D. The SWCC and USDI may expand the Joint Team to include representatives of the technical support contractor. The Joint Team will study the desalination programs of the Kingdom and prepare a tentative plan of action to be carried out which will establish the requirements for facilities to be contained within the Desalination Center. It is envisioned that the plan required to establish the requirements will include, but is not necessarily limited to, items E through I below.

E. Visit appropriate Saudi Arabian government officials, selected university professors, scientific agencies, and water research centers in the Kingdom, in other Arab countries, the United States, or elsewhere. Discuss with those professors, officials, or groups the objectives of this project and request their recommendations for programs, facilities, curricula, or special considerations which should be incorporated in the Desalination Center. During these visits determine:

1. The objectives and policies of scientific research programs and projects, the areas of application, future plans and programs, the scientific, regional, and international agencies with which they operate in projects and in exchanging scientific data.

2. The potential for, and the possibility of, enhancing the Desalination Center mission by cooperating with them through the utilization of existing facilities or existing capability.

3. The opportunity for acquiring qualified and appropriate expertise to support the work of the Center or to assist in planning and carrying out its mission.

F. Visit selected desalination plants in the Kingdom, in other Arab countries, and, if necessary, in other countries, to discuss operating and process problems and to receive from responsible officials in those plants, the problems and potential problems they face, their methods for resolution of problems, and their recommendations for programs, research, development, and training which should be incorporated into the Desalination Center. During the visits to plants in the Kingdom, survey the work force for their input as to areas and extent of training required prior to being employed in an operating desalting plant and for continuing education and training after employment.

G. Visit selected desalting plant design laboratories and research centers of international companies with which the SWCC conducts, or may conduct, business, and receive from appropriate officials within those companies their recommendations for research, development, and training programs which should be incorporated into the Center.

H. Conduct such other interviews, visits, studies, analyses, and activities as may be mutually agreed to by the Joint Team.

I. After all work under items E through H has been completed, the technical support contractor will:

a. Assemble and evaluate all information and data collected in carrying out items E through H and prepare a comprehensive report for the Desalination Research, Development, and Training Center which will recommend the full range of activities to be conducted by or in the Center to fulfill the hereinbefore stated objectives. Each activity will be the subject of a study which will set forth the justification for the activity, the space requirements, the equipment and facilities required, the curricula, the staffing requirements, and the technical support facilities such as libraries and analytical laboratories, training aids, furniture, and personal accommodations.

b. Prepare, if necessary, a comprehensive evaluation of proposed sites for the Desalination Center and a justification for the site recommended.

c. Prepare a conceptual design for the Desalination Center which will accommodate the requirements set forth in the separately conceptualized activity studies mentioned above. The conceptual design will consist of single-line drawings of plot plans, building elevations, floor plans, and such other drawings as may be required to display the concept including, but not necessarily limited to, an artist's rendering of the total facility as conceptualized. The drawings will be accompanied by brief general specifications and a budget estimate for final design, construction, furnishing, staffing and annual operating cost.

d. Prepare the detailed implementation steps for Phases 2 and 3, time schedules, and preliminary cost estimates for performing those phases of the work.

J. The Joint Team will monitor all work and review all submittals by the Technical Support Contractor. The Joint Team will submit final recommendations for implementation of Phases 2 and 3 to H.R.H., the Governor of SWCC. Figure A shows a bar graph representation of the project schedule through Phase 3.

V. Cost Estimate

Phase 1: Preliminary Estimate for the Work Being Immediately Implemented (18 months)

USDI Team for joint project management (total cost)	$ 622,460.
Consulting Service Contracts	$ 120,000.
Technical Support Contract	$ 400,000.
Total Phase 1	$1,142,460.

Cost Proposal Notes:

1. The estimate for the work under Phase 1 is considered to be preliminary and is subject to change at any time during the course of the work.

2. The estimates are based on an USDI full time staffing level of 1-1/2 technical positions with clerical support as required in Jeddah, Saudi Arabia, and 1/2 manyear technical support and coordination in Washington, D. C.

The following order of magnitude-type estimates are for the work covered under succeeding phases of the project:

Phase 2: Preparation of Study Reports and Final Design (15 months)

USDI Team for joint project management (total cost)	$ 319,000.
Consulting Service Contracts	$ 250,000.
Final Design Contract.	$2,000,000.
Construction Contract	$15,000,000.
Technical Support Contract	$1,000,000.
Total Phase 2	$18,569,000.

Phase 3: Construction of Research and Development Center (27 months)

USDI Team for joint project management total cost)	$1,215,250.
Consulting Service Contracts	$ 50,000.
Management, Operation and Maintenance (O&M)	$2,000,000.
(By contract or by staffing + $2M per year)	
Total Phase 3	$3,265,250.

A DESTINATION RESEARCH, DEVELOPMENT AND TRAINING CENTER
IN THE KINGDOM OF SAUDI ARABIA
PHASE 3

Phase 4: Research, Development and Training Program Implementation (36 months)

USDI Team for joint project management (total cost)	$2,025,000.
Management, Operation and Maintenance (O&M)	$5,000,000.
Total Phase 4	$7,025,000.

Summary:

Phase 1	$ 1,142,460.
Phase 2	$18,569,000.
Phase 3	$ 3,265,250.
Phase 4	$ 7,025,000.
Project Totals	$30,001,710.

Total Cost Analysis:

USDI Team for the Joint Project Management	$ 4,181,710.
Consulting Service Contracts	$ 420,000.
Technical Support Contracts	$ 1,400,000.
Design Contract	$ 2,000,000.
Construction Contract	$15,000,000.
O&M Contract	$ 7,000,000.
Project Totals	$30,001,710.

VI. Time Schedule

	Time to Complete	Cumulative Time
Phase 1	18 months	18 months
Phase 2	15 months	33 months
Phase 3	27 months	60 months
Phase 4	36 months	96 months

Total estimated time from start: 96 months or 8 years.

Appendix B

A Technology Development Program
for
250,000 m^3/Day MSF Distillation
Single-Unit Plants
(Project B)

I. Introduction

In 1975, the Government of Saudi Arabia outlined the plans of the Saudi Arabian Saline Water Conversion Corporation (SWCC) for construction of extremely large-scale desalting plants during a second five-year program beginning around the year 1981.

The current five-year program implicates the use of existing technology and a basic unit size of 20,000 m^3/day (5mgd) as the building block for larger scale desalting facilities.

For the installations of the future, the SWCC reasonably envisages operating jointly four or more MSF distillation units of the order 250,000 m^3/day (66 million gallons) to provide the total capacity required.

The Government of Saudi Arabia has requested the assistance of the U.S. Government in a development program to provide desalting technology for the Saudi Arabian Government's second five-year desalting plant program.

The Office of Water Research and Technology (OWRT), United States Department of the Interior, has experience in conducting desalting research and development programs both on new process technology and the scale up of existing technology for use in large size, dual-purpose power and water desalting plants.

Capital and energy costs, as well as the demand for potable water, have been increasing rapidly over the past several years, necessitating a reassessment of the optimum economical MSF unit size. If, in fact, single-unit MSF capacities up to 250,000 m^3/day can be economically justified, some component and process testing will be necessary to minimize the number of technical unknowns for such large, single-unit MSF plants and provide necessary detailed design data. Both technical and economic factors must be thoroughly evaluated before proceeding with the design of a 250,000 m^3/day plant.

II. Project Objectives

The objectives of the project are as follows:

A. Determination of the most advantageous MSF distillation plant innovation, from both a technical and economical standpoint, for large scale plants (of unit size up to 250,000 m^3/day) to be built in Saudi Arabia in the 1980's.

B. Construction and operation in Saudi Arabia of appropriate component and process module test facilities, as necessary, to minimize design unknowns for the MSF unit size.

C. Preparation of a complete design package and bidding documents for the appropriate number of MSF units (250,000 m^3/day) suitable for international tender in the 1980's.

III. Scope of work

In order to meet the objectives started, a five phase development program is envisioned:

Phase 1: Determination of optimum MSF Process innovation and unit capacity.

Phase 2: Design of required component and MSF Process test module.

Phase 3: Test Module construction.

Phase 4: Module testing.

Phase 5: Detailed plant design and bidding specifications.

IV. Technical Proposal for Implementation

It is estimated that this project, through completion of the engineering design and preparation of bidding documents, will take a maximum of 8 years. The complete development program required can only be outlined in general terms at this time since the results of the first phase will define the scope of component and process testing required to obtain the necessary design information.

This proposal, therefore, provides a complete scope of work for Phase 1 with relatively firm estimates of the costs involved. Succeeding phases are outlined to describe the anticipated course of action, including module construction and test operations, data analysis and the preparation of the detailed plant design.

Order of magnitude-type cost estimates and a general work schedule are also provided for Phases 2 through 5 of this agreement.

A SWCC-USDI Joint Team will provide the technical and administrative management services required to implement Phase 1. It is anticipated that the SWCC-USDI Joint Team will provide similar services required for Phases 2 through 5 in accordance with a scope of work to be proposed for these phases.

Phase 1 - Scope of Work for Immediate Implementation (18 months)

During Phase 1 appropriate consulting, engineering, construction and manufacturing firms will be employed to provide, on the basis of a set of ground rules specifying the local conditions in Saudi Arabia, a composite evaluation of the most advantageous MSF Process innovations for application at a single-unit plant capacity of up to 250,000 m^3/day. These studies will also, on the same basis, recommend an economically optimum unit size for application in extremely large desalting facilities.

With the assistance of appropriate consulting service, the SWCC-USDI Joint Team will monitor, manage and direct the work of Phase 1, to:

1. Assimilate background data on selected MSF plant size, define study parameters, and prepare documents for solicitation of proposals from qualified firms for preparation of conceptual design studies to include:
   a. A comparative evaluation of MSF Process innovations over a range of large scale plant designs.
   b. An evaluation of the optimum single unit MSF plant size.
   c. A recommendation for the most advantageous MSF Process innovation at the 250,000 m^3/day plant size.
   d. A conceptual design of the optimum single unit MSF plant.
   e. A complete delineation of engineering unknowns of the optimum single unit MSF plant.

f. A conceptual design of the component and process test module which will be required to investigate the identified engineering unknowns for the optimum MSF plant.

g. A proposed development test program to resolve the engineering unknowns for the optimum MSF plant.

2. Evaluate proposals in "1" above.

3. Negotiate conceptual design study contracts.
(In order to fully utilize existing expertise and expedite the program, a minimum of three parallel conceptual design contracts are recommended.)

4. Monitor progress of conceptual design contracts and prepare quarterly technical progress reports for H.R.H., the Governor of SWCC.

5. Evaluate conceptual designs and contractors recommendations for required component and process training.

6. Submit detailed recommendations to H.R.H., the Governor of SWCC, for the conduct of Phases 2 through 5 of the development program.

Phase 1 is estimated to take 18 months for completion, including solicitation of proposals and negotiation of contracts.

V. Outline Scope of Work for Succeeding Phases

Phase 2 - (18 months)

1. Contract for engineering design and preparation of bid documents for construction of component and/or process test module based on selected conceptual design for the optimum single-unit MSF plant capacity.

2. Monitor, manage, and direct engineering design contract.

3. Prepare complete bid package for construction of the fullscale plant.

Barring unforeseen operational problems, sufficient information should be available 18 months after the start of the test program so that work on the complete plant design and construction

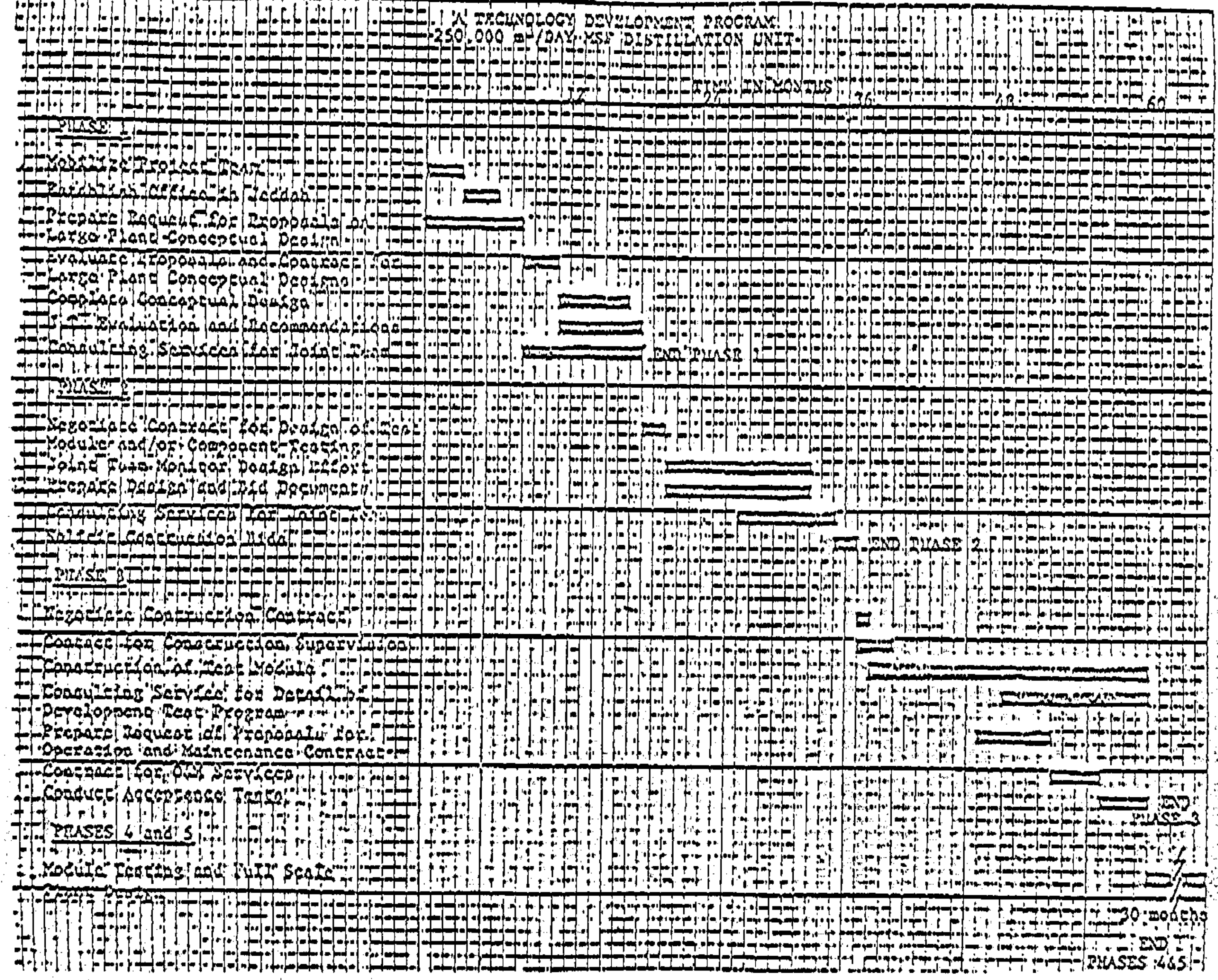
specifications can be started. Construction bid specifications could then be complete approximately 12 months after the completion of Phase 4. The total time for Phases 4 and 5 is therefore 36 months.

Figure B shows a bar graph representation of the project schedule through Phase 3.

Cost Proposal: Preliminary Estimate for Immediate Implementation

Phase 1 - Determination of Optimum MSF Process Innovation and Unit Capacity (18 months)

USDI Team for the joint project management (total cost)	$ 622,460
Consulting Service Contracts	$ 80,000
Conceptual Design Contracts (3)	$ 360,000
Total for Immediate Funding	$1,062,460


A TECHNOLOGY DEVELOPMENT PROGRAM
250,000 m³/DAY MSF DISTILLATION UNIT
TIME IN MONTHS
12
24
36
48
60
PHASE 1
Mobilize Project Team
Establish Office in Jeddah
Prepare Request for Proposals of Large Plant Conceptual Design
Evaluate Proposals and Contract for Large Plant Conceptual Designs
Complete Conceptual Design
JPT Evaluation and Recommendations
Consulting Services for Joint Team
END PHASE 1
PHASE 2
Negotiate Contract for Design of Test Module and/or Component Testing
Joint Team Monitor Design Effort
Prepare Design and Bid Documents
Consulting Services for Joint Team
Solicit Construction Bids
END PHASE 2
PHASE 3
Negotiate Construction Contract
Contract for Construction Supervision
Construction of Test Module
Consulting Service for Detailed Development Test Program
Prepare Request of Proposals for Operation and Maintenance Contract
Contract for O&M Services
Conduct Acceptance Tests
END PHASE 3
PHASES 4 and 5
Module Testing and Full Scale Plant Design
30 months
END PHASES 4&5

Notes

1. The estimates are based on a USDI full-time staffing level of 1-1/2 technical positions with clerical support as required in Jeddah, Saudi Arabia and 1/2 manyear of technical support and coordination in Washington, D. C.

2. The estimate for the contract prices is considered to be preliminary and is subject to change by mutual agreement between SWCC and USDI during the course of the work.

Order of Magnitude Estimates for Succeeding Phases

Phase 2 - Design of Required Component and MSF Process Test Module (19 months)

USDI Team for the joint project management (total cost)	$ 413,667.
Consulting Service Contract	$ 50,000.
Module Design Contract	$1,000,000.
Total Phase 2	$1,463,667.

Phase 3 - Test Module Construction (23 months)

USDI Team for the joint project management (total cost)	$ 1,120,583.
Construction supervision & development of test program	$ 1,200,000.
Construction	$10,000,000.
O&M Contract/Mobilization and first year of testing (includes utilities)	$ 3,000,000.
Total Phase 3	$15,320,583.

Phase 4 - Module Testing (24 months)

USDI Team for the joint project management (total cost)	$1,400,000.
Consulting Service Contracts	$ 50,000.
O&M Contract and Data Evaluation (includes utilities)	$3,050,000.
Total Phase 4	$4,500,000.

Phase 5 - Detailed Plant Design and Bidding Specifications (18 months)

USDI Team for the joint project management (total cost)	$ 625,000.
Consulting Service Contracts	$ 200,000.
Design Contract	$26,000,000.
Total Phase 5	$26,825,000.

Total Cost - Analysis

USDI Team for the Joint Project Management (total cost)	$ 4,181,710.
Consulting Service Contracts	$ 1,580,000.
Design Contracts	$27,360,000.
Construction Contracts	$10,000,000.
O&M Contracts	$ 6,050,000.
Program Total	$49,171,710

2　経　　緯

日サ海水淡水化技術協力経緯

日サ海水淡水化共同研究経緯	51. 7. 4 ～ 52. 10. 8	(52. 10. 22 技術協力課)	資料
海水淡水化共同研究事前調査結果について	52. 11. 3 ～ 12 (石坂団長)	(52. 11. 16 技術協力課)	資料
日サ海水淡水化技術協力事前調査団報告	53. 2. 18 ～ 25 (中島団長)	(52. 3 JICA)	資料
日サ合同委会議記録	53. 3. 31 日サ両政府間非公式会議		資料
第2回日サ合同委本会合及び事務レベル会議における日サ海水淡水化技術協力事業に関する協議について	53. 4. 6 (公信案)		資料

日サ海水淡水化技術協力事業の費用分担について

日本側の費用分担についての基本的考え方を明らかにするとともに費用分担を接近させるため2案を提示。

① 既存の建物を材料研究所として使用。
(日) 971百万円 (サ) 1,626百万円

② テストプラント運転研究中心のプロジェクトとする。
(日) 723百万円 (サ) 1,214百万円

海水淡水化技術協力(電信)

53. 9. 4 (ナシーフ局長)

1. SWCCでは research, training 及び development の三つの分野でテーマとその進め方を検討中で，11月までには結論を出したい。
2. 日本との共同研究で費用を等分に負担するという考え方は両国協力の象徴として望ましいということで，日本側の本件費用負担の基本的考え方は理解する。

53. 10. 30

1. (アル・ラシッド総裁)
SWCCによる25万t/日プラント概念設計に関する日本への呼びかけは，日本との共同研究も考慮してのことである。
2. (米サ合同経済協力委米側次席代表)
プロポーザルよびかけは「大規模多段フラッシュ単体プラントの技術開発」の一環。各国関係企業の実施を期待しており，米国 team 社全体を supervise する。

53. 11. 21 (ジャム ジューム副総裁)

1. 本件は，日サ合同委の担当省である企画省が決定すべき問題。
2. SWCC独自で予算は獲得できず，財政省を説得して予算をひき出すためには企画省の介入が必要。予算問題が最大のあい路。
3. 日本側との取極めには，企画大臣が調印すべきである。農水大臣も関係している。

53. 11. 22 (ラーシッド総裁)

1. 米国，仏，独，日本等との協力につき，全体的なプランを検討の上，重複を避ける形で，それぞれ特定の分野につき，各国と協力を進める。
2. SWCCは 技術的に淡水化問題を専管する機関，SWCCが 技術的検討の中心になるのが筋であり，SWCCが 実際的な結論を出すことが先。
3. 日本チームとは，日本側との協力実施をコミットすることを前提としたものではなく，技術的にオープンな立場で行ないたい。

53. 11. 28 (ナシーフ局長)

1. SWCCとして どのような技術開発を行なうべきかを調べ，その実施のための全体的プランについて12月中に結論を出し，1月には決定の予定。
2. 米サ協定のワク外で日本との技術協力を行ないたいが，全体的プラン作成後，本格的検討に入る。
3. 協力を進めるかどうかの決定権はラーシッド総裁が有しており，企画省の役割りは4月の合同委で一応終了。
4. プロトコール上の問題はジャム ジュール副総裁が詳しい。

日－サ　海水淡水化共同研究経緯

52. 10. 22　技術協力課

51年7月4日　多田公使－モハメッド総裁（51/7/7　第556号）

SWCCのジュベイル・プロジェクトの発電プラント，蒸留プラントについて，日本側の業者と仏の業者のうち，いずれをとるか，決定を困難にしている旨内話があった折，総裁より「日サ・経済・技術協力協定にいわれている　技術協力の分野で，海水蒸留設備の技術的開発について　共同研究の可能性」についての打診があった。

多田公使「具体的な話があれば充分これに対応しうる可能性はある。」旨回答

総　裁　「7月4日のBoard Meetingに本件をもち出してみたい。」

51年7月21日　カーン（米人）→岡崎近ア局参事官（51/7/21　近2第316号）

「カ」と「モハメッド総裁」が，電話連絡した結果

「カ」より「モ」に対し，「日本側は，サ側の具体的要請をまっている」旨伝えたところ，「モ」は「日本側よりの具体案提示を期待している。」

又，「入札問題について「モ」は日本側業者に好意をいだいているように思われたが，同殿下は，最終決定を下す前に，技術協力に対する日本側の反応をみたい。」との態度であった。

51年7月24日　多田公使　意見具申　（51/7/25　第587号）

「モ」殿下は，サウジ アラビアの王族の中では，最初に博士号を得た，極めて学究的な人物であり，50年11月訪日の際，すでに，海水蒸留プロジェクトを含め，我が方との共同研究開発を示唆した経緯があり，「モ」殿下にすれば，日本側より積極的に話が持ちこまれることを，期待している。

51年7月31日　訓　令

(1) 我が国，民間企業の意向は，本件について，積極的に対処していく方針であり，協力内容をつめるために，専門家を派遣する用意がある。

(2) 有償技術協力を基本としたい。なお，今回の協力の申し出は，あくまで本邦民間企業よりの対サ協力であり，日サ政府間の協力ではない。
（例えば　JICAベースでない。）

(3) 協力の方法は，次のとおり。

① 海水淡水化オペレーター・技術者の養成　（研修生受入れ）

② 海水淡水化研究者の養成　（研修者受入れ）

③ サ国に，海水淡水化の訓練 研究用プラントを設置し，オペレーター，技術者，研究者を養成する事業

51年8月23日　多田公使→モハメッド殿下　(8/23 第649号)

上記ラインを説明したところ，

「モ」は「サ側の希望している協力の大筋は，海水淡水化プラントのオペレーションの技術者，専門家養成等の分野ではなく，当該分野における共同研究，技術開発に関する協力を求めるものであり，具体的な例を申し上げれば，プラント，特にパイプ部分の海水における腐蝕作用(corrosion)をいかに防止しうるかの対策についての共同研究，プラントの生産量を引上げるための技術的開発を相互の協力により進めんとするものであり，技術的，化学的観点から，このような共同研究，技術開発のいくつかのテーマを選び出し，相互に合意したものについて技術協力を行なうもので，研究，開発協力と呼称することが，適当かも知れない。以上のテーマについて，当公団の技術陣と日本側の専門家技術者が，話合う必要があるので，チームの派遣をお願いしたい。」

「本件協力を有償を建前として行なうことには，異存ないが，協力実施の窓口については，日本側関係会社の当公団に対するプラント輸出と直接関連づけるような印象を与えるのは，まずいので，日・サ経済技術協力協定のわく組の中で，協力関係を具体化したい。(ナーゼル計画大臣とも協議する由)従つて，造水促進センター工業技術院との協力という形式をとりたい。」

51年9月　　訓　令

(1) 協力内容は，サ側の意向に沿い，テスト プラントを利用した 研究開発を中心としたい。

(2) 協力実施の形式は，単なる，日本側民間企業の対サ協力ではない形式を検討したい。

(3) 研究テーマの選定，有償協力の方法，秘密の保護，研究成果の帰属等につき，専門家レベルによる詳細な打合せを行なう必要があるので，11月上旬を目途に，日本から打合せチームを派遣することとしたい。

51年10月5日　鈴木大使→モハメッド総裁　(10/7 第774号)

研究テーマの選定，協力の詳細について，つめるため，日本の専門家を派遣する旨伝達。

51年11月22日　徳永→アキール副総裁

12月18日以降　打合せチーム 来サして欲しい。

52年2月5～7日 打合せチーム／SWCC （52/2/8 第145号）

共同研究は，(1) 技術情報の交換，(2) 材料研究施設の建設に係る協力，(3) デモンストレーション・プラントの建設 の3項目に分ける。

(1)については，日サ両国の交流を深めることとし，相互合意。

(2) サウジアラビア専門家ミッションを日本に派遣し，日本側と共同で計画を作成し，進めることとした。施設建設費は，サ側で負担し，日本側研究員の派遣費用については，将来検討することとなった。

(1)及び(2)については，SWCCの権限で実施可能（2～3億円程度の規模であれば）であるが，

(3)については，巨額資金を必要とするので，日サ経済協力協定ベースに乗せ，公式ルートでプロポーズするよう強い要請があった。

52年5月10日 佐山開発官→モハメッド総裁

上記会合の議事録を送付

52年6月初旬 佐山開発官→モハメッド総裁

Tentative Proposal の提出

（52年5月3日　米サ 海水淡水化技術協力協定　調印）

52年5月初旬　鈴木前大使／アキール副総裁　（5/8 第414号）
「ミッション のレポートを督促して欲しい。」
「来年度サウジ予算（7月より開始）へ計上する必要がある場合，まず，前記レポートの入手が不可決であり，次いで，同公団の立場上，やりやすくしてくれるためには，先般の同ミッション来訪中に申し上げておいたとおりに，日本側で，もしその意があれば，日サ合同委ベースに乗せるよう，アプローチしてもらいたい。」

52年5月11日　（訓令）
日サ合同委ベースに委せることは，当方もとより希望するところであるが，日サ合同委が石化・製鉄等の問題をひかえて，開催の目途が立つておらず，また，本件のみで合同委を開催することに，サ側は，当然消極的と考えられるところ，ナーゼル大臣との会談において，先方感触を確認されたい。

52年5月15日　鈴木前大使／ナーゼル大臣
「大使」　海水淡水化研究協力に関する，これまでの経緯の骨子を説明し，「SWCC側では，日・サ合同委でとりあげられることを望んでいるやに理解しているところ，まず，合同委のコンテクスト内で，事務的に討議を行なうことの適否につき，感触を承知したい。」

ナ大臣　「自分は，平素から ささいなケースには，かかわりたくないので，本件を全く承知しないが，一応，自分の方でも調査することにして，考えさせてもらいたい。」

52年6月初旬　向井（書）→ AL—BARR 技術研究局長
「SWCCとしては，日本との共同研究に非常に関心を持つているところ，予算面からは，どうしても共同研究を日・サ合同委員会の下に推進する必要がある。すでに一度ナーゼル企画大臣あてに申請文書を提出しているが，未だ回答に接していない。再び，SWCCならびに日本側の共同研究に対する強い関心を同大臣に，文書で訴えたい。」

「材料研究所設立の協議を行なうための専門家は，ナーゼル大臣からの回答を受け取つた後に派遣するのが得策。すでに4名程度の人選を了している。」

「専門家を今すぐ日本に送るわけにはいかないので，材料研究所に関する提案をなるべく早く文書で受け取りたい。この意味で，レポート全体としては，もう少し内容が，具体的であつて欲しかつた。」

52年9月5日　佐山開発官→イサム・ジャムジュン副総裁　（書簡）
「材料研究所の設立に関し，サウジ アラビアの専門家が，いつ来ても，さしつかえないように準備している。我々が，以前に提出したpreliminreportよりさらに，詳細なプランをドラフトしている。従つて，できるだけ早くサウジ アラビアのミッションを派遣していただきたい。」

52年9月26日　イサム・ジャムジュン→佐山開発官　（書簡）
「ジュッダ プラント フェーズⅡの我々の仕事のために，ミッションを派遣できない。しかしながら，今後の技術協力のための議論を継続するために，日本からのミッションを受け入れたい。」

52年10月6日　（訓 令）
東工試　石坂所長，中島技協課長のアポイント取り付け，要請。

52年10月8日　向井（書）→　ハッサム・ジャムジュン総裁室長　（10/9　第778号）
ユース・ナーシフ技術研究局長
「SWCCとしては，11月5日から7日まで日本側ミッションの受入れは可能。日本側提案のレポートは10月中に，SWCCに届くようお願いする。」
「農業水利省次官との会談は，SWCCとしては必要はないものと考える。SWCCのacting Governorが，農業水利大臣であるも，当公団は農業水利省とは独立した組織であり，大臣以外の誰もSWCCとは関係ない。」
「海水蒸留共同研究については，企画省でこれを日・サ合同委員会の 課題として取り上げることに，現時点では，あまり関心のないことは貴官も承知のとおりである。企画省との協議の必要性については，日本側の関心のいかんに依る。」
「SWCC側の期待するところは，今回のミッションが，単に今後の協力の進め方を政策的に協議するのみではなく，今までのミッションによる調査検討結果ならびにそれに基づく，日本側提案を技術的に突つこんで協議することにあると見られるので，報告書の内容について，充分な配慮をお願いしたい。」

3　52年11月　ミッション

プロポーザル正式説明

KINGDOM OF SAUDI ARABIA
Saline Water Conversion Corporation

Our Ref. No. _____ Date _____

MINUTES OF MEETINGS BETWEEN SWCC & JAPANESE EXPERTS IN THE PERIOD OF 5TH TO 7TH NOVEMBER, 1977.

1. Japanese delegation team proposed 4 items: Information Exchange, Establishment of Material Research Laboratory, Construction and Operation of 500m^3/day Material Test Plant, Exchange of Personnel between both countries.

2. SWCC showed strong interest in each item of the Japanese proposal and pointed out the financial situation is important as well as the technical matter.

3. SWCC pointed out four technical points concerning 500m^3/day plant

a) SWCC wishes to operate the plant for production purpose after 5 year research term.

b) Increase of the economy ratio to 6:1 from 3:1

c) Possibility of the specification changes from 6 stage long tube type section to 3 stage long tube type module and 3 stage cross tube type.

d) The proposal doesn't mention kind of materials which will be used for decarbonator and deaerator.

Japanese delegation team replied the SWCC's comments as follows:

a) The Plant is so designed as to complete the test of material used for future MSF Plant including the concrete. Our desire is to obtain the sample cores from the wall of evaporator shelles when the plant is dismantled.

We, however, understood situation of SWCC and will look into this matter.

b) Technically the comments will be introduced to the Plant, which, of course, is accompanied with financial change

Contd...2/

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5163

c) We are much interested in the long tube design because future huge plants will be designed in long tube type.

We already completed the development research on the long tube MSF 100,000 m^3/D Plant having concrete shells and are going to initiate feasibility study on the construction of such plant in Okinawa Island.

Problem we have now is adoptation of such plant to the countries where weather conditions are severe, such as in Near East and Africa.

d) We consider that in this stage of discussion, important matter is to decide the outline of fundamental design of the 500m^3/D Plant. We would like to avoid the detailed discussion.

4. SWCC required the figures of total cost of the research cooperation and of cost sharing between two countries.

Japanese delegation team replied that the figures are not available officially in this moment and express their desire to obtain the agreement of the budget from the Ministry of Finance of Japan.

One of the delegation team explained the ~~rough~~ rough figures which are now being negotiated between M.I.T.I. and the Ministry of Finance of Japan.

Japanese delegation team suggested that early January would be the time of disclosure of the official information from Japanese Government.

SWCC showed strong desire to receive rough figures and their break-down, as early as possible, concerning the research cooperation. All members of Japanese delegation team replied that they will make their best efforts on this matter.

Contd...3/-

KINGD. M OF SAUDI ARABIA

Saline Water Conversion Corporation

Our Ref. No. _____ Page 3 Date _____

5. Both sides confirmed that the cooperation is basically between Saudi Arabian and Japanese Governments.

As a result of discussions and in light of the comments read by Dr. Ishizaka, it is clearly understood that there is no financial commitment on either parties. There is an agreement in principle on the technical merits of the Japanese proposal. A financial decision will have to wait for the arrival of the promised detailed financial description by January, 1978, and then SWCC will reconsider the whole situation of Saudi Japanese technical cooperation in the field of desalination research.

JAPANESE DELEGATION TEAM:

Dr. Seiichi Ishizaka
Director, National Chemical Laboratory,
for Industry, Agency of Industrial Science
& Technology, Ministry of International Trade
& Industry.

Mr. Fukuo Nakashima,
Director, Technical Cooperation
Division, Ministry of International Trade & Industry

IN THE PRESENCE OF:

Mr. Kiyotaka Makai
Second Secretary, Embassy of Japan.

Contd...4/

SAUDI DELEGATION TEAM:

Mr. Youssef M. Nassif, Director of Research & Training Dept., SWCC

Mr. Saeed Naggar, Advisor, Research Department, SWCC

Dr. Hamza I. Amer, Research & Training Dept.

In the partial presence of:

Mr. A.A. Nassif, Acting Director of Western Province, SWCC

Dr. Medhat Kaseab, Western Province

Dr. Mohamed Abdel Hadi, Western Province.

海水淡水化共同研究事前調査結果について

52. 11. 16

通商政策局技術協力課

去る11月3日より11月12日まで，工業技術院東京工業試験所石坂所長，通商政策局中島技術協力課長は，サウジアラビアを訪問し，SWCC及び企画省において，我が方提案のプロポーザルを説明し，意見交換を行なつたところ，概要次のとおり。

1. SWCCとの会談（11月5日，6日，7日）

(1) SWCC副総裁Isam Jamjoomへの表敬のあと，Youssif Nassif研究訓練局長を中心とするスタッフと日本側報告書の説明，質疑応答及び討論，討議内容の確認という順序で討議が行なわれた。

(2) まず我が方より，共同研究の概要として情報交換，材料研究所の設立，500㎥/日の材料テストプラントの建設，両国間の専門家交換，の4つの項目について説明したところ，SWCC側は，日本の提案に非常に高い関心をよせ，共同研究の推進に前向きに取りくむ姿勢を示した。同時にSWCC側は，技術的側面とともに，資金的側面も重要である旨，指摘した。

(3) 500㎥/日プラントについて，SWCC側は，下記4つの点について，指摘した。

① テストプラントは，5年の研究期間後も引き続き実プラントとして操業したい。

② 造水比を3：1から6：1へ向上させること。

③ 6段長管式から3段長管，3段単管へのスペック変更の可能性。

④ 本提案は，脱炭酸装置と脱気装置に使用される材料の種類について，触れられてない。

(4) これに対し，我が方は次のとおり返答した。（(3)の各問に対応）

① このプラントは，将来のMSFプラントに使用する材料（コンクリートを含む）のテストを完結するために，設計されたものである。我が方の希望は，プラントが撤去された際に蒸発缶体の壁体からサンプルコアーを得ることにある。しかしながら，我が方は，SWCCの状況を理解し，本件を吟味してみたい。

② 造水比の向上についてのSWCC側のコメントは本プラントに導入できるが，勿論，所要資金に変化を生じる。

③ 我が方は，将来の大規模プラントは長管式で設計されるとの見通しを持っているが故に，長管式の設計に多大な興味を持っている。我が方は，コンクリート缶体を使用した長管式MSF 10万㎥/日のプラントの研究開発を終了しており，現在，沖縄におけるこのようなプラント建設のフィージビリティ調査を開始しているところである。
我が方が持っている問題は，このようなプラントが，中東やアフリカといつた自然条件

の厳しい国々への適用化の問題である。

④ この段階での議論において，重要課題は 500m³/日 プラントの基本的設計の概要について決定することであり，細い議論に立ち入ることは避けたい。

(5) SWCC側は，研究協力の総費用と両国の費用分担についての数字を要求した。我が方は，この段階では総費用，殊にわが方の費用分担について公式に見解を示すことはできないと解答したが，総費用については，ラフな推定値と注釈して，数字を示した。

また，我が方としては本協力のための予算を確保したいとの希望を表明し，明年1月初旬には，日本政府より公式な情報を通報できる旨，示唆した。

SWCC側は，研究協力に関する概算を，ブレーク ダウンした数字をできるだけ速やかに受けとりたいとし，我が方は，本件についてできるだけの努力をする旨，回答した。

(6) SWCC側及び我が方は，本件協力を基本的に日・サ両政府間の協力とすることを確認した。

(7) 本会談の結果として，双方には，財政的コミットメントがないことを確認し，かつ，我が方提案の技術的側面については，原則的に合意が見られた。費用に関する決定は，1978年1月までに，詳細な費用見積書が到着するのを待たなければならないこと，その際SWCCは，海水淡水化共同研究の分野における日－サ技術協力の全体の位置について再考するとし，報告書を作成して日－サ合同委にあげたいと述べた。

(8) 企画省との打合せに関しては，SWCC側は今回は時間的余裕がないため同席しないが，本件討議の議事要録を提出し，SWCC側の関心を伝えるとともに，打合せ結果について教えて欲しいとの要望があった。

(9) 本研究協力と米－サ研究協力の関係についてSWCC側は次のように述べた。

米サ海水淡水化共同研究について，米サ合同委員会においても，これが討議されてきており，米サ間の共同研究の対象は，全体にわたる網羅的なものを考えているが，なかなか具体的構想にまとまらないでいる。我が方提案の研究協力は，分野が特定され具体的であるので，米サ共同研究と競合しないようにすることは可能であろう。

2. 企画省との会談（11月8日）

(1) Jabr 工業局長，Ulfat 計画実施管理局長に対し，我が方提案及びSWCCとの議事要録を提出の上，従来の経緯及び現状について，詳細説明したところ，先方は早速SWCCとも連絡の上，所要のペーパーを作成し，次官及び大臣に提出して意見を求めることとしたい。

(2) Bashir 次官，Fayez 官房長に対し，我が方よりSWCCとの話し合いの経過，我が国の研究が他国に比較して著しく進展している事実，SWCC側でもこの事実について

は，充分認識している点等を説明の上，ＳＷＣＣ側では，この共同研究推進に必要な財政措置を取るため，これを日サ合同委で取り上げることを強く希望しているところ，企画省においてこの点につき配慮を得たい旨申し入れた。

これに対し，同次官はサウジアラビアはすでに米国との間に共同研究のための協定を締結しているが，一方日本が，この分野で進んだ技術を持っていることも充分承知しているので，両者の間に重複のないことが確認されるならば，日本との間でも共同研究を進めることに何ら反対すべき理由はないと思われるので，この点も含めＳＷＣＣ側より企画省あてに提案するよう働きかけてもらいたい。

3. 今後の対処振り

(1) ＳＷＣＣ側より提案のあった技術的コメントについて，検討する。（1－(2)－①，③）

(2) 総費用の見積り及びその積算について，至急詳細な検討を行なった後，ＳＷＣＣ側へ提出する。

(3) 日・サ双方の費用負担について，明年１月初旬提出する。

(4) ＳＷＣＣより企画省へのアプローチとしての文書が必要なため，これの推進方援助する。（例えば，文書作成に役立つ資料を作成し，ＳＷＣＣに送付する。（他国に比較した我が国の技術的優位性についてのコメント等））

(5) ＳＷＣＣにおいて，１２月中は，我が方の提案につき内部検討を行わせしめることとするため，上記(1)(2)(4)の資料は１２月中にＳＷＣＣ側に送付することとする。

（Bashir 次官は，ＳＷＣＣのBoard of Director のメンバー）

プロポーザル
前　　文

TENTATIVE PROPOSAL FOR JOINT RESEACH BETWEEN THE KINGDOM OF SAUDI ARABIA AND JAPAN ON SEAWATER DESALINATION

MINISTRY OF INTERNATIONAL TRADE AND INDUSTRY

JAPAN

Tentative Proposal for Joint Research between the Kingdom of Saudi Arabia and Japan on Seawater Desalination

1. Outline of Joint Research

On the basis of the seawater desalination technology, characterized by a long tube-type multistage flash evaporation method, which has been developed under the National R & D Project in Japan, the joint research will be carried out on the materials which are required for adaptation to the natural conditions of the Kingdom of Saudi Arabia.

For the time being, the joint research will be placed under the time schedule of a five-year program which may start in April 1978. It will be carried out with primary emphasis placed on cooperation in Phase I-exchange of information between Saudi Arabia and Japan on seawater desalination technology-and Phase II-research on the materials to be used in seawater desalinating systems-which were agreed upon earlier between the mission of the Agency of Industrial Science and Technology, Japan, and the Saline Water Conversion Corporation (SWCC), the Kingdom of Saudi Arabia.

For this purpose, a joint technical meeting of high-level researchers of both countries will be established in order to exchange views on the technical aspects and undertake studies on preventions of corrosion and scale deposition by the effective utilization of the 500 m^3/day Field Test Plant and the Material Research Laboratory.

Cost sharing of both countries which would be required for this joint research will be negociated on

another occasion. The following factors are conceivable in respect to the cooperation.

(1) Exchange of Information

A joint technical meeting will be held between Saudi Arabia and Japan to exchange information about the technology for seawater desalination. Promotion of the project will also be discussed.

(2) Establishment of Materials Research Laboratory

In order to promote this joint research in Saudi Arabia, the Material Research Laboratory will be established in SWCC and furnished with all necessary research equipment. As well as the Field Test Plant, as mentioned below, the establishment of this research laboratory constitutes an essential element of the joint research. So its early establishment is desirable.

(3) Establishment of Field Test Plant

Attached to the research laboratory, the Field Test Plant capable of desalting 500 m^3/day will be established to make a study on the operations for the research of materials.

(4) Dispatch of Researchers from Japan

Researchers from the National Chemical Laboratory for Industry, the Agency of Industrial Science and Technology, the Ministry of International Trade and Industry, which has played the leading role in the development of seawater desalination technology in Japan, and from related private firms will be dispatched to SWCC to engage in the joint research with their Saudi Arabian counterparts.

In Japan, Incidentally, a committee for the promotion of this project, comprised of experts in this field, will be established in the Ministry of International Trade and Industry. The committee will examine concrete methods for the promotion of the project and study various technical problems which arise during the course of the project.

2. Research Themes

Research on prevention of corrosion and scale deposition will be performed in an effective combination of the 500 m^3/day Field Test Plant with the Material Research Laboratory. The basic idea of the research is as follows: The plant will be operated continuously for a fixed period. During the operation, corrosion monitoring, chemical analysis of sea water, brine, fresh water, etc., and testing of the ball cleaning system will be carried out. After the plant is shut down, metallic materials and concrete evaporator shells will be inspected in detail. Further, the personnel of the Material Research Laboratory will study corrosion, scale prevention and standardization of chemical analysis. If requested, the personnel may provide consultative services in solving problems of corrosion and scale deposition in the existing plants. In the future, the scope of this research activity will be expanded to include pollution problems of the sea around the plant site.

The following are explanations for each research item.

(1) Operation of the 500 m^3/day Field Test Plant

The operation schedule is divided into short and long term operations, as well as a number of other

subdivisions. After each operation, metallic and concrete materials will be inspected. Between the short and long term operations, some tubes will be replaced for a detailed examination of corrosion. After the long term operation, the plant will be dismantled and investigated thoroughly.

1) Short term operations

(i) operations at 100°C max. and 45°C min. temperatures

(ii) operations at 120°C max. and 45°C min. temperatures

2) Material inspection after the short term operations

(i) Metallic materials

- observation of metallic corrosion and scale deposition inside tubes
- analysis of corrosion products and scale deposits

(ii) Concrete evaporator shells

- measurements of roughness and surface repulse hardness with Schmidt concrete test hammer
- measurement of air leakage

3) Long term operations as a test of durability

two operations at 120°C max. and 45°C min. temperatures

4) Corrosion monitoring

Two instruments, the "Corrator" (by linear polarization method) and the "Corrosometer" (by electric resistance method) will be used for corrosion monitoring. The testing materials are Al-Brass, 90/10 Cu-Ni and 70/30 Cu-Ni.

5) Reliability of pH control system

Preciseness and durability of the system and its components will be tested during the plant operations.

6) Examination of ball cleaning system

Through the short and long term operations, experiments will be performed to obtain the following data:

(i) overall heat transfer coefficients before and after ball cleaning

(ii) determination of interval and continuation time of cleaning

(iii) heavy metal concentration in brine after cleaning

(iv) life of balls

7) Dismantling of the plant and detailed inspection of materials

The plant will be dismantled after the long term operations. The metallic and concrete materials will be inspected as thoroughly as possible. In addition to inspections under Item 1), core samples from concrete evaporator shells will be used for mechanical strength measurement and chemical analysis.

(2) Research in Material Research Laboratory

1) Corrosion research

(i) Precise examination of metallic corrosion in the Feild Test Plant

Measurments of corrosion loss, increase in roughness by corrosion, depth and number of pits, corrosion potential and observation of

microstructure of corroded area will be conducted from the metallic samples taken from the plant.

(ii) Laboratory research on corrosion

For the selction of metallic materials and investigation of corrosion phenomena, the behavior of various metals and alloys in a variety of corrosive environments under paint conditions will be studied with electrochemical and metallurgical equipment.

2) Chemical research

Routine chemical analysis of sea water, brine and product water is required to provide precise operation conditions of the test plant. When corrosion or scale deposition takes place, concentration of particular constituents should be known in order to study the prevention method.

(i) chemical analysis

Standardization of analytical procedures and preparation of an instruction munual are necessary for routine chemical analysis.

(ii) corrosive environment in brine

The values of pH, dissolved oxygen, free chlorine, sulfide ion and heavy metals are indicators of the corrosive environment, and are essential to an understanding of corrosion.

(iii) scale deposition tendency of brine

Laboratory experiments will be conducted to study the scale deposition tendency under various conditions. The data will provide only a rough

understanding of scale deposition, but it will still be useful as a fundamental basis from which to build.

(iv) chemical identification of corrosion products and scale deposits

X-ray diffraction data and observation with a microscope are required for identification of solid compounds.

(3) Research on Corrosion and Scale Deposition in the Existing Plants

Items (1) and (2) are concerned with the 500 m^3/day Field Test Plant. The Material Research Laboratory can be utilized for the existing plants if requested.

(4) Survey of Sea Water Pollution

If necessary, a survey on pollution of the sea around the plant site will be performed in the future. The survey will involve two items.

1) distribution of polluting materials in the sea

2) diffusion of discharged brine

Diffusion can be measured as three dimensional distributions of temperature and salinity.

3. Organization for Research

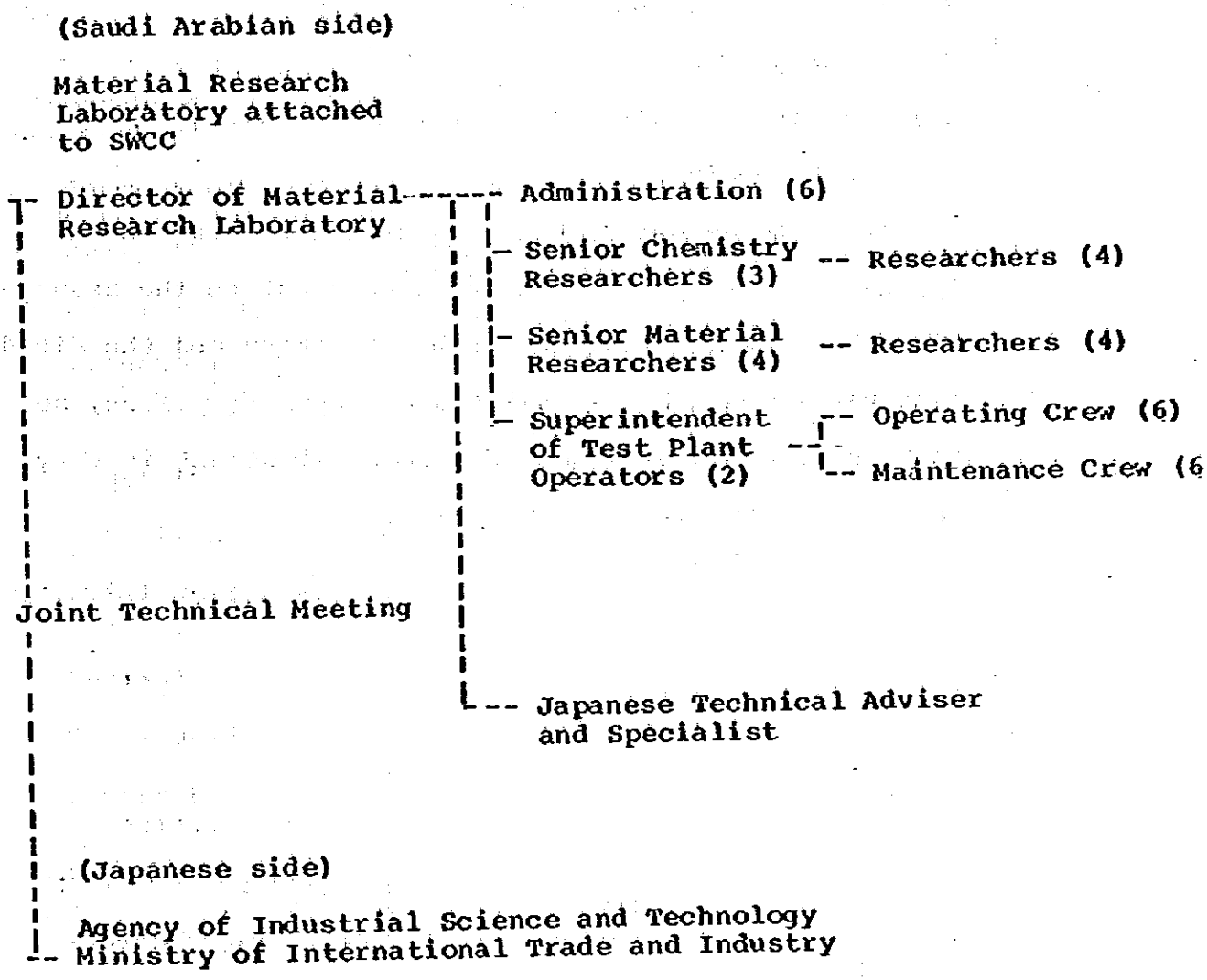
To promote this joint research, it is very inportant to organize researchers and staff of the Material Research Laboratory.

Japanese researchers, who have participated in the National R & D Project on seawater desalination for many years and are quite capable of research and development in this field, will be dispatched to SWCC. However, the

assignment of researchers and staff of the Material Research Laboratory is at least required for the SWCC side as indicated in the appended table.

In conjunction with the joint technical meeting, as mentioned above, the Japanese side will offer technical information on the prevention of corrosion and scale deposition and on the ball cleaning system, all of which have been developed by the Agency of Industrial Science and Technology. The Saudi Arabian side may offer technical information obtained by SWCC.

Furthermore, this meeting has the function to evaluate and analize results of research activities, and to orient future joint research for the purpose of further enhancing mutual understanding between Saudi Arabia and Japan.



(Note) Figures in ( ) indicate number of personnel.

4. Outline of Research Facilities

(1) Field Test Plant

See Appendix 1.

(2) List of Research Equipment

See Appendix 2.

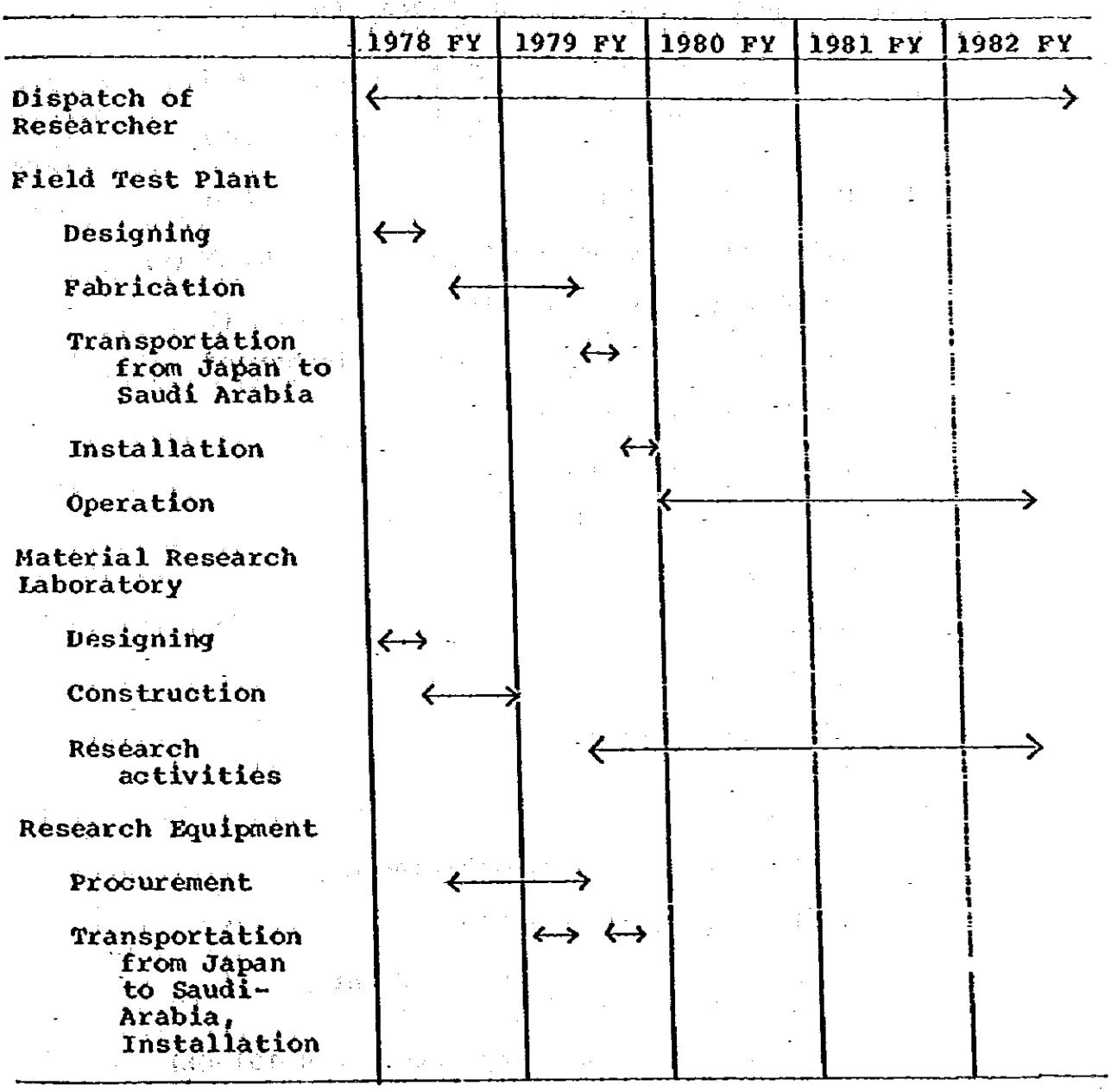
(3) Building of Materials Research Laboratory

See Appendix 3.

It is to be noted, however, that the ideas in the Appendixes are those which are worked out on the assumption that the Material Research Laboratory and the Field Test Plant would be established at separate places, so that there would be a need for some adjustment if they are constructed at the same place.

5. Tentative Schedule for Joint Research

The following schedule is recommended for a five-year research period.



(Note) The fiscal year which is used in this table refers to Japan: from April 1 to March 31, the following year.

APPEN X 1

PROPOSAL SPECIFICATIONS

FOR

500M^3/D SEA WATER DESALINATION

FIELD TEST PLANT

(CONCRETE SHELL)

1. Design Condition
   - (1) Conditions of Location
   - (2) Conditions of Utility
   - (3) Conditions of Waste Water Discharged
   - (4) Conditions of Process
   - (5) Site Condition
2. Specification of Main Equipment
   - (1) Field Test Plant
   - (2) Boiler
   - (3) Site Office
   - (4) Boiler Office

Attached Dwgs

1. P&I Diagram (8001P-181-100-OE)
2. Layout (8001P-332-100-OE)
3. Arrangement for Desali. Plant (8001P-332-101-OE)
4. Site Office Building (8001P-620-101-OE)
5. Boiler House (8001P-620-102-OE)
6. Bird's-Eye View
7. Boiler Plant Layout

1. DESIGN CONDITION

(1) Conditions of Location

A piece of land having necessary and ample space based upon the plot area of the plant proposed, wherein only necessary equipment are considered to be installed, shall be securable.

(2) Conditions of Utility

1) Seawater for feed:

Necessary quantity of clean seawater of 48,200 ppm (MAX.) in TDS shall be supplied with the plant at not higher than 32.2°C.

2) Power:

Power of 200 Volts, 3 Phase, 60 Hz, and
100 Volts, Single Phase, 60 Hz

Necessary amount of above power shall be supplied within the battery limit of the plant.

3) Water:

Necessary amount of water including for pump cooling service etc. shall be supplied within the battery limit of the plant.

(3) Conditions of Waste Water Discharged

Waste water will be discharged without any treatment.

(4) Conditions of Process

Start-up and stoppage of the plant shall be made manually and automatic control (detected by instrumentations) shall be applied while the plant will be kept running.

(5) Site Condition

1) Applicable code and standards

(1) AISC or architectural institute of Japan

(2) UBC or architectural institute of Japan

(3) ASTM & JIS (for materials)

2) Soil conditions

Bearing capacity : 15 ton/m^2 (long duration)

3) External force conditions

Horizontal seismic coefficient : H = 0.1

4) Access road

Load capacity : 50 ton/m^2 (short duration)

2. SPECIFICATION OF MAIN EQUIPMENT

(1) FIELD TEST PLANT

1) GENERAL

(1)	Capacity	500 m^3/day
(2)	Type of plant	Brine recirculating type long tube design multi-stage flash evaporator
(3)	Material of shells	Concrete
(4)	Scale prevention method	PH control by sulfuric acid injection
(5)	Scale elimination	Ball cleaning system
(6)	Performance ratio	3.0
(7)	Number of stages	Heat recovery 6 stages Heat rejection 2 stages
(8)	Seawater	TDS 48200 ppm (MAX.) Temperature(MAX.), 32.2°C Intake quantity, 385 t/h
(9)	Steam (1) Heating	7 t/h (1.5 kg/cm^2G)
	(2) Steam ejector	0.5 t/h (10 kg/cm^2G)
(10)	Concentration ratio	1.24
(11)	Flow rate of recirculating brine	174 t/h
(12)	Recirculating brine maximum temperature	120°C

2) HEAT RECOVERY SECTION

(1) Dimensions

Length	21,700 mm
Width	1,500 mm
Height	2,500 mm
Thickness (shell)	250 mm

(2) Material

Shell	Concrete
Tube bundle A	
Tube	Aluminum brass and copper-nickel alloy (90/10 Cu-Ni) (19mm diameter and 1mm thickness)
Tube plate	Copper-nickel alloy (90/10 Cu-Ni)
Water box	Copper-nickel alloy (90/10 Cu-Ni)
Tube bundle B	
Tube	Titanium tube (19mm diameter and 0.4mm thickness)
Tube plate	Titanium plate
Water box	Titanium plate

3) HEAT REJECTION SECTION

(1) Dimensions

Length	9,900 mm

	Width	1,500 mm
	Height	2,500 mm
	Thickness (shell)	250 mm

(2) Material

Shell	Concrete
Tube	Titanium tube (16mm diameter and 0.4mm thickness)
Tube plate	Titanium plate
Water box	Titanium plate

4) BRINE HEATER

(1) Dimensions

Length	3,300 mm
Shell diameter	720 mm

(2) Material

Shell	Mild steel
Tube	Aluminum brass and copper-nickel alloy (70/30 Cu-Ni) (19mm diameter and 1mm thickness)
Tube plate	Copper-nickel alloy (90/10 Cu-Ni)
Water box	Copper-nickel alloy (90/10 Cu-Ni)

(2) BOILER

1) SPECIFICATION

(1)	Type	Natural Circulation Package Type (12 VPM)
(2)	Evaporation Q'ty	Max. 10 t/h
(3)	MAX. Pressure	35 kg/cm^2G
(4)	Operating Pressure	10 kg/cm^2G
(5)	Operating Temperature	183.2°C
(6)	Boiler Efficiency (L.H.V. base)	86 - 88%
(7)	Draft System	Forced Draft
(8)	Burner System	Steam Atomizing Burner
(9)	Instrumentation System	Electric Positioning
(10)	Fuel Consumption (Light heavy oil)	890 kg/h

2) DIMENSIONS

(1)	Length	3,540 mm
(2)	Width	3,495 mm
(3)	Depth	4,827 mm

3) MATERIAL

(1)	Shell	Mild steel (SS34) (Brick Lining)
(2)	Stream & Water Drum	Carbon steel (SB46-SR)
(3)	Tube	Carbon steel (STB33-E)

(3) SITE OFFICE, BOILER HOUSE

APPENDIX 2

LABORATORY EQUIPMENT LIST

1. Laboratory Equipment for Corrosion Test
2. Laboratory Equipment for Mechanical Test
3. Laboratory Equipment for Water and Chemical Analysis
4. General Equipment
5. Glassware and Others
6. Laboratory Furniture
7. Machine and Tools
8. Process Analyzer

1. LABORATORY EQUIPMENT FOR CORROSION TEST

ITEM NO.	DESCRIPTION	QUANTITY	RECORD
1-1	Corrosometer (12 points MAGNA)	1 set	
	Probe	(12)	
	Corrosometer	(1)	
	Programmer	(1)	
	Recorder	(1)	
1-2	Corrator (4 channels MAGNA)	1 set	
	Probe	(4)	
	Controlling corrater	(2)	
1-3	Electrometer	1 set	
1-4	Tester (volt-ohm meter)	1 set	
1-5	Recorder	1 set	
1-6	Camera	1 set	
1-7	Photographic enlarger	1 set	
1-8	Metallurgical microscope	2 sets	
1-9	Roughness meter	1 set	
1-10	Mounting press	1 set	
1-11	Wet grinder and polisher	2 sets	
1-12	Spot welder	1 set	
1-13	Electropolishing and descaling equipment	1 set	

ITEM NO.	DESCRIPTION	QUANTITY	RECORD
1-14	Dryer	1 set	
1-15	Precision cutter	1 set	
1-16	Plastic desiccator (260 x 310 x 460 H)	4 sets	
(Future Plan)			
1-17	Potentiostat/galvanostat	1 set	
1-18	Immersion corrosion testing equipment	10 sets	
1-19	Profile projection	1 set	
1-20	Electron probe microanalyser	1 set	
1-21	Hydrogen analyser	1 set	
1-22	Vacuum furnace	1 set	

2. LABORATORY EQUIPMENT FOR MECHANICAL TEST (Future Plan)

ITEM NO.	DESCRIPTION	QUANTITY	RECORDS
2-1	Tensile test machine	1 set	
2-2	Microvickers hardness tester	1 set	
2-3	Vickers hardness tester	1 set	

3. LABORATORY EQUIPMENT FOR WATER AND CHEMICAL ANALYSIS

ITEM NO.	DESCRIPTION	QUANTITY
3-1	Atomic absorption and flame photometer	1 set
	(1) Air compressor	1
	(2) Hollow cathode lamp	
	Fe, Cr, Ni, Ti, Na, Ca, K, Mg, Co, V, Cu, Mo, Al, Mn, Si	1 each
	(3) Fuel gas with regulator	
	Acethylene	1
	N_2O	1
	(4) Recorder	1
3-2	Spectrophotometer	
	(1) Laboratory type	1 set
	(2) Portable type	1 set
3-3	X-ray diffractometer	1 set
3-4	Electrical conductivity meter	1 set
3-5	pH meter	
	(1) Laboratory type	2 sets
	(2) Portable type	1 set
3-6	Automatic titrater	1 set
3-7	Residual chlorine meter	1 set
3-8	Portable water analysis kit	1 set
3-9	Ion meter	1 set
	(1) Electrode	
	NH_3, Cl, S, F, NO_3	1 each

ITEM NO.	DESCRIPTION	QUANTITY
3-10	Emission spectrometer	1 set
3-11	Vacuum evaporator	2 sets
3-12	Scale deposition testing equipment	5 sets
(Future Plan)		
3-13	Turbidity meter	1 set
3-14	Portable type COD meter	1 set
3-15	TOC analyzer	1 set
3-16	Oil content determination app.	1 set
3-17	Vapor liquid equilibrium distilling app.	1 set
3-18	Hydrometer	1 set
3-19	CHN analyzer	1 set
	(1) Carrier gas with regulator	
	He	1
	O_2	1

4. GENERAL EQUIPMENT

ITEM NO.	DESCRIPTION	QUANTITY
4-1	Analytical balance, max. 200 g	2
4-2	Chemical balance, direct reading, max. 1 kg	2
4-3	Balance, max. 20 kg	1
4-4	Water distilling app.	1
4-5	Drying oven for glassware, 40 x 40 x 40 cm	2
4-6	Drying oven for chemical, 35 x 30 x 20 cm	1
4-7	Muffle furnace, max. 1,200°C, 15 x 15 x 20 cm	1
4-8	Vacuum pump, 100 ℓ/hr	2
4-9	Air compressor, tank capacity 16 ℓ	1
4-10	Magnetic stirrer	5
4-11	Magnetic stirrer, with hot plate	1
4-12	Water bath, general type	1
4-13	Refrigerator	2
4-14	Ice machine	1
4-15	Water circulating pump (Handy type)	2
4-16	Volt-ohm meter	3
4-17	Stop watch	5
4-18	Hot plate	1
4-19	Air pump (Handy type)	3
4-20	Gas flow meter	3
4-21	Laboratory mill	1
4-22	Constant temperature bath	2
4-23	Calculator	3
4-24	Digital thermometer	2
4-25	Pressure regulator	
	(1) N_2	3
	(2) H_2	2

5. GLASSWARE AND OTHERS

ITEM NO.	DESCRIPTION	QUANTITY
5-1	**Beakers**	
	(1) Beaker, hard glass, standard type	
	Capacity 50 ml	24
	" 100 ml	24
	" 200 ml	24
	" 300 ml	24
	" 500 ml	12
	" 1,000 ml	12
	" 2,000 ml	12
	(2) Beaker, hard glass, tall type	
	Capacity 500 ml	12
	(3) Beaker, hard glass, conical type	
	Capacity 300 ml	12
	(4) Beaker, silicate glass	
	Capacity 500 ml	6
	(5) Beaker, stainless steel with handle	
	Capacity 2,000 ml	3
	(6) Beaker, polyethylene with handle	
	Capacity 500 ml	3
	" 2,000 ml	3
5-2	**Flasks**	
	(1) Flask, erlenmeyer, unstoppered	
	Capacity 25 ml	12
	" 50 ml	12
	" 100 ml	24
	" 300 ml	48
	" 500 ml	24
	" 1,000 ml	12

ITEM NO.	DESCRIPTION		QUANTITY
	(2) Flask with interchangeable stopper		
	Capacity	50 ml	12
	"	100 ml	12
	"	300 ml	12
	"	500 ml	12
	(3) Flask, iodine		
	Capacity	300 ml	3
	(4) Flask, volumetric		
	Capacity	10 ml	12
	"	25 ml	12
	"	50 ml	12
	"	100 ml	12
	"	250 ml	12
	"	500 ml	12
	"	1,000 ml	12
	(5) Flask, volumetric, amber		
	Capacity	10 ml	6
	"	25 ml	6
	"	50 ml	6
	"	100 ml	6
	"	250 ml	6
	"	500 ml	6
	"	1,000 ml	6
5-3	Pipette		
	(1) Pipette, volumetric		
	Capacity	0.5 ml	12
	"	1 ml	12
	"	2 ml	12
	"	5 ml	24

ITEM NO.	DESCRIPTION	QUANTITY
	Capacity 10 ml	24
	" 20 ml	12
	" 25 ml	12
	" 50 ml	12
	(2) Pipette, graduated	
	Capacity 1 ml	12
	" 2 ml	12
	" 5 ml	12
	" 10 ml	12
	" 25 ml	12
	(3) Pipette, safety automatic	
	Subdivision 0.05 ml, Capacity 5ml	3
	" 10ml	3
5-4	Burettes	
	(1) Burette, plain, teflon plug	
	Subdivision 0.05 ml, Capacity 5ml	6
	" 0.05 ml, " 10 ml	6
	" 0.1 ml, " 25 ml	3
	" 0.1 ml, " 50 ml	3
	(2) Burette, blue line, teflon plug	
	Subdivision 0.1 ml, Capacity 50 ml	3
	(3) Burette, amber, teflon plug	
	Subdivision 0.1 ml, Capacity 50 ml	3
	(4) Burette, micro, plain, teflon plug with stand	
	Capacity 1 ml	3
	" 2 ml	3
	" 5 ml	2
	" 10 ml	2
	(5) Burette, automatic, plain, teflon plug with bulb and reservoir	

ITEM NO.	DESCRIPTION	QUANTITY
	Subdivision 0.1 ml, Capacity 10 ml	3
	" 0.1 ml, " 25 ml	6
	" 0.1 ml, " 50 ml	6
	(6) Burette, automatic, amber, teflon plug with bulb and reservoir	
	Subdivision 0.1 ml, Capacity 25 ml	6
	" 0.1 ml, " 50 ml	6
5-5	Bottles	
	(1) Bottle, plastic with screw cap	
	Capacity 250 ml	36
	" 500 ml	36
	" 1,000 ml	36
	(2) Bottle, reagent, narrow mouth with stopper	
	Capacity 250 ml	48
	" 500 ml	48
	" 1,000 ml	48
	(3) Bottle, reagent, amber, narrow mouth with stopper	
	Capacity 250 ml	24
	" 500 ml	24
	" 1,000 ml	24
	(4) Bottle, reagent, wide mouth with stopper	
	Capacity 100 - 120 ml	12
	(5) Bottle, reagent, amber, wide mouth with stopper	
	Capacity 100 - 120 ml	12
	" 250 ml	6
	" 500 ml	6
	(6) Bottle, dropping with pipette and test	
	Capacity 100 - 120 ml	12

ITEM NO.	DESCRIPTION	QUANTITY
	(7) Bottle, dropping, amber with pipette and test	
	Capacity 100 - 120 ml	12
	(8) Bottle, filtering, buchner type	
	Capacity 250 ml	12
	" 500 ml	12
	" 1,000 ml	6
	(9) Bottle, washing, polyethylene	
	Capacity 500 ml	24
	(10) Bottle, polyethylene with stopcock	
	Capacity 10 ml	3
	(11) Bottle, gas washing	
	(a) Dressel type Capacity 250 ml	12
	(b) Fritted disc type " 250 ml	12
	(12) Bottle, weighing	
	40 mm (high) x 20 mm (diameter)	12
	60 mm (high) x 30 mm (diameter)	12
5-6	Cylinders	
	(1) Cylinder, glass, graduated with stopper	
	Capacity 25 ml	24
	" 50 ml	24
	" 100 ml	24
	" 250 ml	24
	" 500 ml	24
	" 1,000 ml	24
	" 2,000 ml	6
	(2) Cylinder, glass, graduated, unstoppered	
	Capacity 5 ml	12
	" 10 ml	12
	" 10 ml (cone type)	12
	" 100 ml	12

ITEM NO.	DESCRIPTION	QUANTITY
	Capacity 250 ml	12
	" 500 ml	12
	" 1,000 ml	12
	" 2,000 ml	6
5-7	Condensers	
	(1) Condenser, liebig type Length 300 - 350 mm	3
	(2) Condenser, dimroth type Length 300 - 350 mm	3
	(3) Condenser, graham type Length 300 - 350 mm	3
5-8	Crucibles and Dishes	
	(1) Crucible, porcelain with cover (B-type) Capacity 30 ml	12
	(2) Crucible, porcelain, gooch type 40 mm diameter with 24 mm inlet board Capacity 35 ml	12
	(3) Dish, evaporating Diameter 85 mm, Capacity 100 ml	12
	" 120 mm, " 260 ml	12
	(4) Crucible, platinum Capacity 120 - 150 ml	2
5-9	Funnels	
	(1) Funnel, separatory with teflon plug Capacity 100 ml	12
	" 250 ml	12
	" 500 ml	12
	" 1,000 ml	12

ITEM NO.	DESCRIPTION	QUANTITY
	(2) Funnel, filtering	
	ID at top 75 mm	24
	" 100 mm	12
	" 200 mm	6
	" 75 mm (Long stem)	6
	(3) Funnel, buchner type, porcelain	
	ID at top 100 - 120 mm	6
	(4) Funnel, buchner type, fritted glass disc	
	ID at top 60 - 70 mm	3
	(5) Funnel with fritted disc	
	JIS No. 1, Capacity 30 ml	6
	JIS No. 2, " 30 ml	6
	JIS No. 3, " 30 ml	6
	JIS No. 4, " 30 ml	6
	Stem for above	6
5-10	Disiccators with Perforated Porcelain Plate	
	(1) Desiccator, scheibler type with perforated porcelain plate	
	Diameter, inside 150 mm	6
	" 300 mm	2
	(2) Desiccator, vacuum type with cover and stopcock	
	Diameter, inside 300 mm	2
	(3) Desiccator, scheibler type, amber	
	Diameter, inside 150 mm	2
5-11	Test Tubes	
	Hard glass 200 (L) x 21 (D) mm	100
	" 150 (L) x 12 (D) mm	100

ITEM NO.	DESCRIPTION	QUANTITY
5-12	Watch Glasses	
	Diameter 75 mm	36
	" 120 mm	36
5-13	Glass Tubing	
	(1) 1,500 mm length, 6 - 7 mm OD, glass rod	10
	(2) 1,500 mm length, 1 mm ID capillary, hard glass	5
	(3) 1,500 mm length, 2mm ID 6 - 7 mm OD, hard glass	5
	(4) 1,500 mm length, 4mm ID medium wall, hard glass	30
	(5) 1,500 mm length, 6mm ID medium wall, hard glass	30
	(6) 1,500 mm length, 8mm ID medium wall, hard glass	30
	(7) 1,500 mm length, 12 mm ID medium wall, hard glass	10
	(8) 1,500 mm length, 16 mm ID medium wall, hard glass	5
	(9) 1,500 mm length, 19 mm ID medium wall, hard glass	5
	(10) 1,500 mm length, 26 mm ID medium wall, hard glass	3
5-14	Glass Stopcocks, Interchangeable plug for Liquid	
	(1) Straight type, Arms 5 - 6 mm OD	12
	(2) Straight type, Arms 7 - 8 mm OD	12
	(3) Three way type, Arms 7 - 8 mm OD	6
5-15	Tubes, Connecting, T-shaped, Glass	
	Arms 7 - 8 mm OD	12

ITEM NO.	DESCRIPTION		QUANTITY
5-16	Tubes, Connecting, Y-shaped, Glass		
	Arms 7 - 8 mm OD		12
5-17	Filter Pump (Aspirator)		
	Length 300 - 350 mm		12
5-18	Glass stopcock for Gas		
	(1) Stopcock, high vacuum, oblique bore		
	Arms 7 - 8 mm OD		6
	" 10 - 12 mm OD		6
	" 13 - 15 mm OD		6
	(2) Stopcock, high vacuum, three way bore		
	Arms 7 - 8 mm OD		3
	" 10 - 12 mm OD		3
5-19	Drying Tubes, U-shape with Side Arms and Stoppers		
	Height of tube, 100 - 150 mm		6
5-20	Stopper, Cork		
	Size No.	Top Diameter mm/Bottom Diameter mm	
	1	15/12	100
	2	16.5/13.5	100
	3	18/15	100
	4	19.5/16.5	100
	6	22.5/19.5	100
	8	25.5/22.5	50
	10	30/27	50
	12	36/33	50
	14	42/39	50
	16	48/45	50
	18	54/51	50

ITEM NO.	DESCRIPTION	QUANTITY
5-21	Stopper, Rubber	
	Size No. — Top Diameter mm/Bottom Diameter mm	
	03 — 11/ 9	20
	01 — 14/10	20
	0 — 15/12	20
	1 — 16/12	20
	2 — 18/14	20
	3 — 19/15	50
	4 — 20/16	20
	5 — 22/19	20
	6 — 23/20	20
	7 — 25/21	20
	8 — 28/23	20
	9 — 30/25	20
	10 — 32/28	20
	12 — 37/32	10
	14 — 41/37	10
	16 — 46/40	10
	18 — 52/46	10
	20 — 58/51	10
	25 — 74/63	10
	30 — 90/84	10
5-22	Stopper, Silicone	
	Size No. — Top Diameter mm/Bottom Diameter mm	
	3 — 19/15	20
	8 — 28/23	10
5-23	Tubings	
	(1) Tubings, rubber, red	
	3mm (ID) x 4.6 mm (OD)	10 m
	5mm (ID) x 7 mm (OD)	20 m

ITEM NO.	DESCRIPTION	QUANTITY
	8 mm (ID) x 11.6 mm (OD)	50 m
	12 mm (ID) x 17.0 mm (OD)	50 m
	(2) Tubing, rubber for gas burner	
	8 mm (ID) x 12 mm (OD)	30 m
	(3) Tubing, rubber for vacuum	
	4.5 mm (ID) x 15 mm (OD)	10 m
	6 mm (ID) x 21 mm (OD)	10 m
	9 mm (ID) x 24 mm (OD)	10 m
	(4) Tubing, rubber for high pressure	
	8 mm (ID) x 18 mm (OD)	10 m
	(5) Tubing, synthetic rubber	
	5 mm (ID) x 7 mm (OD)	10 m
	7 mm (ID) x 10 mm (OD)	10 m
	10 mm (ID) x 14.5 mm (OD)	10 m
	(6) Tubing, silicone	
	6 mm (ID) x 8 mm (OD)	10 m
	8 mm (ID) x 11 mm (OD)	10 m
	12 mm (ID) x 16 mm (OD)	10 m
	(7) Tubing, polyvinyl chloride	
	3 mm (ID) x 5 mm (OD)	10 m
	6 mm (ID) x 8 mm (OD)	50 m
	8 mm (ID) x 11 mm (OD)	30 m
	10 mm (ID) x 13 mm (OD)	30 m
	15 mm (ID) x 19 mm (OD)	20 m
	18 mm (ID) x 22 mm (OD)	10 m
	25 mm (ID) x 29 mm (OD)	10 m
5-24	Bucket, polyethylene	
	Capacity 10 ℓ	12
5-25	Siphone, polyethylene, middle type	6

ITEM NO.	DESCRIPTION	QUANTITY
5-26	Thermometer, General Use	
	Temperature range 0 - 100°C	12
	" 0 - 250°C	6
	" 0 - 360°C	6
5-27	Transformer, variable, total capacity 1 KW	3
5-28	Boring Apparatus	
	(1) Borer, for cork, set	3
	(2) Borer, for rubber, set	3
	(3) Cork borer sharpener	2
5-29	Cork press, rotary	1
5-30	Tripod, iron 20 - 22 cm high, 10 - 12 cm OD	12
5-31	Triangle, with clay pipe stem	24
5-32	Asbestos wire gauge, 18 cm x 18 cm square	100
5-33	Asbestos	
	(1) Asbestos, band, 3 cm width, high quality (AAA)	60 m
	(2) Asbestos, band, 5 cm width, high quality (AAA)	60 m
	(3) Asbestos, yarn, 3 mm, high quality (AAA)	50 m
5-34	Pinch cock, middle type	24
5-35	Screw Cocks	
	(1) Screw cock, large type (5 cm)	24
	(2) Screw cock, middle type (3 cm)	24

ITEM NO.	DESCRIPTION	QUANTITY
5-36	Mortars	
	(1) Mortar and pestle, porcelain, 150 mm OD	3
	(2) Mortar and pestle, agate, 150 mm OD	2
5-37	Tongs	
	(1) Tong, crucible, 150 - 180 mm long	6
	(2) Tong, crucible, 220 - 250 mm long	2
	(3) Tong, crucible, 500 - 600 mm long	2
	(4) Tong, breaker, safety, 300 mm long	2
	(5) Tong, crucible with platinum shoes, 200 - 250 mm long	2
5-38	Forceps	
	(1) Forcep, general use, 120 mm long	12
	(2) Forcep, general use, 180 mm long	12
	(3) Forcep, general use, 300 mm long	6
	(4) Forcep, telfon coating, 180 mm long	3
5-39	Spoons	
	(1) Spoon, general use, 150 mm long	12
	(2) Spoon, general use, 180 mm long	12
	(3) Spoon, with spatula, 150 mm long	6
	(4) Spoon, with spatula, 180 mm long	6
5-40	Spatula, stainless steel, 150 mm long	6
5-41	Clamps	
	(1) Clamp, versatile, small size	12
	(2) Clamp, versatile, medium size	12

ITEM NO.	DESCRIPTION	QUANTITY
	(3) Clamp, versatile, large size	24
	(4) Clamp holder, regular type	48
5-42	Supports	
	(1) Support stand, tripod base, 50 cm high	6
	(2) Support stand, tripod base, 90 cm high	6
	(3) Support, funnel for two funnel	2
	(4) Support, buret with holder and porcelain base	6
	(5) Support, test tube	2
	(6) Support, pipet	3
5-43	Rings	
	(1) Ring support, cast iron with clamp, small size	6
	(2) Ring support, cast iron with clamp, medium size	12
	(3) Ring support, cast iron with clamp, large size	6
5-44	Gas Burners	
	(1) Gas burner, standard type	12
	(2) Gas burner, Meker type	3
5-45	Blower, rubber (Spray)	12
5-46	Pipette filler, rubber	6
5-47	Papers	
	(1) Paper, filtering, qualitative No. 1 12.5 cm (diameter)	600

ITEM NO.	DESCRIPTION	QUANTITY
	(2) Paper, filtering, qualitative No. 1 18.5 cm (diameter)	600
	(3) Paper, filtering, qualitative No. 2 12.5 cm (diameter)	600
	(4) Paper, filtering, quantitative No. 5A 12.5 cm (diameter)	600
	(5) Paper, filtering, quantitative No. 5B 12.5 cm (diameter)	600
	(6) Paper, filtering, quantitative No. 5C 12.5 cm (diameter)	600
	(7) Paper, filtering, oil, 800 x 300 mm square	200
	(8) Paper, paraffin, pack of 500 sheets	6 packs
	(9) Paper, for pH test, pH range 0.4 - 13.6	6 sets
5-48	Emery Paper	
	(1) Fine	24 sheets
	(2) Medium	24 sheets
	(3) Coarse	24 sheets
5-49	Brushes	
	(1) Brush, for test tube	12
	(2) Brush, for burette	12
	(3) Brush, for flask, middle type	12
	(4) Brush, for flask, large type	12
	(5) Brush, for pipette	12
	(6) Brush, for beaker	6
5-50	Vessel, evacuated with case capacity 1 l	6
5-51	Platinium dish	2
5-52	DO measuring bottle	10

6. LABORATORY FURNITURE

ITEM NO.	DESCRIPTION	QUANTITY
6-1	Center table with 2 sink, length 4 m	2 sets
6-2	Center table with 1 sink, length 4 m	1 set
6-3	Work table for micro-polishing room, 3 x 1.2 m	1 set
6-4	Work table for machine shop, 3 x 1 m	1 set
6-5	Side bench with utility box, length 3 m	3 sets
6-6	Side bench with utility box, length 2.4 m	6 sets
6-7	Side bench with utility box, length 1.8 m	4 sets
6-8	Side bench with utility box, length 1.5 m	2 sets
6-9	Side bench without utility box, length 3 m	3 sets
6-10	Side bench without utility box, length 2.4 m	1 set
6-11	Side bench without utility box, length 1.8 m	1 set
6-12	Corner bench with utility box	4 sets
6-13	Special side bench for dark room	1 set
6-14	Balance table, length 0.9 m	1 set
6-15	Fume hood, length 1.8 m	3 sets
6-16	Cabinet, length 1.5 m	8 sets
6-17	Cabinet, length 1.2 m	3 sets
6-18	Shelf, length 1.5 m	7 sets
6-19	Shelf, for stock room (Total length approx. 25 m)	1 set
6-20	Desk with chair	5 sets
6-21	Special labo. chair	30 sets
6-22	Sink, length 1 m	2 sets
6-23	Special blind for EPMA and microscopic anal. room	2 sets
6-24	Black curtain	1 set
6-25	Tool box and tool cabinet for machine shop	1 set

7. MACHINE AND TOOLS

ITEM NO.	DESCRIPTION	QUANTITY	RECORDS
7-1	Precision lathe	1 set	
7-2	Bench drilling machine	1 set	
7-3	Electric bench grinder	1 set	
7-4	Cutter	1 set	
7-5	Electric drill	2 sets	
7-6	Hand lever shear	1 set	
7-7	Hack sawing machine	1 set	
7-8	Universal swivelling bench vice	1 set	
7-9	Cast anvil	1 set	
7-10	Hack saw frame	1 set	
7-11	File each size	1 set	
7-12	Caliper	1 set	
7-13	Steel tape measuring	1 set	
7-14	Steel rule	1 set	
7-15	Vernier caliper	1 set	
7-16	Micrometer (All kinds)	1 set	
7-17	Adjustable tap wrench	1 set	
7-18	Electric soldering iron	1 set	
7-19	Spanner (Each size)	1 set	
7-20	Adjustable angle wrench	1 set	
7-21	Water pump plier	1 set	
7-22	Side cutting plier	1 set	
7-23	Radio plier	1 set	
7-24	Diagonal cutting nipper	1 set	

ITEM NO.	DESCRIPTION	QUANTITY	RECORDS
7-25	Figure and letter punch	1 set	
7-26	Wire stripper	1 set	
7-27	Hammer	1 set	
7-28	Plastic hammer	1 set	
7-29	Tinners scissors	1 set	
7-30	Oil guns	1 set	
7-31	Screw drivers (All kinds)	1 set	
7-32	Box spanner	1 set	
7-33	Gas cutter	1 set	
(Future Plan)			
7-34	Shaper	1 set	
7-35	Box type furnace	1 set	
7-36	Arc welding machine	1 set	
7-37	TIG welding machine	1 set	

8. PROCESS ANALYZER

ITEM NO.	DESCRIPTION	QUANTITY
8-1	DO meter	1 set
8-2	CO_2 meter (Infra-red)	1 set

APPENDIX 3

PLAN OF MATERIAL RESEARCH LABORATORY

1. General

2. Buildings

3. Building facilities
   Building Facility Equipment List

Attached Dwgs

1. Material Research Laboratory
   Floor Plan

2. Material Research Laboratory
   Elevations, sections Fin. Schedules

3. Loop Test Shop
   Plan, Elevations, Sections Fin. Schedules

1. GENERAL

Function of each part of the laboratory is briefly explained below.

(1) Entrance (No. 1)

Double-door will be installed for the purpose of air conditioning and of preventing entry of sand.

(2) Lobby (No. 2)

The lobby will be spacious enough to give a splendid impression and to allow installation of a set of lounge furniture for talking with guests for a short time.

(3) Reception rooms (Nos. 3, 4)

The reception room will have a space capable of accommodating approximately 7 - 8 guests per room.

(4) Director's room (No. 5) and Secretary room (No. 12)

The secretary room will be provided in front of the director room for enabling the secretary to satisfactorily conduct his (her) work.

(5) Conference room (No. 6)

The conference room will have a space sufficient to hold a conference attended by 15 - 16 persons and to accommodate, if fully utilized, all of the expected number of laboratory personnel amounting to 30.

(6) Office rooms (Nos. 8 - 11)

While being arranged as engineer's rooms, the office rooms can be used for a variety of purposes. Office room No. 8 can be used as an office for the laboratory administration and clerical work. Accordingly, the information counter will be provided with a door to office room No. 8.

(7) Corridor (No. 7)

The corridor will be 3 m in width and will give a wide impression. This width or so is necessary for enabling escape in the event of emergencies.

(8) Locker room (No. 13)

The locker room will be provided with lockers for laboratory technicians.

(9) Library (No. 14)

Although being somewhat small in floor area, the library will be capable of considerably large amount of accommodation by microfilming as far as possible the documents and drawings to be accommodated.

(10) Laboratory technicians room (No. 15)

This is a waiting room to be used by laboratory technicians.

(11) Dark room (No. 16)

The dark room is for development of photographs necessary mainly in the course of material tests.

Meanwhile, each door of the laboratory room will be of the outside opening type for the purpose of easy escape in the event of an emergency.

(12) X-ray room (No. 17)

The X-ray room will accommodate the X-ray diffractometer indispensable for analysis of scales, materials and other solids, and will be of the dark room type.

(13) Preparation room (No. 18)

The preparation room is mainly for preparing specimen for the X-ray diffractometer, and will be provided with desks, cabinets, etc. for data analysis.

(14) Microscopic analysis room (No. 20)

The microscopic analysis room is for accommodating various optical facilities for materials corrosion research, i.e. microscope, projector, hardness tester, roughness tester, etc., and will be of the dark room type.

(15) X-MA room (No. 19)

Although being very expensive, the X-ray microanalyzer (X-MA) will be installed since it is indispensable for future material analysis, and X-MA room will be of the dark room type.

(16) Micropolishing room (No. 21)

In the micropolishing room, various operating table, centered on the micropolishers for preparing test pieces, will be arranged.

(17) Corrosion test and chemical analysis room (Nos. 22, 23)

This room is for conducting small scale corrosion tests using test pieces and analysis of several waters, and will mainly be provided with the laboratory bench.

(18) Instrumental analysis room (No. 24)

This room will be provided with facilities necessary for analysis of water. Being for conducting common items of work, these three (3) rooms Nos. 22, 23 and 24 will be connected to each other by connecting doors.

(19) Control room for loop test (No. 25)

This room will be provided with a control box for facilities installed at the loop test shop.

(20) Stock room for glassware and chemicals (No. 26)

This stock room is for accommodating spare glassware and chemicals.

(21) Air conditioning machine room (No. 33)

This room is for accommodating the air conditioner and heater. Meanwhile, rooms Nos. 2-, 31 and 33 emitting noises will be grouped together and installed at the end of the laboratory.

(22) Mechanical test room (No. 28)

This room will accommodate the tensile testing machine and vacuum furnace.

(23) Preparation room (No. 29)

This room is for serving as a spare room for use for various purposes.

(24) Tea service (No. 30)

This will have a space sufficient for conducting tea service and installing a kettle.

(18) Instrumental analysis room (No. 24)

This room will be provided with facilities necessary for analysis of water.
Being for conducting common items of work, these three (3) rooms Nos. 22, 23 and 24 will be connected to each other by connecting doors.

(19) Control room for loop test (No. 25)

This room will be provided with a control box for facilities installed at the loop test shop.

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(24) Tea service (No. 30)

This will have a space sufficient for conducting tea service and installing a kettle.

2.2 Design Basis

(1) Applicable code, standards, etc.

(a) AISC

(b) UBC

(c) ASTM & JIS (for materials)

(2) Soil conditions

Bearing capacity 15 t/m^2 (long duration)

(3) External force conditions

Horizontal seismic coefficient H = 0.1

2.3 Design Drawings

(1) Material research laboratory

Bird's-eye view	5-1646-R001
Plan	5-1646-R002-B
Elevation	5-1646-R003-B

(2) Loop test shop

Plan, elevation and section	5-1646-R003-C

3. BUILDING FACILITIES

3.1 Outline

The laboratory for material research shall be provided with the following facilities:

(a) Air conditioning

(b) Ventilation

(c) Sanitary facilities

(d) Septic tank

(e) Electric facilities

(f) City gas

(g) Cold and hot water supply

(h) Telephone system

(i) Sewer system
(Laboratory waste, rain water, etc.)

3.2 Design Basis

(1) Applicable code, standards, etc.

(a) NPC, ASHRAE (for design)

(b) ASTM, JIS (for equipment and materials)

(2) Temperature conditions

		Ambient Temp.	Room Temp.
Winter	Dec. - Feb.	30°C	21°C
Summer	Mar. - Nov.	41°C	26°C
		Humidity (70%)	Humidity (50%)
At night		0°C	21°C

(3) Electric power source of laboratory equipments

230 V/50 Hz

(4) Air-conditioning and ventilation system (each room)

Centralized system
(Air-conditioner + Air duct + Discharge outlet)

(5) Sewage

Rain water and waste water from sanitary facilities, laboratory and septic tanks are collected at a common pit.

(6) Indoor illumination

(a) Luminous intensity above the laboratory table is 500 lux. Fluorescent lighting is of 2-tube, semi-embedded type.

(b) Loop test shop is 400 lux above the floor.

BUILDING FACILITY EQUIPMENT LIST

1. AIR CONDITIONING

2. HOT WATER SUPPLY

3. VENTILATION

4. POWER RECEIVING

1. AIR CONDITIONING

ITEM NO.	DESCRIPTION	QUANTITY	RECORD
1-1	Water Chilling Units	2 sets	
	Cooling Capacity	192500Kcal/H	
	Cooling Water Inlet Temperature	7°C	
	Cooling Water Outlet Temperature	12°C	
	Cooling Water Rate	6501/min	
	Condenser Water Flow Rate	8501/min	
	Motor For Compressor	30Kw x 2 Units	
	Water Chilling Units	1 set	
	Cooling Capacity	11000Kcal/H	
	Cooling Water Inlet Temperature	7°C	
	Cooling Water Outlet Temperature	12°C	
	Cooling Water Rate	351/min	
	Condenser Water Flow Rate	551/min	
	Moter For Compressor	3.75Kw	
1-2	Air Handling Units	1 set	
	Cooling Capacity	385000Kcal/H	
	Heating Capacity	215000Kcal/H	
	(Electric Heater)	(250Kw)	
	Air Flow	21605m^3/H	
	Static Pressure Outside The Unit	20mmH_2O	
	Moter For Fan	11Kw	
1-3	Water Cooled Packaged Airconditioners	1 set	
	Cooling Capacity	165000Kcal/H	
	Heating Capacity	129000Kcal/H	
	(Electric Heater)	(150Kw)	
	Condenser Water Flow Rate	7001/min	
	Air Flow	13860m^3/H	
	Static Pressure Outside The Unit	20mmH_2O	
	Moter For Fan	7.5Kw	
	Moter For Compressor	37Kw	

ITEM NO.	DESCRIPTION	QUANTITY	RECORD
	Water Cooled Packaged Airconditioners	1 set	
	Cooling Capacity	56000Kcal/H	
	Heating Capacity	51600Kcal/H	
	(Electric Heater)	(60Kw)	
	Condenser Water Flow Rate	240l/min	
	Air Flow	11300m^3/H	
	Static Pressure Outside The Unit	20mmH_2O	
	Moter For Fan	3.7Kw	
	Moter For Compressor	15Kw	
1-4	Cooling Towers	2 sets	
	Cooling Ton	80RT	
	Cooling Water Flow Rate	850l/min	
	Moter For Fan	1.5Kw x 4 Units	
	Cooling Towers	1 set	
	Cooling Ton	50RT	
	Cooling Water Flow Rate	700l/min	
	Moter For Fan	0.75Kw x 2 Units, 1.5 Kw x 2 Units	
	Cooling Towers	1 set	
	Cooling Ton	20RT	
	Cooling Water Flow Rate	240l/min	
	Moter For Fan	1.5Kw	
	Cooling Towers	1 set	
	Cooling Ton	5RT	
	Cooling Water Flow Rate	55l/min	
	Motor For Fan	0.75Kw	
1-5	Pump	2 sets	
	Water Flow Rate	1300l/min	
	Head 125ϕ	20mH_2O	
	Moter Output	11Kw	

ITEM NO.	DESCRIPTION		QUANTITY	RECORD
	Pump		10 sets	
	Water Flow Rate		850l/min	
	Head	100ϕ	20mH_2O	
	Moter Output		5.5Kw	
	Pump		2 sets	
	Water Flow Rate		240l/min	
	Head	65ϕ	20mH_2O	
	Moter Output		2.2Kw	
	Pump		4 sets	
	Water Flow Rate		55l/min	
	Head	40ϕ	20mH_2O	
	Moter Output		1.5Kw	
	Pump		2 sets	
	Water Flow Rate		10l/min	
	Head	40ϕ	50mH_2O	
	Moter Output		2.2Kw	
1-5	Tank	8 m^3	1 set	
	Tank	0.2 m^3	1 set	
1-6	Power Control Panel	3ϕ 400/230V 4W 50HZ	1 set	

2. HOT WATER SUPPLY

ITEM NO.	DESCRIPTION	QUANTITY	RECORD
2-1	Hot Water Boiler	1 set	
	Electric	3ϕ 230V 50H 26.5 Kw	
	Capacity	600 l 22,500Kcal/H	

3. VENTILATION

3-1	Wall Ventilator/with Filter Box	
	500ϕ x 0.4Kw	2 sets
	450 x 0.25	2 "
	400 x 0.2	2 "
	350 x 0.2	2 "
	300 x 0.1	2 "
	250 x 0.1	1 set

4. POWER RECEIVING

4-1	Main Panel 3ϕ 4W 400/230V 50HZ $1{,}500^{W} \times 1{,}500^{L} \times 500^{H}$	1 set
4-2	Lighting Control Panel 3ϕ 4W 400/230V 50HZ $600^{W} \times 150^{L} \times 1{,}400^{H}$	1 set
4-3	Power Control Panel 3ϕ 4W 400/230V 50HZ $1{,}000^{W} \times 350^{L} \times 2{,}000^{H}$	1 set
4-4	Cable	
4-5	Cable Back	
4-6	Other Material	

4. LABORATORY EQUIPMENT

4.1 Estimation Basis

(1) The type and number of laboratory equipments are selected and attached as equipment list. These equipments shall be utilized not only for the test of seawater and brine from the plant for field testing of materials but also for the corrosion test of materials.

(2) Three (3) copies of instruction books for each equipment (written in English) are attached, but test and analysis methods are not included in above instruction book.

4　53年2月　ミッション

Tentative Cost
Estimation は第2回
合同委資料に掲載

サウジ アラビア王国海水淡水化
技術協力事前調査団 報 告

昭和53年3月

1. 調査の目的

昭和５３年度から実施を予定しているサウジ アラビア海水淡水化技術に関する研究調査プロジェクトに対する協力について，サウジ アラビア海水淡水化公団と協力の内容，実施方法，費用の分担，合意の形式等について話し合い，実施のための準備を行なうことを目的としている。

2. 調査日程

昭和５３年２月１８日から２月２５日迄，別表の日程で実施した。

3. 調査団の構成

国際協力事業団　鉱工業計画課長　佐伯嘉彦を団長とし，工業技術院東京工業試験所　プロセス開発部第一課長　後藤 藤太郎，同院国際研究協力官室 課長補佐　長田 直俊の３名で構成した。

なお，ＳＷＣＣ（サウジ アラビア海水淡水化公団）との討議には，通商産業省通商政策局技術協力課長　中島 福雄氏，工業技術院 研究開発官付，研究開発専門職 石川明美氏，外務省経済協力局 開発協力課 班長　松本 好隆氏と合流した。

4. 事前調査結果の概要

当初の計画では，ＳＷＣＣ（サウジ アラビア海水淡水化公団）と話し合うとともに，企画省に説明に行くこととしていたが，出発前になつて，在サウジ アラビア日本大使館から企画省に都合を打診したところ，企画省はＳＷＣＣから何の説明も受けていない。ＳＷＣＣの考えを聞いたうえで考えたいとのことであるので，今回企画省へ行つても仕方がない」旨の連絡が入り，予定を中止した。

第一日目

Western Region 担当のAbdul Aziz Nassif 局長に表敬。

当方から別添R/D案とその付属文書（案）を手交し，翌日の会議の打合せを行なつた。

第二日目

前記局長も出席したが，主として Saeed Najjar 技術顧問ほか３名の技術者との間で技術的な問題について意見を交換した。しかしながら，予算，費用分担，合意の形式等については，彼等の権限外であるとの返事であつた。

この会議での論点は次のとおりである。

㈠ コンクリート缶体は，従来のスチール パイプに比べて優利であるか。

一腐蝕に強く，安いのが特徴である。

㈱ 造水比　1：3　を　1：6　にしたい。実用目的でも使いたい。
一研究目的のためには，1：3で十分である。
－1：6にし，実用で使う場合には，170百万円の費用で可能である。
ただし，日本側としては，この費用を負担できないので，研究終了後，増設することを勧めたい。

㈲ 日本からの専門家の派遣人数は，十分であるか。
最終年次の途中で日本の専門家が居なくなるのは困る。協力期間中フルに居て欲しい。

㈳ アラブ人カウンター・パートは，サウジ アラビア人だけで指定の人数は集められない。日本から出してもらえないか。又，他の中近東諸国の人でも良いか。
－日本から連れて来るのは難しいが，検討してみよう。

㈴ 研究所のサイトについては，未だ決っていない。近く決まるであろう。東部にすることが有力だ。（将来の水需要が増が見込まれる。）
場所がジェッダ以外でも差支えないか。
－特に問題はないと思う。

㈵ 予算の問題は，上の問題なので，上の者と話をして欲しい。

第三日目

Isam Jamjoom 副総裁と会談

専門家から話を聞いている。内容的には良く分った。しかしながら，企画省及び大蔵省が了解し，企画省からのgo sign がないと公団としては動けない。企画省と話をつけて欲しい。企画省から指示があつて始めて，公団として実施について意見が出せる。
（向井書記官に対し）君が何度もリヤドに飛ばなければだめだ。

だからと言つて，公団が本件に不熱心だと考えないで欲しい。我々としては，スタートするばかりになつている。要はイグニッションが必要なだけだ。

日サ合同委に出席するかどうかは，窓口になつている企画省からの指示次第なので，大使館からそのように働きかけて欲しい。

合意の形式については，企画省，大蔵省の問題である。

大使館の判断

4月初旬の日サ合同委の議題として取り上げ，その際，海水淡水化公団からも人を出してもらい，分科会を設置して，R/Dをつめたらどうか。

ナーゼル企画大臣は，本件を未だ十分知らないと思われるので，日サ合同委の機会を利用してgo sign を出してもらうようにしてもらいたい。

別　表

日　　程

2月18日(土)	11.00	東京発 — パリ乗換 — ロンドン着
2月19日(日)	9.00	在英日本大使館　林書記官訪問
	12.55	ロンドン発 — ジェッダ着
2月20日(月)	9.00	日本大使館 打合せ
		参事官，向井書記官
	11.00	海水淡水化公団訪問
		Abdul Aziz Nassif 局長表敬
		会議予定 打合せ
	2.00	大使館 打合せ
2月21日(火)	9.00	海水淡水化公団 訪問
		R/D案の内容等について討議
	2.00	大使館 打合せ
2月22日(水)	10.30	海水淡水化公団 訪問
		Isam Jamjoom 副総裁と会談
	2.00	大使館と今後の進め方を打合せ
2月23日(木)	7.30	ジェッダ発
		(クェート経由) — バンコック着
		在タイ日本大使館　高島書記官
		JICA　岩口所員と打合せ
2月24日(金)	11.30	(予定が2時間遅れ) バンコック発
		東京着

5　第２回　日サ合同委

通産省発言（想定）

1. 通産省においては，大型研究開発制度により昭和44年度（1969年度）から総額約70億円の費用をかけて海水淡水化技術の開発を行なつてきた結果，52年度（1977年度）をもつて画期的な技術開発を成功裡に終了しました。

即ち，本研究開発によつて海水から低廉かつ大量に淡水を生産できる大型の海水淡水化装置が開発された次第であります。

2. 一方，中近東，特に貴国においては，大規模な工業化を進めておられ，これに伴い，大量の工業用水都市用水が必要になるものと考えますが，我が国としては我が国で開発した本技術が，貴国の水資源の確保に極めて有効であろうと考えています。

3. 貴国政府の海水淡水化公団におかれても，いち早く本技術に関心を示され，我が国との共同研究を要望されたと聞いています。

昨年9月，貴国側の御希望を勘案の上，我が国における研究開発の指導的立場にある東京工業試験所長石坂博士を貴国に派遣し，貴国の自然条件に適応する海水淡水化装置の材料に関する調査を日本と貴国の専門家が共同で行なうことを提案した次第であります。

4. 我が国としては，本件を国際協力事業団を通ずる技術協力として実施したいと考え，本年度に日本側が負担すべき必要な予算を確保しており，早急に本協力を実施していきたいと考えています。ついては，貴大臣をはじめとする貴国政府関係当局の本協力事業推進に対する御尽力をお願いしたいと思います。

5. できれば本合同委に引続いて，本日午後から海水淡水化プロジェクトの実施について事務レベル協議を開催することと致したく，その事務レベルの協議において検討が進展し，本件協力が本年度の早い時期にスタートすることを私としても強く期待しています。

1978 - 2
ミッション 提出資料

1978 - 4
第2回合同委提出資料

The Tentative Cost Estimate of Technical Cooperation on Seawater Desalination between Japan and the Kingdom of Saudi Arabia

1. The estimated cost for this project, attached hereunder, is a preliminary one based on informations available in Japan. Especially, the local construction costs are estimated under certain assumptions; therefore, they must be refined after a detailed investigation can be conducted in Saudi Arabia.

   For a detailed investigation, the Government of Japan is considering sending a mission in the early part of FY 1978 (starting from April 1978).

2. This estimate does not reflect the increase in costs generated by inflation in the future.

Item	Cost Million Yen (Thousand US$)	Description
1. Material Research Laboratory	1,682 (7,008)	
(1) Basic Designing	16 (67)	
(2) Laboratory building construction	976 (4,067)	The floor area of the building is 1,280m^2. The expense includes that of the building facilities, such as air conditioning equipment but does not include that of the land acquisition. A special design suitable for a research laboratory, which is triple the cost of an ordinary office building (see Appendiex 3 in the Tentative Proposal), is required for the building.
(3) Civil works other than those for the laboratory building	30 (125)	Fences, roads, landscape gardening, etc.
(4) Office furniture and laboratory furniture	50 (208)	Office furniture and fixtures, such as desks, chairs and lockers.
(5) Operating and maintenance (spare parts, utilities, etc.)	350 (1,458)	The expenses for reagents and spare parts of laboratory equipment, etc., are estimated at ¥100 million per annum. The inauguration of the laboratory is expected to be in the latter half of 1979.
(6) Laboratory equipment, transportation	260 (1,083)	See Appendix 2 in the Tentative Proposal
2. Field Test Plant	773 (3,221)	See Appendix 1 in the Tentative Proposal
(1) Designing, fabrication, transportation, etc.	275 (1,146)	

(2) Civil works	340 (1,416)	These expenses include the costs of the foundation works (2,500m^2) for the test plant, the construction of the control cabin (460m^2), and the construction of fresh and sea water supplies and drainage systems.
(3) Installation	58 (242)	
(4) Operation and maintenance	100 (417)	The expenses of this item include the charges for exchanging tubes and etc. The amount of heavy oil and electric charges used are estimated to equal 2,000 hours of operations in a year.
3. Personnel	1,171 (4,879)	
(1) Dispatch of Japanese researchers	476 (1,983)	Included within the expenses for this item are charges for dispatch and accomodations.
(2) Joint technical meeting	40 (167)	During the joint research, four meetings are scheduled to be held in Japan and five are scheduled in Saudi Arabia. The relevant traveling expenses should be born by each country.
(3) Personnel from the Saudi Arabia side	648 (2,700)	The number of required personnel is estimated to be 36, at 500,000 yen per month per head. (for three years)
Grand Total	3,619 (15,079)	

Note 1. The above estimate is based on January 1, 1978 prices in Tokyo.

2. The exchange rate used above is US$ 1 = ¥240.

List of the main measures to be taken
by both government

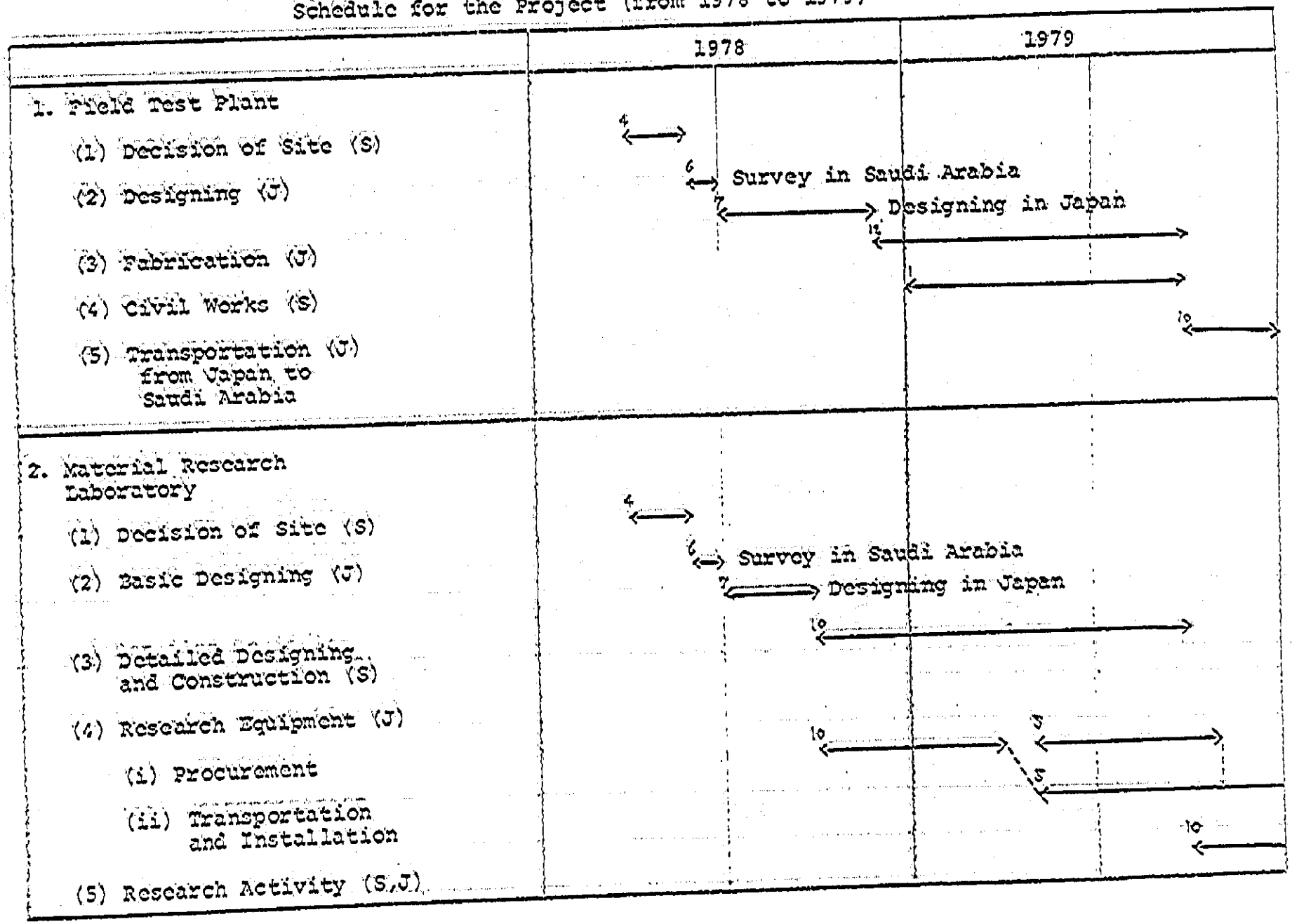
Item	Saudi Arabia	Japan
Land for Material Research Laboratory and Field Test Plant	O	
Material Research Laboratory		
(1) Basic designing		O
(2) Laboratory building construction	O	
(3) Civil works other than those for the Laboratory building	O	
(4) Office furnitures and laboratory furnitures	O	
(5) Operation and maintenance	O	
(6) Laboratory equipments transportation	O	O
Field Test Plant		
(1) Designing, fabrication transportation to Saudi Arabia transportation in Saudi Arabia	O	O
(2) Civil works	O	
(3) Installation	O	O
(4) Operation and maintenance	O	
Personnel		
(1) Dispatch of Japanese specialists		O
Acommodation, vehicle, internal travelling expense	O	
(2) Joint meeting	O	O
(3) Personnel from the Saudi Arabian side	O	
(4) Acceptance of Saudi Arabian trainees		O

Budgetary arrangment of the Government of Japan for the Project in 1978 F.Y.

Item	Expense (thousand US$) million yen	Note
Basic designing mission for Field Test Plant	(84) 20	15 man-months
Basic designing mission for Laboratory building	(66) 16	11 man-months
Dispatch of specialist	(33) 8	4 man-months
Fabrication of Field Test Plant (Evaporator shell)	(102) 25	
Procurement of laboratory equipments	(109) 26	
Joint Meeting	(18) 4	2 sessions
Advisary committee in Japan	(6) 1	
Grand Total	(418) 100	

1 US$ = 240¥

Schedule for the Project (from 1978 to 1979)



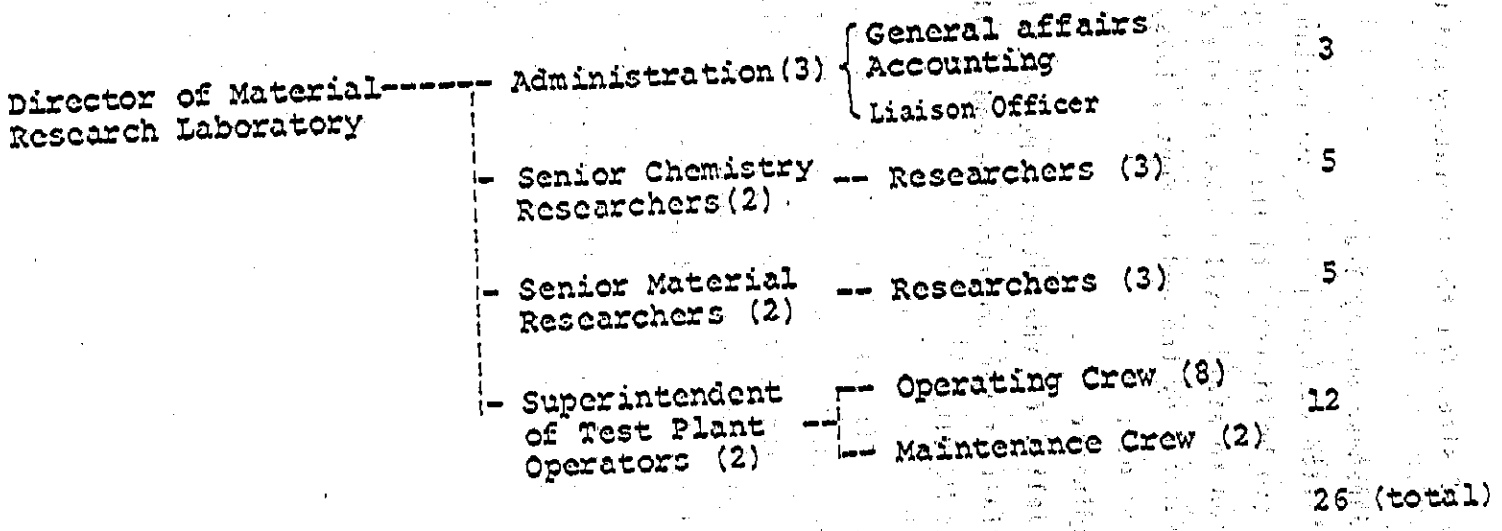
	1978		1979	
3. Personnel				
(1) Saudi Arabian Personnel (S)	←			
(2) Dispatch of Specialists (J)		←		
4. Joint Meeting (S,J)		○	○	○

Note; S: Done by SWCC

J: Done by JICA

The Saudi Arabian Personnel

who are needed for the Project



Japanese specialists

To be done by Saudi Arabia in 1978

1. Decision of sites for the Laboratory and the Field Test Plant
2. Receive Japanese Survey Team
3. Start detailed designing and construction of the Laboratory building (to be finished by the end of Sept., 1979).
4. Preparation to start civil works for the Field Test Plant (to be finished by the end of Sept., 1979).
5. Appointment of :
   (1) Coordinator
   (2) Specialist for the Material Research Laboratory
   (3) Specialists for Architecture and civil work
6. Hold Joint Meeting

SUPPLEMENT

1. Site Area Required

The Field Test Plant including site office building and future addition of modules for increase in performance ratio, will require 82 m x 58 m area, and the Material Research Laboratory will occupy 75 m x 75 m area. Roughly speaking, the necessary area is the sum of the above two, that is, 82 m x 58 m + 75 m x 75 m = 10,381 m^2. However, the practical area will vary considerably depending on the site conditions.

2. The Least Number of Saudi Arabian Personnel

In order to function the Material Research Laboratory for the research themes, 1 director, 4 senior researchers and 6 junior researchers will be necessary, 2 seniors and 3 juniors being assigned to the corrosion, and the same being for the chemistry, respectively.

For operation of the Plant, 2 superintendents and 10 crews are required. One superintendent is responsible for operation, and another is in charge of maintenance. Four teams in 2 crews each will operate the Plant in 3 shifts of 8 hours. The remaining 2 crews will be the maintenance personnel.

The administration section will consist of 3 persons, each being assigned to general affairs, accounting and liaison official to the Japanese specialists.

The following is the summary:

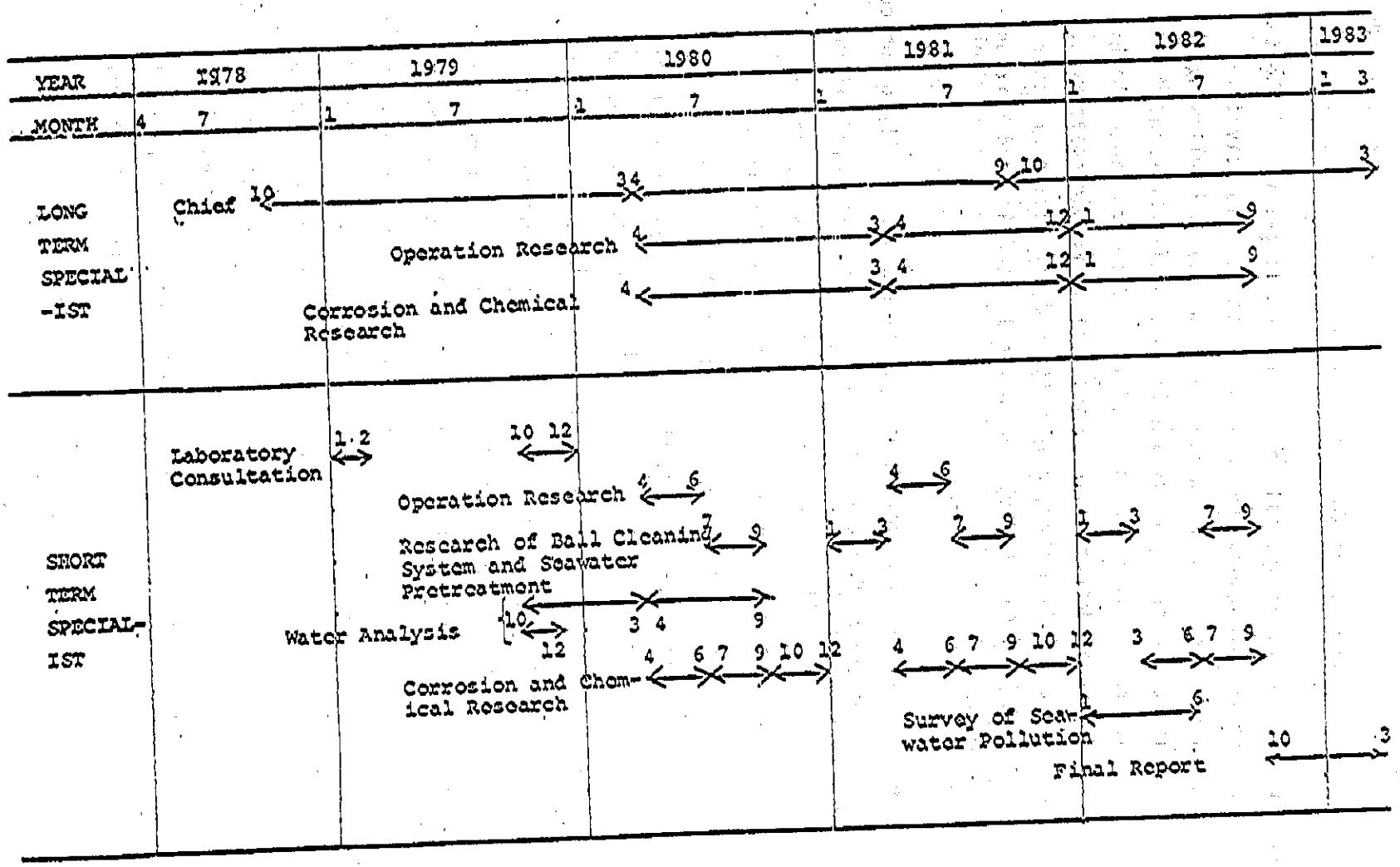
Director	1
Administration	3
Material Research Laboratory	
Corrosion	
Senior Researcher	2
Junior Researcher	3
Chemistry	
Senior Researcher	2
Junior Researcher	3
Field Test Plant	
Superintendent	2
Operating Crew	8
Maintenance Crew	2
Total	26

3. Increase of Performance Ratio from 3 to 6

An increase of performance ratio is possible by addition of 8 stages in the recovery section. The additional section will consist of two modules, each having 4 stages and 16 m long. The layout is shown in a separate drawing. When the extension is expected before the construction of the Field Test Plant, consideration must be taken to minimize the re-arrangement.

The expense for the extension is estimated at 170 million yen.

TENTATIVE PROGRAM OF DISPACH OF JAPANESE SPECIALISTS



Requirement for Accomodation

1. Average number of specialists staying on long-term and short-term basis throughout any one year is three respectively. Number of accomodation required is either of the following.
   a. Three 3-bedroom, fully furnished and airconditioned apartments or houses located in good surroundings which can accomodate short-term specialists when necessary.
   b. Six fully furnished, airconditioned bachelor apartments with bath (or shower) and toilet located in good surroundings.

2. Long-term as well as short-term specialists are usually expected to stay single in Saudi Arabia.

第2回日サ合同委提出資料

Outline of the Research Project on Desalination Technology

1. The Agency of Industrial Science and Technology (Ministry of International Trade and Industry) has successfully developed desalination technology under the National Research and Development Project.

For the purpose of assisting Saudi Arabia to obtain water in the future by the transfer of such technology, a Japanese mission, headed by Dr. S. Ishizaka, proposed a research project concerning seawater desalination technology (hereinafter referred to as 'the Project') to the Saline Water Conversion Corporation of the Government of the Kingdom of Saudi Arabia, in November, 1977.

The Saline Water Conversion Corporation welcomed the proposal and showed strong interest in all aspects of the proposal, namely information exchange, establishment of the Material Research Laboratory, construction and operation of the 500 m^3/day Field Test Plant and exchange of personnel.

In December 1977, the Government of Japan made budgetary arrangements for Fiscal Year 1978 for the Project and the Government of Japan sent a preliminary mission to the Saline Water Conversion Corporation, in February, 1978, for consultations about the itemized cost allocation to be borne by each country and the draft of the Record of Discussions, on which the organizations concerned of the two countries would have to reach agreement before implementation of the Project.

Through the explanation provided by the mission, the Saline Water Conversion Corporation fully understood the technical aspects of the Project and the Japanese side expressed its willingness to cooperate with the Corporation in implementing the Project.

The Government of Japan believes that mutual understanding on the Project will be reached.

2. The outline of the Project is as follows:

On the basis of the seawater desalination technology, characterized by a long tube-type multi-stage flash evaporation method, the study of the materials which are required for adaptation to the natural conditions of the Kingdom of Saudi Arabia will be carried out under the time schedule of a five-year program as indicated in the ANNEX:

(1) Consultation and Exchange of Information

A joint meeting of high-level officials or specialists of both countries will be established in order to have consultations and exchange of information about the technology for seawater desalination and to promote the Project.

During the duration of the Project, meetings are scheduled to be held alternately in Japan and in the Kingdom of Saudi Arabia.

(2) Establishment of Material Research Laboratory

The Material Research Laboratory will be established attached to the Saline Water Conversion Corporation and furnished with all necessary research equipment.

(3) Construction of Field Test Plant

Attached to the Material Research Laboratory, the Field Test Plant, capable of desalting 500 m^3/day, will be constructed.

(4) Reseach

Research will be undertaken on the durability of the concrete evaporator shell, and the prevention of corrosion and scale deposition, by the effective utilization of the Material Research Laboratory and the 500 m^3/day Field Test Plant.

3. The Main research themes are as follows:

(1) Operation of the 500 m^3/day Field Test Plant

1. Short-term operations
2. Long-term operations
3. Material inspection
4. Corrosion monitoring

(2) Research in Material Research Laboratory

1. Corrosion research

-- examination of metallic corrosion in the Field Test Plant and study of metals in a variety of corrosive environments

2. Chemical reseach

-- study on chemical analysis, corrosive environment, scale deposition tendency and corrosion products

「海水淡水化技術に関する調査プロジェクトの概要」

―― 第2回日サ合同委員会（昭和５３年４月３日）提出資料和訳 ――

1. 日本政府通商産業省工業技術院は，研究開発ナショナルプロジェクトにより，成功裡に海水淡水化技術を開発した。

右技術を移転することにより，将来のサウディアラビアの水の確保に寄与することを目的として，石坂博士を団長とするミッションは１９７７年11月に，サウディアラビア王国政府海水淡水化公団に対して，両国間の海水淡水化に関する調査プロジェクト（以下本プロジェクトという。）を提案したところである。

海水淡水化公団は，右提案を歓迎し，提案の各内容，すなわち，情報交換，材料研究所の設立，500 ㎥／日フィールド・テストプラントの建設及び運転並びに人材の交流について強い関心を示した。

一方，日本政府は，本プロジェクトのため，１９７８会計年度に，予算措置を講じたところである。

かような状況を背景にして，１９７８年２月，日本政府は，海水淡水化公団にミッションを派遣し，両国間の資金負担に関する協議及び本プロジェクトを開始するための関係機関間の了解の基礎となる両国の関係機関の間の議事録の日本案ドラフトを説明した。

海水淡水化公団は，本プロジェクトの技術的側面について完全に理解した。

日本政府は両国間で実施されている技術協力プロジェクトにおける本プロジェクトの重要性を認識しており，「経済及び技術協力に関する日本政府とサウディアラビア王国政府との間の協定」及び１９７８年４月３日に開催される日本・サウディアラビア合同委員会の勧告に従って相互協力を行いたいと希望している。

この機会に，日本政府は，両代表団が，本プロジェクトについて合意に達することを希望する。

2. 本プロジェクトの概要は以下のとおりである。

長管式多段フラッシュ蒸発法による海水淡水化技術に基づき，本プロジェクトは付属書に示されている5ケ年計画のスケジュールにより，サウディアラビア王国の自然条件に適応するために必要な材料の研究について実施される。

(1) 協議及び情報交換

海水淡水化技術に関する協議及び情報の交換並びに本プロジェクトの推進のため，両国の高級政府職員又は専門家によるジョイント・ミーティングを設置する。

本プロジェクトの期間中，ミーティングは日本国及びサウディアラビア王国において交互に開催されることを計画している。

(2) 材料研究所の設立

材料研究所は海水淡水化公団の中に設立され，必要な研究機材が備えられる。

(3) 屋外テストプラントの建設

材料研究所に付属して造水能力500m³/日の屋外テストプラントが建設される。

(4) 調　　査

調査は，材料研究所と500m³/日屋外テストプラントの有効な活用により，コンクリート蒸発缶体の耐久性，腐食とスケール析出の防止等に関して実施される。

3. 主要調査テーマは次のとおりである。

(1) 500m³/日屋外テストプラントの運転

1. 短　期　運　転

2. 長 期 運 転

3. 材 料 研 究

4. 腐食モニタリング

(1) 材料研究所における調査

1. 腐 食 調 査

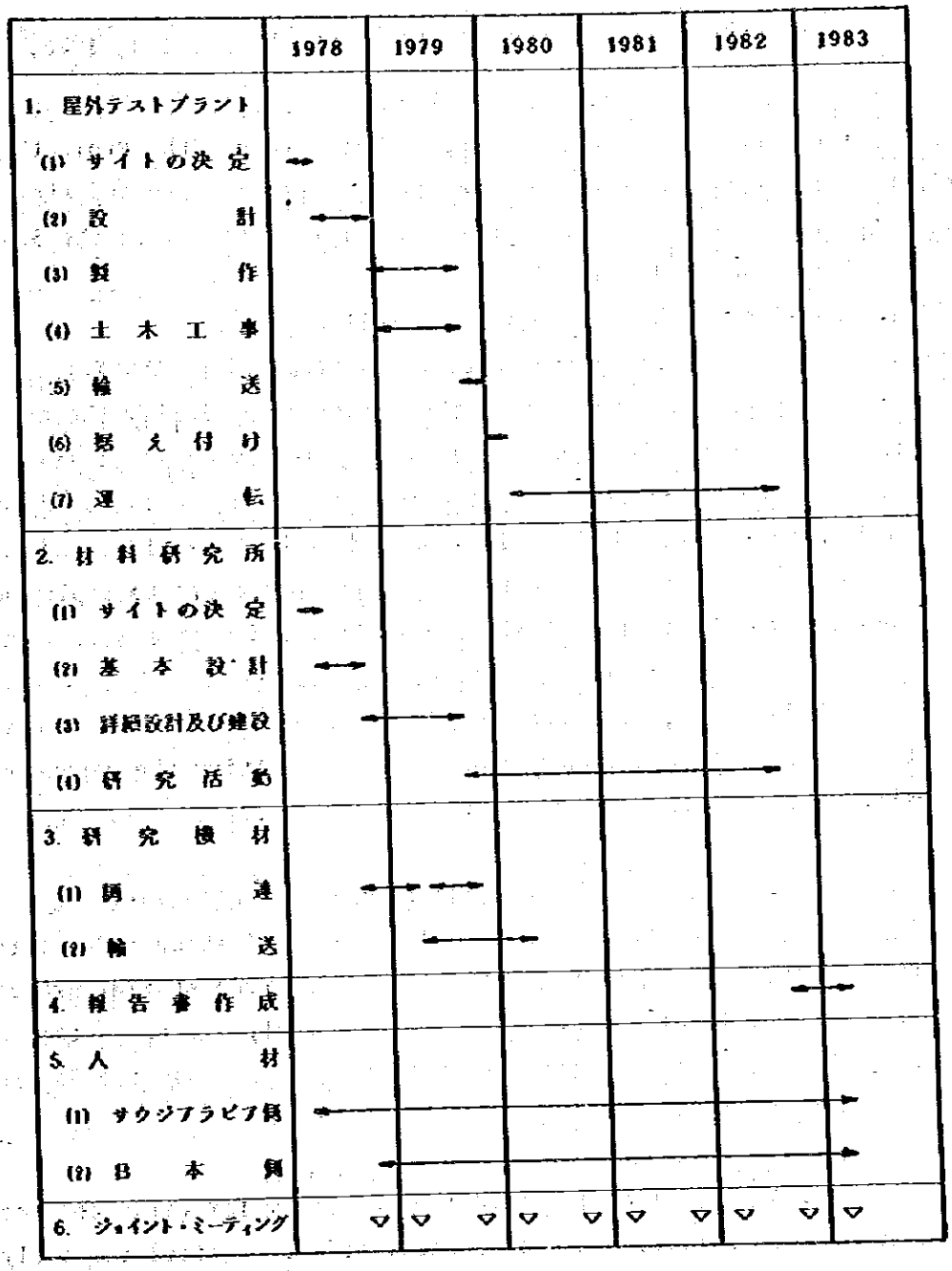
屋外テストプラントの金属腐食試験及び種々の腐食環境における金属の研究

2. 化 学 研 究

化学分析，腐食環境，スケール析出傾向及び腐食生成物の研究

3. 経 済 性 評 価

付属書　本プロジェクトのスケジュール



(April 4, ナシーフとの間で交換したミニッツ)

Minutes

April 4, 1978, Tokyo

The meetings concerning the technical cooperation on sea water desalination technology (hereinafter referred to as "the Project") were held between representatives of the Governments of Japan and Kingdom of Saudi Arabia at the Ministry of Foreign Affairs, Tokyo, on the 31st of March and the 3rd of April 1978.

The outline of the meetings is as follows.

(The list of attendants to the meetings is attached in ANNEX.)

1. The Saudi Arabian side raised the question to clarify the nature of the R/D of which draft was already proposed by Japanese side. The Japanese side responded that the implemeting agencies would conclude such a R/D to record the points agreed by both parties, and would submit it to each government, as general procedure to implement the governmental basis technical cooperation, and that a Note Verbal with the R/D as annex would be exchanged between both governments through diplomatic channel. The Saudi Arabian side stated that they would deliberate on the procedure and notify the Japanese side once the decision was reached.

2. The Japanese side asked the present stage of deliberation on implementation of the Project, and the Saudi Arabian side stated that the Government of Saudi Arabia had received similar proposals from other friendly countries and was actively reviewing them and that the Japanese proposal was also being studied by the Government of Saudi Arabia.

3. The Saudi Arabian side inquired the necessity for early commencement of the Project, and the Japanese side emphasized the early implementation of the Project, explaining (1) the necessity from the budgetary system of the Government of Japan, (2) the past long history of negotiations between two countries.

In addition, the Japanese side expressed the desire to dispatch the first mission to the Kingdom of Saudi Arabia in May or June 1978 at the latest to collect information for the basic design of the Material Research Laboratory and the Field Test Plant.

4. The Saudi Arabian side requested to get the detailed information on the equipment such as specifications, which would be provided by the Japanese side. The Japanese side promised to provide a tentative but most suitable list as soon as possible during their stay in Japan.

5. The Saudi Arabian side sought the clarification on the schedule and number of the Japanese experts to be dispatched, refering to its importance for smooth implementation of the project and for the acquisition of their accomodation.

The Japanese side explained the outline of the plan and promised to provide the more detailed data in English.

Regarding the question of supply source of the experts, the Japanese side explained that they would be sent from the government as well as private sector, and also elaborated that the experts from the government would be mainly from the National Chemical Laboratory for Industry, the Agency of Industrial Science and Technology and the experts from the private sector would be mainly through the Water Re-use Promotion Center.

6. Refering to the Article 9 of the R/D, both sides agreed that data and information acquired in the course of the project should be shared equally by both parties and be disclosed to the private sector in each country or to the third parties after consultation between both countries, in accordance with the Article 9 of the R/D. Both sides also agreed that Article 9 of the R/D should be amended accordingly.

7. The Saudi Arabian side requested that the Japanese side should offer the information on the sea water desalination technology accumulated

in Japan, to facilitate the understanding of Saudi Arabian engineers on the desalination technology developed in Japan.

The Japanese side stated that they would try to offer as much data as possible for promoting the Project, refering to the restraint of translation works as well as protection of commercial interest.

8. Regarding Article 3 (3) C in the proposed draft of R/D, the Saudi Arabian side expressed the desire that the phrase "upon the advice of the Japanese specialists" as well as "exclusively" should be deleted. The Japanese side agreed to delete the former phrase, but as for the latter one, the Japanese side explained the phrase might be necessary to guaratee the budgetary regulation, that is, the property procured for the project should be used only for the implementation and operation of the project.

9. As for the increase of performance ratio (1:3--1:6) raised by the Saudi Arabian side, the Japanese side stated that performance ratio of 1:3 might be enough for research activity, and that incremental cost necessary to increase the performance ratio (1:6) after the completion of the Project couldn't be borne by the Japanese side.

10. The Japanese side stressed the importance for the Saudi Arabian side to get financial appropriation in 1978 F.Y. (starting from June, 1978) and inquired present stage and prospect on the Saudi Arabian side. The Saudi Arabian side stated that they could get necessary appropriation in 1978 F.Y., when they could complete the deliberation on the detailed arrangement for the Project.

11. The Saudi Arabian side asked the Japanese side for the clarification on the Saudi Arabian cost which is necessary in 1978 FY and the Japanese side stated as follows.

(1) The expense necessary for detailed designing of Material Research Laboratory shall be borne by the Saudi Arabian side.

(2) The expense necessary for detailed designing of engineering works for Field Test Plant (including foundation works, and water supply and drainage works) shall be borne by the Japanese side.

(3) The Saudi Arabian side is requested to procure the budget necessary to complete the construction of Material Research Laboratory (including detailed designing) and civil works for Field Test Plant before September, 1979, to accomodate Field Test Plant and the equipments.

12. The Saudi Arabian side, in response to the question on the location for Material Research Laboratory and Field Test Plant, stated that it is now under consideration.

13. The Japanese side inquired of the Saudi Arabian side about the services of the Saudi Arabian counterparts for the Project and the Saudi Arabian side responded that they couldn't give any definite comment now, although they recognized the importance of the matter.

14. The Japanese side indicated that both Minister of Foreign Affairs and Minister of International Trade and Industry, Japanese delegates, would propose the active implementation of the Project as well as the meeting of NG in the afternoon of the 3rd of April, and requested the positive response by the delegates of the Saudi Arabian side.

The Saudi Arabian side promised to convey Japanese wish to H.E. Sheikh Hisham Nazer, Minister of Planning.

15. The Japanese side expressed their desire that the proposed R/D should be signed between both implementing Agencies on this good occasion of the Second Japan-Saudi Arabia Joint Committee.

The Saudi Arabian side suggested that final decision would depend on the availability of the information requested by them and on the re-evaluation of the whole situation. The Japanese side stated that they would make their atmost efforts to make the in-

information requested available as early as possible. The Japanese side submitted the tentative informations to the Saudi Arabian side on the 1st of April.

16. The Saudi Arabian side seeked further clarification in interpreting the article 10 of the proposed R/D.

The Japanese side clarified it in detail and the Saudi Arabian side understood it fully. Both sides agreed to amend the sentences of the article, accordingly.

17. The Saudi Arabian side proposed for both governments to share the cost of the Project equally.

The Japanese side explained the existing technical cooperation system in Japan and expressed that it would be difficult for the Japanese side to follow the proposal. Both sides requested each other to examine a proposal presented by the other side respectively.

Since some items discussed in the minutes are still under negotiations, my signature is an acknowledgements not an approval of three items.

Sign

4/4/'78

ANNEX

Saudi Arabian Side

Mr. Sammy A. Mosly	Director General, Yanbu District Royal Commission for Jubail and Yanbu
Mr. Youssif Nassif	Director General of Research and Training Department, Saline Water Conversion Corporation
Mr. Mahmond Fayez	Director of Minister's Office for Technical Affairs Ministry of Planning
Mr. Mohammed Al-Ghanimi	Economic Counsellor Ministry of Ministry of Planning
Dr. Jamel Habib	Director, Technical Affairs Department Royal Commission for Jubail and Yanbu

Japanese Side
(Ministry of International Trade and Industry)

Mr. Fukuo Nakashima	Director, Technical Cooperation Division, Economic Cooperation Department, International Trade Policy Bureau
Mr. Isao Kubokawa	Director, Office of International Research and Development Cooperation, Agency of Industrial Science and Technology
Mr. Minoru Sayama	Director, National Research and Development Program (Desalination), Agency of Industrial Science and Technology
Dr. Toraro Gotoh	Chief of First Section, Process Research and Development Division, National Chemical Laboratory for Industry, Agency of Industrial Science and Technology

Mr. Eizo Kawarada	Deputy-Director, Technical Cooperation Division, Economic Cooperation Department International Trade Policy Bureau
Mr. Satoshi Okumura	Deputy-Director, West Europe-Africa-Middle East Division, International Trade Policy Bureau
Mr. Naotoshi Osada	Deputy-Director, Office of International Research and Development Cooperation, Agency of Industrial Science and Technology
Mr. Masatoshi Urashima	Technical Cooperation Division, Economic Cooperation Department, International Trade Policy Bureau

Japanese Side
(Ministry of Foreign Affairs)

Mr. Yuzuru Kubota	Director, Development Cooperation Division, Economic Cooperation Bureau
Mr. Yuji Miyamoto	Deputy-Director, Development Cooperation Division, Economic Cooperation Bureau
Mr. Koryu Matsumoto	Development Cooperation Division, Economic Cooperation Bureau
Mr. Haruo Nanawa	Second Middle East Division, The Middle Eastern and African Affairs Bureau
Mr. Makoto Itoh	Second Middle East Division, The Middle Eastern and African Affairs Bureau

(Japan International Cooperation Agency)

Mr. Yoshihiko Saeki	Director, Development Planning Division, Mining and Industrial Planning and Survey Department

日サ合同委の機会に「サ」に提出したR/D

ON THE RECORD OF DISCUSSIONS
BETWEEN THE JAPAN INTERNATIONAL COOPERATION AGENCY
AND THE DELEGATE OF THE SALINE WATER CONVERSION CORPORATION
OF THE GOVERNMENT OF THE KINGDOM OF SAUDI ARABIA

On the occassion of the Second Japan-Saudi Arabia Joint Committee held in Tokyo on the 3rd of April, 1978, the delegate of the Saline Water Conversion Corporation of the Government of the Kingdom of Saudi Arabia, visited Japan from the 29th of March, 1978, to the 5th of April, 1978, for the purpose of working out details of the Project for the technical cooperation on seawater desalination between Japan and the Kingdom of Saudi Arabia (hereinafter referred to as 'the Project').

At the Second Japan-Saudi Arabia Joint Committee, confirmation by the representatives of both Governments was given to promote the Project actively.

At the Working Group Meeting on the Project, at the Joint Committee, both delegates exchanged views on the basis of the results of the preliminary survey conducted by the Japanese delegation in November 1977 and in February 1978.

The Japan International Cooperation Agency, and the Saline Water Conversion Corporation exchanged views with officials of both governments and made the attached Record of Discussions.

The Record of Discussions includes the construction stage of the Material Research Laboratory and the Field Test Plant, and the research stage.

The delegate of the Saline Water Conversion Corporation will take the necessary measures for obtaining the financial allocations from the Saudi Arabian authorities concerned.

The delegates of the Japan International Corporation Agency, on the other hand, agreed to recommend to their own Government the matters referred to in the Record of Discussions attached herewith.

Both delegates confirmed the importance of the Project among the technical cooperation projects which have been implemented between Japan and the Kingdom of Saudi Arabia, and also confirmed their intentions to endeavor to achieve the smooth realization and the fruitful implementation of the Project.

Written in duplicate in English at Tokyo on the 3rd of April, 1978.

For the Japan International Cooperation Agency

For the Saline Water Conversion Corporation

RECORD OF DISCUSSIONS

1. The Government of Japan and the Government of the Kingdom of Saudi Arabia will cooperate with each other, in accordance with the Agreement on Economic and Technical Cooperation between the Government of Japan and the Government of the Kingdom of Saudi Arabia, and the recommendation of the Japan-Saudi Arabia Joint Committee, in implementing the research project on desalination technology (hereinafter referred to as 'the Project') for the purpose of securing water in the future by transferring the technology which the Agency of Industrial Science and Technology, the Ministry of International Trade and Industry, has developed under the National R & D project.

2. The Outline of the Project

On the basis of the seawater desalination technology, characterized by a long tube-type multistage flash evaporation method, the Project will be carried out on the study of the materials which are required for adaptation to the natural conditions of the Kingdom of Saudi Arabia, under the time schedule of a five-year program as indicated in ANNEX 1.

(1) Consultation and Exchange of Information

A joint meeting of high-level officials or specialists of both countries will be established in order to have consultations and exchange of information about the technology for seawater desalination and to promote the Project.

During the Project, the meetings are scheduled to be held alternately in Japan and in the Kingdom of Saudi Arabia.

(2) Establishment of Material Research Laboratory

The Material Research Laboratory will be established in the Saline Water Conversion Corporation and furnished with necessary research equipments.

(3) Construction of Field Test Plant

Attached to the Material Research Laboratory, the Field Test Plant, capable of desalting 500m^3/day, will be constructed.

(4) Research

Research will be undertaken on the durability of the concrete evaporator shell, and the prevention of corrosion and scale deposition, by the effective utilization of the Material Research Laboratory and the 500m^3/day Field Test Plant. The research theme of this study is listed in ANNEX II.

3. The measures to be taken by the Government of Japan

(1) In accordance with the laws and regulations in force in Japan, the Government of Japan will take the necessary measures to provide, at its own expense, the requisite services of Japanese specialists through the normal procedures under the Technical Cooperation Scheme of Japan for the purpose of conducting the Project as mentioned in the above 2.

(2) In accordance with the laws and regulations in force in Japan, the Government of Japan will take necessary measures to receive, at its own expense, the Saudi Arabian personnel connected with the Project for technical training in Japan, through the normal procedures under the Technical Cooperation Scheme of Japan.

(3) a. In accordance with the laws and regulations in force in Japan, the Government of Japan will take the necessary measures to provide, at its own expense, the Field Test Plant, capable of desalting 500m^3/day, and the main equipment for the laboratory. Specifications for the 500m^3/day seawater desalination Field Test Plant and the list of Laboratory equipment are indicated in ANNEX III and ANNEX IV, respectively.

b. The laboratory equipment will be provided through the normal

procedures under the Technical Cooperation Scheme of Japan, and will become the property of the Government of the Kingdom of Saudi Arabia upon being delivered C.I.F. at the port of disembarkation to the authorities concerned of the Kingdom of Saudi Arabia.

c. The Field Test Plant and laboratory equipment referred to above will be utilized exclusively for the implementation of the Project upon the advice of the Japanese specialists.

(4) In accordance with the laws and regulations in force in Japan, the Government of Japan will take the necessary measures to meet:

a. Expenses for drawing the basic design of the Material Research Laboratory.

b. Expenses for holding the Japan-Saudi Arabia joint meeting in Japan.

c. Expenses for dispatching senior Japanese officials of specialists to the Kingdom of Saudi Arabia to attend the Japan-Saudi Arabia joint meeting.

4. The Measures to be Taken by the Government of the Kingdom of Saudi Arabia:

(1) In accordance with the laws and regulations in force in the Kingdom of Saudi Arabia, the Government of the Kingdom of Saudi Arabia will take the necessary measures to provide at its own expense:

a. The services of the Saudi Arabian counterpart personnel for the Project (including the operation of the Test Plant) as listed in ANNEX V.

b. Requisite land for the Material Research Laboratory and the Field Test Plant.

c. Buildings and their necessary facilities for the Material Research Laboratory (including the operation room of the Field

Test Plant).

d. Equipment, machinery, instruments and other materials necessary for the Material Research Laboratory except for those provided by the Government of Japan at its own expense.

e. Separate office room in the Material Research Laboratory for the Japanese specialists.

f. A fully furnished suitable accomocation for each Japanese specialist (and his family).

(2) In accordance with the laws and regulations in force in the Kingdom of Saudi Arabia, the Government of the Kingdom of Saudi Arabia will take the necessary measures to meet:

a. Expenses necessary for the domestic transportation of the goods provided by the Government of Japan as well as for their installation (including foundation works, and construction of seawater supplies and drainage systems and fresh water distribution systems).

b. All running expenses necessary for the implementation of the Project.

c. Customs duties and any other charges, if any, as may be imposed upon the goods provided by the Government of Japan to the Kingdom of Saudi Arabia.

d. Expenses for the internal travel in the Kingdom of Saudi Arabia of the Japanese specialists on duty.

e. Expenses for vehicles with drivers for the Japanese specialists during working hours.

f. Expenses for holding the Japan-Saudi Arabia joint meeting in the Kingdom of Saudi Arabia.

g. Expenses for dispatching senior Saudi Arabian officials or specialists to Japan to attend the Japan-Saudi Arabia joint

meeting.

5. (1) The Governor of the Saline Water Conversion Corporation, the Government of the Kingdom of Saudi Arabia will have the overall responsibility for the implementation of the Project.

(2) The Governor will appoint a senior SWCC official responsible for implementing the terms of this Record of Discussions.

(3) Establishment and management of the Laboratory will be done by the senior SWCC official upon the advice and recommendation of the Japanese specialists.

(4) Execution of the research work will be directed jointly by the senior SWCC official and a chief of the Japanese specialists to be appointed.

6. Both governments will jointly review the progress of the implementation of the Project at the forum of the joint meeting and take measures necessary to secure smooth and effective cooperation and otherwise consult with each other in respect of any matter that may arise from or in connection with this understanding.

7. According to Article 3 (c) of the Agreement, the Japanese specialists, their families and the missions who are to be dispatched for the Project will be granted, in the Kingdom of Saudi Arabia, the privileges, exemptions and benefits as listed in ANNEX VI not less favourable than those granted to the specialists and their families of a third country in the Kingdom of Saudi Arabia.

8. The Government of the Kingdom of Saudi Arabia undertakes to bear claims, if any arise, against the Japanese specialists resulting from, ocurring in the course of, or otherwise connected with the discharge of their official functions in the Kingdom of Saudi Arabia, excepting those claims arising from the willful misconduct of gross negligence of the Japanese specialists.

9. Each government shall keep, in general, confidential any information or data provided by another government or generated as a result of the work under the Project. In the case of mutual agreement, however, each government or government official can make and publish oral or written reportes of society.

10. (1) If inventions or discovery arise out of any work performed under the Project.

    a. Each government shall acquire all rights, title, and interest in and to any such invention or discovery in its own country.

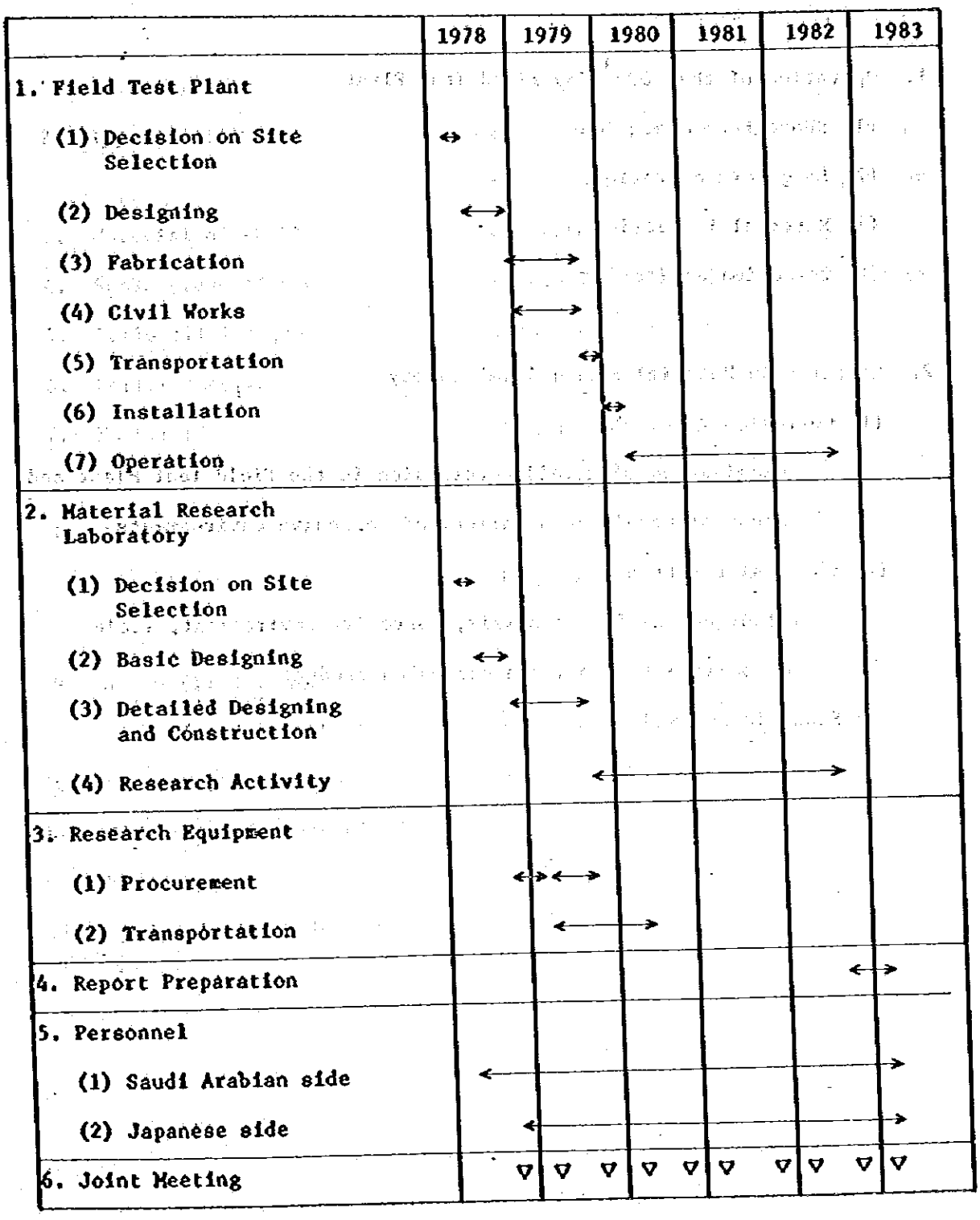
    b. Both governments shall acquire, in general, equal rights title, and interest in and to any such invention or discovery in a third country.

    (2) The government which owns an invention referred to in the sub-paragraphs of (1) above shall license such inventions to the nationals of the other country on terms and conditions most favourable under the laws and regulations of the owner-country.

11. The duration of the Technical Cooperation for the Project will be five years from _____, _____, 1978.

ANNEX I

Schedule for the Project



ANNEX II Research Themes

The main research themes are as follows:

1. Operation of the 500m^3/day Field Test Plant
   - (1) Short term operations
   - (2) Long term operations
   - (3) Material inspection
   - (4) Corrosion monitoring

2. Research in Material Research Laboratory
   - (1) Corrosion research
     - -- examination of metallic corrosion in the Field Test Plant and study of metals in a variety of corrosive environments
   - (2) Chemical research
     - -- study on chemical analysis, corrosive environment, scale deposition tendency and corrosion products
   - (3) Economic Analysis

ANNEX III

Specification of Field Test Plant

1.	Capacity	500 m^3/day
2.	Type of plant	Brine recirculating type long tube design multi-stage flash evaporator
3.	Material of shells	concrete
4.	Scale prevention method	PH control by sulfuric acid injection
5.	Scale elimination	Ball cleaning system
6.	Performance ratio	3.0
7.	Number of stages	Heat recovery 6 stages Heat rejection 2 stages
8.	Seawater	TDS 48200 ppm (max.) Temperature (max.), 32.2°C Intake quantity, 385 t/h
9.	Steam (1) Heating	7 t/h (1.5 Kg/cm^2 G)
	(2) Steam ejector	0.5 t/h (10 Kg/cm^2 G)
10.	Concentration ratio	1.24
11.	Flow rate of recirculating brine	174 t/h
12.	Recirculating brine maximum temperature	120°C

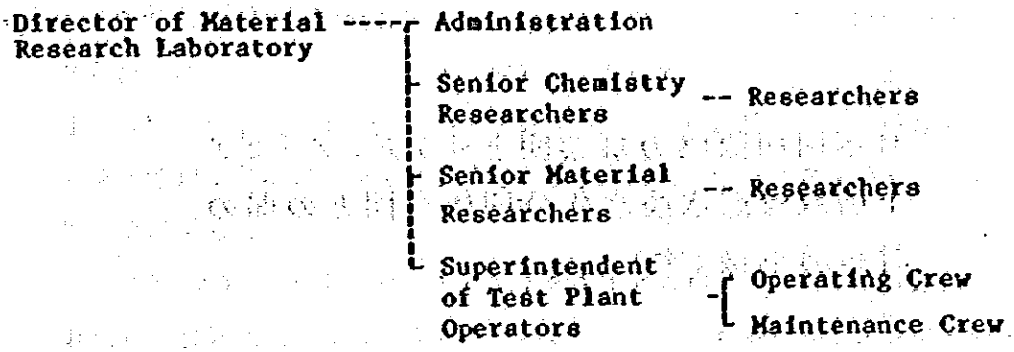
ANNEX IV

Laboratory Equipments

1. Equipment for Corrosion Test
   (1) Corrosometer
   (2) Corrator
   (3) Metallurgical microscope
   (4) Roughness meter
   (5) Potentiostat/galvanostat
   (6) Immersion corrosion testing equipment
2. Equipment for Mechanical Test
   (1) Tensile test machine
   (2) Microvickers hardness tester
   (3) Vickers hardness tester
3. Equipment for Water and Chemical Analysis
   (1) Atomic absorption and flame photometer
   (2) Spectrophotometer
   (3) X-ray diffractometer
   (4) Automatic titrater
   (5) pH meter
   (6) Ion meter
   (7) Emission spectrometer
4. General Equipment
   (1) Analytical balance
   (2) Drying oven
   (3) Muffle furnace
   (4) Vaccum pump
5. Process Analyzer
6. Other necessary Equipments, Tools, Glassware and Materials to be selected by mutual agreement.

ANNEX V

The Saudi Arabian Personnel



Japanese Specialists

ANNEX VI

Privileges, Exemptions and Benefits

(1) Exemptions from income tax and charges of any kind imposed on or in connection with the living allowances remitted from abroad.

(2) Exemptions from import and export duties and any other charges in respect of personal and household effects, including motor vehicles, which may be brought into the Kingdom of Saudi Arabia from abroad.

(3) Free medical services and facilites to the Japanese specialists and their families.

[サ]側に提示したR/Dの
Baseとなるもの
必ずしも 英文に Match せず

日本国国際協力事業団とサウディアラビア王国政府海水淡水化公団代表団との間の討議議事録（案）

日本国国際協力事業団とサウディアラビア王国政府海水淡水化公団代表団との間の討議議事録

サウディアラビア王国政府海水淡水化公団によって組織されたサウディアラビア代表団は，＿＿＿＿＿＿を団長とし，１９７８年＿＿＿＿より＿＿＿＿までの間，日本国－サウディアラビア王国海水淡水化に関する技術協力プロジェクト（以下「本プロジェクト」という）の細目を策定する目的をもって日本国を訪問した。

サウディアラビア代表団は，１９７７年１１月及び１９７８年２月に派遣された日本側代表団によってなされた事前調査の結果に基づき，国際協力事業団と意見の交換を行った。

本議事録は，材料研究所及び屋外テストプラントの建設段階並びに調査段階を含んでいる。

サウディアラビア側の代表は，関連サウディアラビア当局の承認と予算措置を講ずるため，所要の措置をとるものとする。

一方，日本側の代表は，ここに添付する本議事録に掲げる諸事項を自国政府に提言することに同意する。

両国代表は，日本国－サウディアラビア王国間に実施されている技術協力プロジェクトの中における本プロジェクトの重要性を確認し，このプロジェクトが１９７８年４月３日に東京で開催された第２回日－サ合同委員会の主要議題の１つとなったことを歓迎する。

１９７８年＿＿＿＿＿東京にて英文２部を作成した。

日本国国際協力事業団のために　　海水淡水化公団のために

討　議　議　事　録

1. 通商産業省工業技術院が国家的研究開発プロジェクトとして研究開発を行ってきた海水淡水化技術を移転することにより，将来サウディアラビアにおける淡水を確保するために，日－サ経済技術協力協定及び日－サ合同委員会の勧奨に従い，日本国政府とサウディアラビア王国政府は，海水淡水化技術に関する調査プロジェクト（以下「本プロジェクト」という。）の実行について相互に協力することとする。

2. 本プロジェクトの概要

長管式多段フラッシュ蒸発法による海水淡水化技術に基づき，本プロジェクトは，付属書Ⅰに示されている５ケ年計画のスケジュールにより，サウディアラビア王国の自然条件に適応するために必要な材料の調査について実施される。

(1) 協議及び情報交換

海水淡水化技術に関する協議及び情報の交換並びに本プロジェクトの推進のため，両国の高級政府職員又は専門家によるジョイント・ミーティングを設置する。

本プロジェクトの期間，ミーティングは日本国及びサウディアラビア王国において交互に開催されることを計画している。

(2) 材料研究所の設立

材料研究所は海水淡水化公団の中に設立され，必要な研究機材が備えられる。

(3) 屋外テストプラントの建設

材料研究所に付属して，造水能力５００m^3／日の屋外テストプラントが建設される。

(4) 調　査

調査は，材料研究所と500m³／日屋外テストプラントの有効な活用により，コンクリート蒸発缶体の耐久性並びに腐食及びスケール析出の防止に関して実施される。この調査テーマは付属書Ⅱに掲げられている。

3. 日本国政府の執るべき措置

(1) 日本国政府は，自国において施行されている法令に従って，第2項に述べられた本プロジェクトを進めるため，自己の負担において，日本の技術協力計画に基づく正規の手順に従い，これに必要な日本人専門家を派遣することとする。

(2) 日本国政府は，自国において施行されている法令に従って，自己の負担において，日本の技術協力計画に基づく正規の手順に従い，本プロジェクトに関するサウディアラビア人の日本国における技術的訓練のための受け入れについて必要な措置をとることとする。

(3) a. 日本国政府は，自国において施行されている法令に従って，自己の負担において，造水能力500m³／日の屋外テストプラント及び材料研究所の主要機材を提供するために必要な措置をとることとする。

500m³／日海水淡水化屋外テストプラントの仕様及び研究所機材の一覧はそれぞれ付属書Ⅲ及び付属書Ⅳに示されている。

b. 研究機材は，日本の技術協力計画に基づく正規の手順に従い，提供されるものとし，サウジアラビア王国の関係当局にC.I.F.だてで陸上げ港に配達されたところでサウジアラビア王国政府の財産となる。

c. 上記屋外テストプラント及び研究所機材は，日本人専門家の助言に基づいて，本プロジェクト遂行のために専ら利用されるものとする。

(4) 日本国政府は，自国において施行されている法令に従って，次の諸事項に必要な措置をとる。

a. 材料研究所の基本設計を行うのに必要な経費