provided by the Contractor for the Employer and Engineer's Office.

<u>a) Site Manager's Room</u>	<u>Quantities</u>
- Wooden Desk, 1.90 m x 0.90 m top, 6 side Drawers and 1 center drawer	1
- Revolving Executive Chair, on rollers, with armrests	1
- Streight Chair	2
- Bookcase, 0.30 m x 0.90 m x 0.80 m high, wood or metal	2
- Overstuffed Office Lounge Suite, Coffee Table, wooden, Formica top, 0.50 m x 1.20 m x 0.40 m high	1
- Wastebasket, large, solid sides, no wire	2
- Wall Board 250 cm x 150 cm	2
- 1 H.P. (12500 BTU) air conditioner	1
<u>b) Site Engineer's Room</u>	
- Wooden Desk, 1.50 m x 0.75 m top, 6 side drawers and 1 center drawer	6
- Executive Chair with armrests	6
- Drafting Table ,	2

	<u>Quantities</u>
- Stool	2
- Bookcase, 0.30 m x 0.90 m x 0.80 m high, wood or metal	3
- Straight Chair	6
- Wastebasket, large, solid sides, no wire	6
- Wall Board, 250 cm x 150 cm	2
- Coffee table	1
- 1 H.P (12500 BTU) air conditioner	2
c) <u>Resident Engineer's Room</u>	
- Same as those for Site Manager's Room	
d) <u>Supervisor's Room</u>	
	<u>Quantities</u>
- Wooden Desk, 1.70 m x 0.75 m top, 6 side drawers and 1 center drawer	6
- Executive Chair with armrests	6
- Wooden Desk, 1.5 m x 0.75 m top, 6 side drawers and 1 center drawer	10
- Executive Chair	10
- File Cabinet, four drawers, lock type, legal size with metal clip hanging files (30 per drawer)	8
- Drawing Cabinet, twelve drawers, lock type, 0.9 m x 1.3 m x 1.5 m high	2
- Drawing Hanger, 0.9 m x 1.2 m high	4
- Coffee Table	2
- Bookcase, 0.30 m x 0.80 m high, wood or metal	4
- Straight Chairs	8
- Wastebasket, large, metal, solid sides, no wire	16
- Wall Board 250 cm x 150 cm	4
- 1 H.P. (12500 BTU) air conditioner	4

<u>e) Drafting Room</u>	<u>Quantities</u>
- Drafting Table	2
- Complete Set of Drafting Machine	2
- Stool	2
- Wastebasket, large, metal solid sides, no wire	2
- Drawing instruments	2
- Drawing Cabinet, twelve drawers, lock type, 0.9 m x 1.3 m x 1.5 m high	2
- Drawing Hanger, 0.9 m x 1.2 m high	4
- Cupboard with shelves & locks	2
- Wall Board 250 cm x 150 cm	2
- Blue Printing Machine, Electric, to handle up to 90 cm x 120 cm paper, to be approved by the Engineer's Representative	1
- 1 H.P. (12500 BTU) air conditioner	1
<u>f) Administration</u>	
- Wooden Desk, 1.50 m x 0.75 m top, 6 side drawers and 1 center drawer	2
- Executive Chair	2
- File Cabinet, four drawers, lock type, legal size with metal clip hanging files (30 per drawer)	2
- Coffee Table	1
- Bookcase, 0.30 m x 0.80 m high, wood or metal	1
- Wastebasket, large, metal, solid sides, no wire	2
- Cupboard with shelves and locks	1
- Wall Board 250 cm x 150 cm	1
- Typewriter Table, metal no rollers	2

	<u>Quantities</u>
- Electric typewriters, IBM, DUALECTRIC, Thai & English or approved equal	2
- Dry Photo-Copier, Electric, XEROX Model "4800" or a-proved equal	1
- Wooden Desk 1.25 m x 0.75 m top, 3 side drawers and 1 center drawer	2
- Straight Chair	2
- 1 H.P. (12500 BTU) air conditioner	2
g) <u>Conference Room for 20 persons</u>	
- Table 250 cm x 125 cm	4
- Straight Chair	20
- Wall Board 250 cm x 150 cm	2
- Blackboard with eraser	2
- Wastebasket, large, solid sides, no wire	2
- 1 H.P (12500 BTU) air conditioner	4
h) <u>Conference Room for 8 persons</u>	
- Table 250 cm x 125 cm	1
- Straight Chair	8
- Wastebasket	1
- 1 H.P. (12500 BTU) air conditioner	1
i) <u>Kitchen</u>	
- Kitchen necessities	1 set
- Tea and coffee sets	2 dozens
- Electric refrigerator (14 cu. feet)	1

- (4) The Contractor shall be required to employ and be responsible for the welfare and housing of the following staff to be available during the hours agreed by the Engineer.
- Two cleaners
 - Two office boys
- (5) Following services shall be provided, installed and maintained in the Employer & Engineer's Office by the Contractor:
- a) An adequate piped supply of clean, fresh water connected to the toilet and suitable sewage disposal facilities.
 - b) Potable water
 - c) Electricity supply, with sufficient and suitable light fittings and socket outlets.
 - d) Fire Extinguishings
 - e) Two outside telecommunication lines
 - f) Office supplies
- (6) The Contractor shall provide fifty (50) sets of safty helmets, boots, raincoats in the Employer and Engineer's Office for use of the Employer and Engineer. Color of these shall be white or other color deffered from those of the Contractor, and the qualities of these shall be the subject to approval of the Engineer.

1302 EMPLOYER & ENGINEER'S RESIDENCE

- (1) The Contractor shall provide and maintain the Employer and Engineer's Residence throughout the Contract Period.

This item shall consist of construction and/or the rent, maintenance and cleaning of the Employer and Engineer's Residences as well as the furnishing and maintenance of the furniture including the air-conditioners for the sole use of the Employer and the Engineer and their staff together with the provision, installation and maintenance of services. The buildings, furnitures and equipments shall remain the property of the Contractor. The buildings shall be approved in advance by the Engineer.

The buildings, furnitures, equipments and services shall be available in full working order within three (3) months after signing of the contract, and shall continue to be so available during progress of the Works until the commissioning works have been completed.

A few bedrooms and related facilities and services shall only be available during commissioning period after the date of Provisional Take-Over.

The Contractor shall be responsible for the security of the building and its contents at all times and shall employ watchmen for this purpose.

- (2) Location of the Employer and Engineer's Residences will be at Mab Ta Pud or in the vicinity of the Site which shall be proposed by the Contractor and approved by the Engineer.
- (3) The buildings for the Employer and Engineer Residence shall have at least following rooms and facilities and total area of the building(s) shall not be less than 900 sq.m.
 - a) Ten (10) single-bed Bedrooms with bath and toilet for the Employer use
 - b) Five (5) twin-bed Bedroom with bath and toilet for the Employer use
 - c) Fifteen (15) single bed Bedrooms with bath and toilet for the Engineer use
 - d) Five (5) twin bed Bedrooms with bath and toilet for the Engineer use
 - e) Sitting and Recreation Room(s)
 - f) Canteen Facilities
- (4) Each building for the Employer and Engineer's Residences shall be furnished with new furnitures and equipments. The following furnitures and equipments shall be at least provided with each of the Residences by the Contractor as the minimum basic requirement.

<u>Description</u>	<u>Quantities</u>
<u>Sitting Room</u>	
- Wooden bookcase	1
- Wooden armchair	6
- Wooden teatable	1
- Curtain for window with insect net	
- 1 H.P. (12500 BTU) air conditioner	1
<u>Recreation Room</u>	
- Wooden dining tables for 4 persons	2
- Wooden chairs for above table	8
- Wooden cup-board	1
- Curtain for window with insect net	
- 1 H.P. (12500 BTU) air conditioner	1
<u>Twin-bed Bedroom</u>	
- Single bed with Dunloppillow mattress	2
- Wooden bed table	2
- Bed lamp	2
- Wooden table with chair	2
- Pillow with two pillow covers	2
- Sheet for single bed with mattress	4
- One person blanket	4
- Wardrobe	2
- Curtain for window with insect net	
<u>Single-bed Bedroom</u>	
- Single bed with Dunloppillow mattress	1
- Wooden bed table	1
- Bed lamp	1
- Wooden table with chair	1
- Pillow with two pillow covers	1
- Sheet for single bed with mattress	2

<u>Description</u>	<u>Quantities</u>
- Blanket	2
- Wardrobe	1
- Cabinet, lock type	1
- Curtain for window with insect net	

- (5) More than one bathroom and toilet shall be provided for each of the Residences, and the bathroom and toilet shall be at least provided at the rate of four person to one.
- (6) Canteen facilities shall have the capacity to provide mess for at least 40 persons of the Employer and the Engineer.
- (7) The Contractor shall provide the sufficient number of personnels, such as cleaner, housemaid, boy, etc., for the welfare and maintenance of the Employer and Engineer's Residences.
- (8) Following services shall be provided, installed and maintained in the Engineer's Residences by the Contractor:
 - a) Adequate piped supply of clean water connected to toilets and bathrooms in the Buildings and suitable sewage disposal facilities.
 - b) Potable water
 - c) Electric immersion water heaters in the bathrooms connected to the piped water supply.
 - d) Electric refrigerator (230 liters) for each of the Residences.
 - e) Electricity supply with sufficient and suitable light fittings and socket outlets.
 - f) Two internal telecommunication lines for each building

1303 EMPLOYER & ENGINEER'S TRANSPORTATION

- (1) The Contractor shall provide and maintain until the end of the commissioning period vehicles for the Employer and Engineer

and staff for both on-site and off-site transport. The vehicles shall be for the exclusive use of the Employer and Engineer. The vehicles shall be new when provided. The property of vehicles shall remain to the Contractor during and after the contract period. Mailage of monthly off-site transport shall not be more than 5,000 km. (per

(2) The Contractor shall be required to provide:

a) Four (4) four-door saloon cars, air-conditioned, nominal engine capacity 2 litres, or similar.

- One car for the Employer use
- Three cars for the Engineer use

b) Four (4) micro buses, for not less than 10 persons seats, air-conditioned, nominal engine capacity 2 litres, or similar.

- Two micro bus for the Employer use
- Two micro bus for the Engineer use

c) Two (2) pick up of 1 ton, nominal engine capacity 1.6 liters, or approved equal.

Vehicles shall be right hand drive and shall be fitted with the following:

- 1) Seat belts
- 2) Fire extinguishers
- 3) First aid kit

(3) Vehicles shall be regularly served and repairs shall be made as soon as required. Vehicles which have to be kept out of service due to extensive repairs or maintenance work shall be substituted by similar serviceable vehicles within 24 hours from the time the original vehicles become out of service.

Any vehicle which has become permanently defective, unreliable or otherwise unfit for its intended use shall be replaced with a

similar new vehicle within 60 days from the time the supply of such new vehicle has been ordered by the Engineer. Until the new vehicle is available for use at Site, a temporary substitute, serviceable vehicle shall be provided.

Vehicle maintenance shall include, but not necessarily be limited to, all fuels, lubricants, tires and other supplies; all maintenance repairs; insurance; licenses and other operating requirements.

(4) The Contractor shall provide vehicles within following period and in accordance with a delivery schedule to be provided by the Engineer.

- a) Four saloon car : within one month after signing of contract
- b) Two pick up : within two months after signing of contract
- c) Four Micro bus : within three months after signing of contract

Prior to ordering vehicles, the Contractor shall submit to the Engineer for approval detailed specifications, for each vehicle proposed.

A pertinent service handbook and related manuals shall be supplied with each vehicle.

(5) A licensed competent and experienced driver shall be provided on each vehicle.

1305 SUPPLY OF TRANSPORT

(1) The Contractor shall supply the following transports which will be uses of the operation and maintenance people of the Project.

- a) Five (5) pick up
- b) Three (3) moter cycle

(2) The pick up to be supplied shall be new and the specifications of the pick up are as followings:

- a) Type : Pick up truck body. 4 x 2
- b) Weight ratings : Gross vehicle weight not less than 1,950 kilograms. Payload approximately 1,000 kilograms.
- c) Wheelbase : Minimum 2,400 mm.
- d) Suspension : Springs and shock absorbers, front and rear.
- e) Steering : Right hand drive
- f) Engine : Make and model
Gasoline, water cooled, multicylinder engine. Piston displacement approximately 1,600 C.C. Minimum output 55 KW (75PS) at not more than 100 rps. (6,000 rpm)
- g) Clutch : Manufacturer's standard
- h) Transmission : Floor mounted shift lever, synchromesh gear type.
- i) Brakes : 4-wheel hydraulic brake with vacuum booster. Hand parking brake shall be equipped.
- j) Electrical Equipment : Manufacturer's standard
- k) Gauges or warning lights : Direct reading or warning lights for fuel, lubricating oil pressure, temperature and battery charging indicator. Metric speedometer and recording odometer shall be equipped.
- l) Accessories : Accessories and attachment furnished shall be the manufacturer's standard and shall include but not limited to dual electric windshield wipers, rear view mirrors, sun visors, insulated cab, safety glasses in cub, tools originally supplied in the manufacturer's tool kit.

- m) Wheels and tires : Disc type wheel, tube type tires, manufacturer's standard tire size and ply rating. One spare wheel and tire.
 - n) Body : Steel-pick up type Dimensions consistent with manufacturer's standard model. Non-skid steel floor type and equipped with synthetic fabric top with rear side seats.
 - o) Paint finish : Omaha orange
- (3) The motor cycle to be supplied shall be new and the specifications of the motor cycle are as followings
- a) Suspension : Front and rear shock absorbers.
 - b) Engine : Approx. 100 C.C. piston displacement, gasoline, air cooled engine. Min. brake horsepower 9 HP or PS at approximately 7,500 revolutions perminute.
 - c) Electrical system : Kick starter type, front and rear turn signal lights, brake lights, speedometer light, head light, tail light and other necessary warning lights.
 - d) Clutch : Manufacturer's standard
 - e) Brakes : Front and rear wheels.
 - f) Transmission : Multiforward speeds. Gear shift by foot operation.
 - g) Tire : Tube type tire. Manufacturer's standard size and ply rating.
 - h) Accessories : Accessories and attachments furnished shall be the manufacturer's standard and shall include but not be limited to rear view mirrors, electric horn, speedometer, tool equipment orginally supplied in the manufacturer's standard tool kit. One copy of operator's Handbook.
 - i) Body : Rigid sturdy man riding type metal frame. Front and rear mudguards.
 - j) Paint : Dual seat - black.
Body - Manufacturer's standard paint.

- (4) The Contractor shall supply the pick-up and motor cycles at 13th month after signing of the contract or in accordance with the instructions by the Engineer.

Prior to ordering vehicles and moter cycles, the Contractor shall submit to the Engineer for approval detailed specifications, for each vehicle proposed.

A pertinent service handbook and related manuals shall be supplied with the pick-up and motor cycle.

1306 MEASUREMENT AND PAYMENT

- (1) Measurement for payment for the Employer and Engineer's Office shall cover the provision, maintenance and other requirements stated in the Specifications.
- (2) Payment for the Employer and Engineer's Office will be made by lump sum under Item 1101 of the Bill of Quantities.

Thirty (30%) percent of the lump sum under Item 1101 will become payable when the Engineer deems the provision and furnishing of the Employer and Engineer Office to be substantially completed.

The remaining seventy (70%) percent of the lump sum will be paid in equal monthly payments so that the total sum shall be fully disbursed upon the Provisional Take-over of the Works.

- (3) Measurement for payment for the Employer and Engineer's Residence shall cover the provision, maintenance and other requirements stated in the Specifications.
- (4) Payment for the Employer and Engineer's Residences will be made by lump sum under Item 1102 of the Bill of Quantities.

Thirty (30%) percent of the lump sum under Item 1102 will become payable when the Engineer deems the provision and furnishing of the Employer and Engineer Residences to be substantially completed.

The remaining seventy (70%) percent of the lump sum will be paid in equal monthly payments so that the total sum shall be fully disbursed upon the Provisional Take-over of the Works.

- (5) Measurement for payment for the Field Laboratory shall cover construction, furnishing, and maintenance of the laboratory and other requirements of the Specifications.
- (6) Payment for the Field Laboratory will be made by lump sum under Item 1103 of the Bill of Quantities.

Thirty (30%) percent of the lump sum under Item 1103 will become payable when the laboratory is substantially completed and facilitated.

The remaining seventy (70%) percent of the lump sum will be paid in equal monthly payments so that the total sum shall be fully disbursed upon the Provisional Take-over of the Works.

- (7) Measurement for payment for provision, operation and maintenance of vehicles shall cover the purchase, delivery of the vehicles to the site, provision of and operation by a licensed competent driver on a full time basis, depreciation, taxes, the cost of comprehensive insurance and licenses, petrol, oil and lubricants, repairs and replacement of parts and vehicles and all other costs and charges incurred in the running and upkeeping of the vehicles, and any other requirements stated in the Specifications.
- (8) Payment for provision, operation and maintenance of vehicles will be made under Items 1104, 1105, 1106 and 1107 of the Bill of Quantities and shall be made on the vehicle-month basis as computed months from the date of delivery of each vehicle to be ready for operation to the date of return back of each vehicle to the Contractor.
- (9) Payment for supply of pick up car will be made under Item 1108 of the Bill of Quantities. The payment will be made at the time of delivery of the pick-up and against the certificate of acceptance of the Engineer, and shall be cover the purchase and delivery to site of pick-up and any other requirements stated in the specifications.

付録 - 8 APPROVAL LETTER



ROYAL IRRIGATION DEPARTMENT

BANGKOK, THAILAND

CABLE ADDRESS:
RID Bangkok

No. 731 /2525

August 25, B.E. 2525

Mr. Yuichi Katayama
Team Leader
Detailed Design Team for Water Pipeline
in the East Coast
Japan International Cooperation Agency

Re: Final Reports and Tender Documents

Dear Sir:

In connection with the Dok Krai - Mab Ta Pud Water Pipeline Project in the East Coast of Thailand, for which the Royal Irrigation Department (RID) is designated as the project executing Agency by the Government of Thailand, we have received to date the following mentioned reports and documents from your team.

Drafts of

- * Prequalification Tender Documents
- * Tender Documents for Construction
- * General Conditions of Contract
- * Special Stipulation of Contract

----- on April 15, 1982

Drafts of

- * Design Report
 - Main Report
 - Supporting Report
- * General Specifications
- * Particular Specifications
- * Bill of Quantities
- * Contract Drawings

----- on July 2, 1982

Draft reports and draft documents have been reviewed in due course by technical and legal personnels of RID and other Government Agencies concerned, and also fruitful discussions on the said documents have been continued between representatives from Thai side and your team.

Our comments on your draft reports and draft documents derived from our reviewal as well as conclusions reached in the discussion meetings are as summarized in the Minutes of Meeting dated July 8, July 14 and July 28, 1982, respectively.

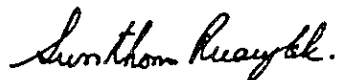
This is, therefore, to inform you with our greatest pleasure that you may kindly proceed to finalization of those draft reports and documents through incorporating descriptions as presented in said Minutes of Meeting. It is expected that we will be furnished with the following reports and documents as final ones by the end of August 31st.

- * Main Design Report
- * Supporting Design Report
- * Instructions to Tenderers
- * Conditions of Contract
- * Particular Specifications
- * General Specifications
- * Bill of Quantities
- * Contract Drawings

Your kind attention on the above will be highly appreciated.

With our thanks to what your team has done for the subject project as well as to the close cooperation extended by JICA Tokyo.

Yours sincerely,



Sunthorn Ruanglek
Director General

cc: 1. JICA Bangkok Office
2. JICA Head Quarter, Tokyo

JICA