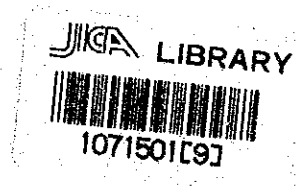


**ANNUAL REPORT 1987
THE TECHNICAL COOPERATION
FOR THE PROJECT (RESEARCH)
OF
THE SEA-WATER DESALINATION TECHNOLOGY
IN
THE KINGDOM OF SAUDI ARABIA**

MARCH, 1988

JAPAN INTERNATIONAL COOPERATION AGENCY

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18660

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JAPAN INTERNATIONAL COOPERATION AGENCY



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1. Outline of the Project

1.1 History

The project commenced after the basic Record of Discussion entering into contract between the Japan International Cooperation Agency (hereinafter referred to as JICA) and the Saline Water Conversion Cooperation (hereinafter referred to as SWCC) at Riyadh, the Kingdom of Saudi Arabia (hereinafter referred to as the Kingdom) in September 1979.

The scope of the technical cooperation at that time was to establish a research center of desalination technologies together with a test plant having a capacity of 500 cubic meters/day of multistage flash distillation. The test plant is to comprise concrete evaporators developed by the Agency of Industrial Science and Technology of the Japanese Government, with the aim to transfer desalination technologies of Japan to the Kingdom by conducting cooperative research by researchers of both countries.

After the contract, details of the cooperation were discussed by both parties. However, in April 1981, SWCC requested the Japanese Government to establish a training center instead of the test plant comprising concrete evaporators, as the Council of Ministers decided that it was more important to carry out operation management of existing desalination plants by Saudis rather than to introduce the new technology of desalination.

JICA discussed the request of SWCC with relevant organizations and decided to accept this request. The Department of Mining and Industrial Planning and Survey (JICA) and the Department of Social Development Cooperation (JICA) would be in charge of establishing the research center of desalination technologies and the training center, respectively. Then JICA discussed with SWCC to revise the aforesaid basic Record of Discussion.

Consequently, both parties signed a new Record of Discussion (hereinafter referred to as R/D) on 12th of February, 1982. Implementation of the project started based on the said R/D. A technical survey team visited the Kingdom in March 1982 to hold a meeting on detailed matters about implementation of the project and for site survey of the research center.

The department of Mining and Industrial Planning and Survey prepared the conceptual design and sent it to SWCC in September 1982. It also dispatched a technical team for detailed explanation of the conceptual design in October 1982.

SWCC approved the contents of the conceptual design, and further requested JICA to provide the conceptual design for the training center. The reason given was that SWCC intended to award construction of both the research center and the training center to one contractor. As the request of SWCC for the training center involved wide and high technical expertise, it took time to prepare the conceptual design.

Meanwhile Mr. S. Najaar, the Director of Department of Research and Technical Affairs (SWCC), who visited Japan in April 1983 with Mr. Nazer, the Minister of Planning of the Kingdom, proposed in a new idea of nine items regarding the research center. Envisaged was expansion of the area of research activities as well as the facilities. JICA dispatched a joint team comprising of both research and training experts in August 1983. Regarding the research, both parties agreed upon matters after explanation by the Japanese side and also discussed contents of the training project.

SWCC suspended construction of the new building for the research center and proposed to JICA modification of an existing administration building in February 1984. Upon being informed of this matter, JICA dispatched a survey team in May 1984 to carry out site study on the existing building and to discuss modification feasibility of the building. Both parties agreed that the structure of the existing building would be for offices, some rooms could be made available for administration and the remaining spaces would be modified to accommodate the training center. Other spaces for the laboratory were to be newly constructed on the initially proposed site.

JICA provided the revised conceptual design and explained it to SWCC in August 1984. JICA started procedures for procurement of test plants and laboratory equipment so as to meet the timetable of construction of the research center, and delivered it to the Kingdom in May 1985 after procured.

SWCC contracted a consultant and commenced detailed design in December 1984. The cost proposal from the tenderer proved to be far exceeding the budgetary appropriation of SWCC and, in October 1985 SWCC was forced to suspend the project.

This project was to terminate on 31st of March 1986 according to the terms of R/D. However, as the implementation of the project was considerably delayed, JICA dispatched survey teams for consulting SWCC about extension of R/D in July 1985 and March 1986, respectively.

The Council of Ministers entrusted the extension of R/D to the SWCC Board of Directors in September 1986. Meanwhile, SWCC requested JICA to study full use of the existing administration building as the Desalination Technology Research Center (this name was formally agreed upon in the Minutes of Meeting dated October 10, 1987, and is hereinafter referred to as the Research Center), reduction in the numbers of training courses at the training center, and transfer of the training center to the existing Research & Training Center in Jubail.

JICA dispatched a technical survey team in February 1987 for studying utilization of the building. The team concluded that the building could be utilized by remodeling. Then it was agreed upon that test plants could be installed in/nearby another existing building (which had been served as the building for a pilot plant) by adding a complementary building. In the discussions at Riyadh, SWCC strongly requested JICA to carry out not only conceptual design work but also detailed design work (which was to be undertaken by SWCC as per R/D) by reason of the limited schedule. After discussions with the relevant governmental parties, JICA decided to carry out the detailed design of the Research Center on its own expense in March 1987.

1.2 Objective

This project is intended to establish the Desalination Technology Research Center in the Kingdom, and to introduce Japanese desalination technology into the Kingdom through the joint research activities. The objective is to contribute to the stable supply of water resources in the Kingdom.

1.3 Scope

The project covers the following items.

- (1) Establishing the Research Center (in the former phase).
 - (a) Setting up the laboratory building with its related facilities, and installing laboratory equipment.
 - (a) Setting up a multi-stage flash evaporation process (MSF) test plant (1 unit; 20 cubic meters/day in capacity).
 - (c) Setting up reverse osmosis (RO) test plants (2 units; 20 cubic meters/day in capacity).

- (2) Conducting joint research on seawater desalination (in the latter phase).
 - (a) Study on technology for corrosion prevention and scale deposition control at the MSF test plant.
 - (b) Study on RO module performance test methods at the RO test plant.
 - (c) Study on the problems in the large scale plant in Saudi Arabia.
 - (d) Study on chemical analysis methods.

1.4 Work Progress in the Year

Outline of works in the year is as described below.

(1) Extension of Cooperation

On October 25, 1987, JICA signed the Minutes of Meetings, in which extension of the cooperation term for a period of three years was agreed upon.

(2) Design of the Research Center

In April, JICA commenced revision of the conceptual design, aiming at full remodeling of an administration building into a laboratory. JICA dispatched a survey team in June to explain the revised conceptual design to SWCC and to carry out site survey for detailed design. JICA prepared "Detail Design" documents at the end of July and dispatched a survey team to explain the documents to SWCC.

As SWCC announced open tendering of construction of the Research Center, JICA dispatched advisors to assist in the SWCC tendering work.

(3) Procurement of Additional Laboratory Equipment

JICA already shipped test plants and laboratory equipment to SWCC in May 1985, since these items were to be provided by JICA. Upon reviewing laboratory equipment required for research activities, JICA found out the need of additional equipment and drew up specifications for the equipment in December 1985. On the basis of the specifications, JICA procured the additional equipment in March 1988.

(4) Research items

JICA and SWCC held a meeting in November 1984 on the subject of research activities for the two years period in the latter phase and decided upon the research items. These items were confirmed in the meeting held in October 1987.

2. Program of the Project Implemented in 1987 Fiscal Year

2.1 Extension of Cooperation

2.1.1 Outline

The R/D that entered into effect on January 12, 1982 terminated on March 31, 1986. At the meeting held between JICA study team and SWCC in March 1986, it was agreed that officers of both parties would mutually put forth their utmost efforts to extend R/D for three years.

The Council of Ministers entrusted discussion of the extension of R/D to SWCC's Board of Directors. The decision of the extension of the R/D was informed to the Japanese Embassy by letter from the Deputy Governor of SWCC, Mr. Abanmy.

2.1.2 Contents

Extension of the R/D as well as its supplemental items were agreed upon in the Minutes of Meeting attached herewith instead of the modification of R/D itself.

The major items agreed upon were as follows.

- (1) Cooperation term shall be extended for three years until February 28, 1989.
- (2) Research cooperation for the extended period will be implemented within the Scope of Work as shown below.
 - (a) The Research Center will be formally called the Desalination Technology Research Center.
 - (b) Detailed design of the Research Center shall be carried out by the Japanese side.
 - (c) Based on the detailed design, SWCC will construct the Research Center building at its own expense.
 - (d) JICA will dispatch the advisor(s) from the tendering stage to the completion of remodeling and construction work stage of the Research Center.
 - (e) Research cooperation activities shall be carried out on the basis of the themes agreed upon on November 20, 1984.

2.1.3 Signature of the Minutes of Meeting

The Minutes of Meeting, in which extension of the cooperation term was agreed upon, was undersigned by Mr. Toshihiko KOGA, the Executive

Director of JICA and Mr. Abdul Rahman Abdul Aziz AL EL SHEIK, the Minister of Agriculture and Water on October 25, 1987 at the Ministry of Agriculture and Water in Riyadh.

2.2 Conceptual Design

2.2.1 Location of the Research Center

As has been stated, the survey team in February 1987 agreed with SWCC that two existing buildings were utilized as buildings for the Research Center. Outline and location of the buildings are as follows.

(1) Existing administration building

Although the building was to be utilized partly for the administration area of the Research Center and partly for classrooms of the Training Center, the entire building became available for use as the Research Center due to the transfer of the Training Center.

The building is located adjacent to the northwest corner of the Phase II area of SWCC Yanbu-Medina Power & Desalination Plant, and situated together with a mosque, in the fenced site with an approximate area of 23,000 square meters. The distance from the existing Phase I area is about 1 Km. The building was initially built to be served as the administration building for Yanbu-Medina Power & Desalination Plant after the completion of the Phase II. The building has a floor space about 1,800 square meters (ground floor; 840 sm, first floor; 960 sm).

(2) Existing control room of solar desalination pilot plant

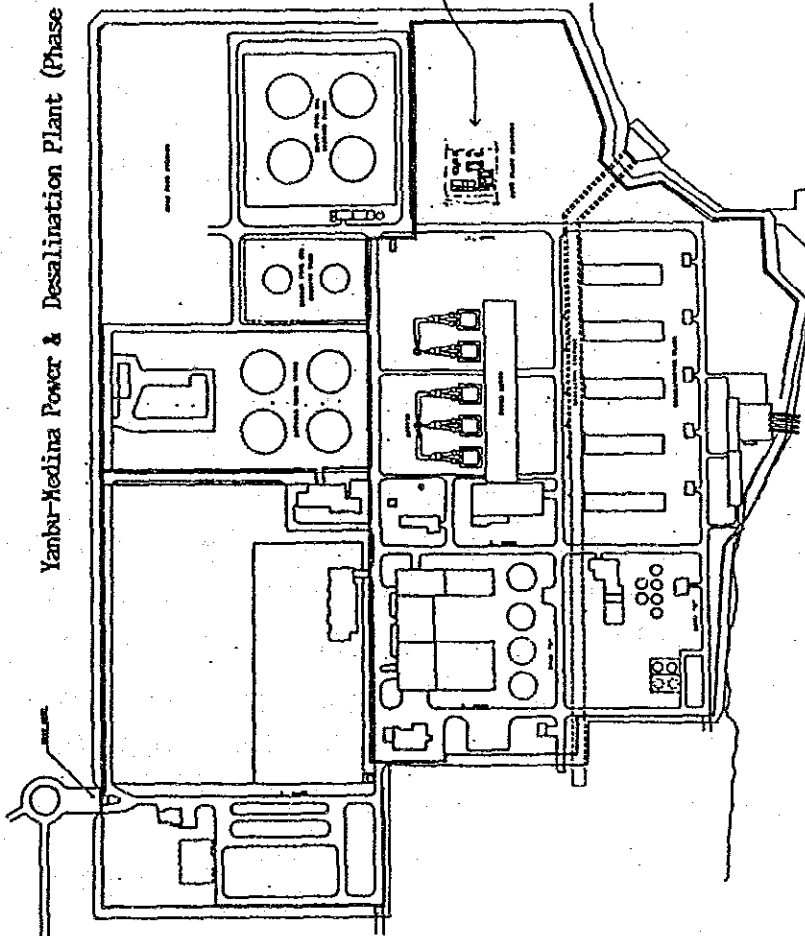
This building is located south of the Phase I area and was built to serve as a control room of a solar desalination pilot plant. The building is utilized as the Test Plant building after removing instruments installed in it. The building is suitable as the Test Plant building, since utilities for the pilot plant are still available.

However, since the space of the building (230 sm) is insufficient to install the test plant facilities, an additional building is required to be constructed.

(3) Distance between two buildings

Refer to the illustrated drawing contained hereinafter.

Yanbu-Medina Power & Desalination Plant (Phase I)



Existing Administration building
& Mosque

Land Area : 23,000m²
 Ground floor : 840m²
 First floor : 960m²

Test Plant

Area: 1,800m²
 Existing building : 230m²
 (Control room for
 solar pilot plant)
 Additional building: 380m²



2.2.2 Remodeling of the Existing Buildings

(1) Plans on distribution of rooms to two buildings

In view of separation of functions of the Research Center, test plants, a store house, rooms for resident engineers, a work shop and a laboratory for routine chemical analysis are planned to be located in/near the Test Plant Building. Other laboratories, a laboratory store room, rooms for researchers and administration area are planned for the existing Administration Building.

(2) Basic policy of remodeling

In viewpoint of reducing construction cost, partitions and floors will be left as they are wherever practicable. The remodeling is made only in area in need of reinforcement, water proof, fire prevention, etc. for laboratory use.

2.2.3 Preparation of revised Conceptual Design

A revised Conceptual Design Package was prepared by reviewing the former package prepared in 1984, from the viewpoint of remodeling of the existing buildings.

The main revisions are as follows.

- (1) Heavy laboratory equipment will be installed on the first floor since the allowable stress of the second floor is insufficient. Utilities required for each equipment will be illustrated clearly.
- (2) An additional building will be constructed adjacent to the existing control room for installation of RO test plant, machine tools, etc.
- (3) Plot plan of the test plants will be slightly changed due to the change in layout of the Test Plant Building.

2.3 Detailed Design

2.3.1 Condition of Design

In June 1987, the survey team visited the site to carry out detailed investigation of the buildings to be remodeled and their surroundings. After the investigation, the team discussed and agreed with SWCC about the design criteria for the structure, indoor finishings, facilities, etc., as well as the route of pipelines from/to the test plants.

2.3.2 Works of Japanese Side

Japanese side prepared the following books as "Detail Design" documents.

- (1) Specifications
- (2) Detailed drawings
- (3) Structural calculations
- (4) Bill of quantities

SWCC used the above "Detail Design" documents as "Tender Documents" and additionally prepared the tender document which prescribed the condition of contract.

The "Tender Documents" and their outline are as follows.

Vol. 1 ; General Conditions (in Arabic, prepared by SWCC)

Vol. 2 ; Technical Specifications

Specifications for Building Works (Standards, Earth Work, Concrete Work, Block Work, Roofing Work, Finish Work, Door and Wind Work, Roads Work, Car Shelter, etc.), Air Conditioning Works (Standards, Equipment, Ventilation, Insulation, etc.), Mechanical Works (Plumbing and System for Water and Drainage, etc.), Electrical Works (Material Specifications, Distribution Systems, Lightning, Telephone, etc.) and Laboratory Furniture (Laboratory Tables and etc.) for remodeling works of the existing buildings

Vol. 3 ; Drawings

Drawings regarding Vol. 2

Vol. 4 ; Technical Documents

Structural Calculation and Material Take Off regarding Vol. 2 and Vol. 3

Vol. 5 ; Test Plants

Specifications, Drawings and Bill of Quantities for civil works of the test plants such as Foundation Works and Road Works, and for ancillary facilities of the test plant such as wastewater discharge, seawater intake, fuel oil pipeline, etc.

Vol. 6 ; Bill of Quantities

Bill of quantities regarding Vol. 2 and Vol. 3

2.4 Assistance to SWCC's Tendering Work

2.4.1 Tendering Schedule

Since SWCC decided to invite tenders in February 1988 for construction of the Research Center and informed JICA of the schedule, JICA dispatched technical advisors from February 1988 to March to assist SWCC's tendering work, in accordance with the Minutes of Meeting dated October 25, 1987. The invitations for tenders were announced successively in newspapers at the beginning of February. The closing date for tendering was March 26. SWCC opened the tender the next day.

The JICA team gave advice to SWCC in estimating construction costs and evaluating proposal document from tenderers.

2.4.2 Assistance

(1) Cost estimation for construction of the Research Center

In order to evaluate cost proposals submitted by tenderers, the JICA team advised SWCC how to estimate construction costs.

JICA team advised SWCC how to estimate construction costs.

The costs were estimated based on the following.

(a) Building

Reviewing unit prices from documents of several tenderers in past similar projects on file at SWCC, costs described in the Bill of Quantities provided by JICA were estimated.

(b) Ancillary facilities for test plants

Selecting unit prices from price cards for equipment and materials on file at Yanbu-Medina Plant, costs of facilities and installations were estimated.

(2) Answer to inquiries from tenderers

The JICA team assisted SWCC in answering to inquiry letters concerning technical matters.

(3) Evaluation of proposals from tenderers

Since technical items were not described in the documents from tenderers, the JICA team pointed out questions and advised SWCC to prepare comparison table of unit prices to service as technical evaluation, so that SWCC would be able to refer the table for evaluation.

2.5 Procurement of Additional Laboratory Equipment

2.5.1 Objectives

In order to implement the research themes effectively, JICA studied laboratory equipment to be supplied additionally, comparing the equipment already purchased and sent to the Kingdom with those required for conducting research on the basis of the research themes which were agreed upon in November 1984 and drew up the specifications in December 1985.

Since the construction of the Research Center had been delayed, the procurement of the said equipment was postponed. However, as the timetable of construction was fixed in October 1987, JICA commenced procurement of the additional equipment in January 1988.

2.5.2 Additional Equipment

Major additional equipment consists of an Ion-chromatograph, Total Organic Carbon Analyzer, Liquid Chromatograph, Biological Microscope, Particle Counter, etc. The details are shown in Appendix.

3. JICA Survey Teams dispatched to the Kingdom of Saudi Arabia

3.1 Detailed Design (I)

(1) Objectives

- (a) To explain revised Conceptual Design.
- (b) To conduct survey on the existing administration building and the solar energy pilot plant control building, in order to draw up detailed design.
- (c) To discuss criteria for the detailed design.
- (d) To discuss the time schedule of signing for Extension of R/D.

(2) Member and Itinerary of the Team

(a) Member

MASAYOSHI ENOMOTO	Leader	Head, Natural Resources Division, JICA
SHINJI SHIBATA	Coordination	Natural Resources Division, JICA
TAKEO SAKAMOTO	Specifications	Consulting Engineer, WRPC(*)
HARUKICHI OKAMURA	Laboratory Equipment	Consulting Engineer, WRPC
TOSHIO HARADA	Architecture	Consulting Engineer, WRPC
TOSHIO KOJITANI	Architecture	Consulting Engineer, WRPC
TOYAMA KINJI	Machinery	Consulting Engineer, WRPC
SHOHEI KIBE	Electricity	Consulting Engineer, WRPC
HIROSHI KAJIYA	Structure & Material	Consulting Engineer, WRPC

(*) WRPC; Water Re-Use
Promotion Center

(b) Itinerary

(ENOMOTO and SHIBATA did not visit Yanbu.)

June 12 (Fri.)	Leaving Tokyo
13 (Sat.)	Arriving at Riyadh

- 14 (Sun.) Discussing with JICA Riyadh Office and with the Embassy of Japan
- 15 (Mon.) Explaining revised Conceptual Design to SWCC. Discussing the time of signing for extension of R/D
- 16 (Tue.) Signing Minutes of Meeting in Riyadh (ENOMOTO and SHIBATA)
Moving to Yanbu except ENOMOTO and SHIBATA
- 17 (Wed.) Discussing with JICA Riyadh Office and the Embassy of Japan (ENOMOTO and SHIBATA)
Surveying the Existing Administration Building and Solar Pilot Plant Control Room (SAKAMOTO and other members)
- 18 (Thu.) Surveying surroundings of the Control Room (SAKAMOTO and other members)
- 19 (Fri.) (ENOMOTO and SHIBATA leaving Riyadh)
Checkig survey results
- 20 (Sat.) Studying and checking drawings on file at SWCC Yanbu Plant. Moving to Riyadh (SAKAMOTO and HARADA)
- 21 (Sun.) Making complementary explanation of revised Conceptual Design (SAKAMOTO and HARADA)
Moving to Riyadh (OKAMURA and other 3 members)
- 22 (Mon.) Discussing with SWCC about criteria for detailed design
- 23 (Tue.) Preparing Technical Memo and reporting it to JICA Riyadh Office and the Embassy of Japan
- 24 (Wed.) Leaving Riyadh
- 25 (Thu.) Arriving at Tokyo (via Bahrain, Hongkong)

(3) Meeting Member

(a) SWCC (Riyadh)

Mr. ABDULLAH A. AL-AZZAZ	Director General, Department of Research & Technical Affairs
Mr. HABEEB MOHAMMED HABEEB	Technical Advisor, Department of Research & Technical Affairs
Mr. ABDUL RAHMAN AL-ASOOS	Department of Research & Technical Affairs

Mr. HABIB H. AL-SHAREEF	Construction Department
Mr. KHAJA KAMULUDDIN	Construction Department
Mr. NABEEL AL-GAHTANI	Construction Department
(b) SWCC (Yanbu)	
Mr. NAJI A. DARWISH	Plant Manager
Mr. AWAD A. AL-HARBI	Efficiency Engineer
(c) Japanese Residents in Riyadh	
Mr. N. WATANABE	Minister, Embassy of Japan
Mr. E. HIRAOKA	First Secretary, Embassy of Japan
Mr. T. JIBIKI	Resident Representative, JICA Riyadh Office

(4) Contents of the Discussion

(a) General Items

In the discussions, the following were agreed upon.

- 1) The responsibility and the defect liability on all documents and drawings which will be prepared by Japanese side shall be taken by SWCC.
- 2) Signing of the extension of R/D will be done approximately in the middle of September 1987.
- 3) SWCC will implement the project according to the work schedule attached to the Minutes of Meeting. However SWCC will make its best effort to shorten the schedule period of remodeling and construction.

(b) Technical Items

Outline are as follows.

- 1) SWCC agreed to the Conceptual Design with comments that additional facilities should be in conformity with the existing system and that suitable fire fighting system should be provided.
- 2) Both parties agreed to arrangement of laboratories, lay out of test plant building and routes of pipelines for test plant ancillary facilities.
- 3) SWCC agreed to criteria for detailed design with comments, such as type of door.

3.2 Detailed Design (II)

(1) Objectives

To explain "Detail Design" documents to SWCC.

(2) Member and Itinerary of the Team

(a) Member

YOSHIO MURAYAMA	Leader	Consulting Engineer, WRPC
KAZUAKI KOIZAWA	Water Generation Policy	Deputy Director, Indus- trial Water Division, MITI
TAKEO SAKAMOTO	Specifications	Consulting Engineer, WRPC
HARUKICHI OKAMURA	Laboratory Equipment	Consulting Engineer, WRPC
TOSHIO HARADA	Architecture	Consulting Engineer, WRPC
TOSHIO KOJITANI	Architecture	Consulting Engineer, WRPC
KINJI TOYAMA	Machinery	Consulting Engineer, WRPC

(b) Itinerary

August 13 (Thu.)	Leaving Tokyo
14 (Fri.)	Arriving at Riyadh
15 (Sat.)	Discussing with JICA Office and Embassy of Japan
16 (Sun.)	Discussing schedule with SWCC
17 (Mon.)	Explaining "Detail Design" to SWCC
18 (Tue.)	ditto
19 (Wed.)	ditto
20 (Thu.)	Meeting among Japanese team
21 (Fri.)	Meeting among Japanese team
22 (Sat.)	Q & A with SWCC
23 (Sun.)	ditto
24 (Mon.)	Reviewing
25 (Tue.)	Preparing Minutes of Meeting Reporting to JICA Office
26 (Wed.)	Leaving Riyadh
27 (Thu.)	Arriving at Tokyo (via Bahrain, Hongkong)

(3) Meeting Member

(a) SWCC (Riyadh)

Mr. ABDULLAH A. AL-AZZAZ	Director General, Department of Research & Technical Affairs
Mr. HABEEB MOHAMMED HABEEB	Technical Advisor, Department of Research & Technical Affairs
Mr. ABDUL RAHMAN AL-ASOOS	Department of Research & Technical Affairs
Mr. NABEEL GAHTANI	Construction Department
Mr. KHAJA KAMULUDDIN	Construction Department
Mr. HABIB H. AL-SHAREEF	Construction Department

(b) Japanese Residents in Riyadh

Mr. N. WATANABE	Minister, Embassy of Japan
Mr. E. HIRAOKA	First Secretary, Embassy of Japan
Mr. T. JIBIKI	Resident Representative, JICA Riyadh Office

(4) Contents of Discussion

The JICA team explained "Detail Design" documents (Specifications, Drawings, Technical Documents, Bill of Quantities) to SWCC. The documents were approved after the following request were made.

- (a) Regarding buildings, descriptions shall be corrected and several additional drawings are needed.
- (b) Regarding test plants, fire fighting system shall be added according to Saudi Standard.

The JICA team understood the request and submitted corrected documents afterward.

The JICA team mentioned that the Bill of Quantities concerning installation of test plants and adjustment of equipment was not contained in the "Detail Design" documents because experts for those work were to be dispatched and documents required for the work were to be prepared by that time. SWCC agreed to this point.

SWCC promised to take necessary measures at its own expense to provide all materials and others required for installation of test plants, ancillary facilities and laboratory equipment, including additionally required materials due to the change of design conditions.

3.3 Signing for Extension of R/D

(1) Objectives

- (a) To hold final discussions on Extension of R/D in which the project was scheduled to be terminated in March 31, 1986 and to sign the Minutes for the Extension of R/D.
- (b) To hold discussions on the implementation of the project for the extended period.
- (c) To survey current condition of the project site.

(2) Member and Itinerary of the Team

(a) Member (Research Cooperation)

TOSHIHIKO KOGA	Leader	Executive Director, JICA
MASAYOSHI ENOMOTO	Coordination	Head, Natural Resources Division, JICA
KOICHI AIZAWA	Cooperation Management	Technical Cooperation Division, MITI
TAKEO SAKAMOTO	Desalination Technology	Consulting Engineer, WRPC

(b) Itinerary (Research Cooperation)

October 22 (Thu.)	Leaving Tokyo. Arriving at Bangkok
23 (Fri.)	Leaving Bangkok. Arriving at Riyadh
24 (Sat.)	Discussing with JICA Riyadh Office and Embassy of Embassy of Japan
25 (Sun.)	Discussing with SWCC. Signing at Ministry of Agriculture and Water
26 (Mon.)	Leaving Riyadh. Arriving at Yanbu
27 (Tue.)	Surveying project site in SWCC Yanbu Medina Power & Desalination Plant. Moving to Riyadh
28 (Wed.)	Meeting with JICA Riyadh Office. Reporting to Japanese Ambassador to the Kingdom of Saudi Arabia
29 (Thu.)	Leaving Riyadh. Arriving at Bangkok
30 (Fri.)	Leaving Bangkok. Arriving at Tokyo

(3) Meeting Member

(a) Riyadh

Mr. ABDUL RAHMAN ABDUL AZIZ AL-EL SHEIKH Minister of
Agriculture and Water
Director General,
Department of Research
& Technical Affairs,
SWCC

Mr. ABDULLAH A. AL-AZZAZ

(b) Yanbu

Mr. NAJI A. DARWISH Plant Manager, SWCC

(c) Japanese Residents in Riyadh

Mr. H. OKAZAKI Japanese Ambassador
to the Kingdom of Saudi Arabia

Mr. T. JIBIKI Resident Representative, JICA Riyadh Office

(3) Contents of Discussion

Both side agreed to the following matters.

- (a) The term of cooperation of the Project shall be extended for three years until February 28, 1989.
- (b) In connection with Budgetary Appropriations after the present extension upto February 28, 1989, the remaining amount from one in the original R/D shall be utilized during further extension of the R/D when approved by both parties.

3.4 Technical Advisors for SWCC's Tendering Work

(1) Objectives

- (a) To give advice on cost estimation.
- (b) To give advice on evaluation of tender documents from tenderers.

(2) Member and Itinerary of the Advisors

(a) Member

ICHIZO AOYAMA	Water Generation Policy	Deputy Director, Industrial Water Division, MITI
TAKEO SAKAMOTO	Specification of Test Plant	Consulting Engineer, WRPC
HARUKICHI OKAMURA	Specification of Laboratory	Consulting Engineer, WRPC
TOSHIO HARADA	Architecture	Consulting Engineer, WRPC

KINJI TOYAMA	Machinery	Consulting Engineer, WRPC
SHOHEI KIBE	Electricity	Consulting Engineer, WRPC

(b) Itinerary:

February 12 (Fri.)	Leaving Tokyo (AOYAMA, SAKAMOTO, OKAMURA)
13 (Sat.)	Arriving at Riyadh (via Bahrain).
14 (Sun.)	Meeting with JICA Riyadh Office and Embassy of Japan. Discussing the schedule at SWCC
15 (Mon.)	Courtesy call to the Deputy Governor, SWCC
16 (Tue.)	Leaving Riyadh. Arriving at Yanbu
17 (Wed.)	Surveying the Project site. Moving to Riyadh
18 (Thu.)	Meeting among advisors
19 (Fri.)	Arranging documents. Leaving Riyadh (AOYAMA)
20 (Sat.)	Discussing with SWCC on tendering schedule
21 (Sun.)	Discussing with Department of Research & Technical Affairs, on price list
22 (Mon.)	Discussing with Construction Department
23 (Tue.)	Preparing items for cost estimation
24 (Wed.)	Studying Albawardy's tender documents
25 (Thu.)	Checking data
26 (Fri.)	Checking data
27 (Sat.)	Discussing the progress of tendering
28 (Sun.)	Studying Albawardy's tender documents
29 (Mon.)	Studying Albawardy's tender documents
March 1 (Tue.)	Meeting with Construction Department
2 (Wed.)	Reporting to JICA Office
3 (Thu.)	Checking data
4 (Fri.)	Checking data
5 (Sat.)	Discussing with JICA Office
6 (Sun.)	Studying cost data in the similar project
7 (Mon.)	Leaving Riyadh. Arriving at Yanbu
8 (Tue.)	Surveying connection points from existing facilities to test plants
9 (Wed.)	Surveying unit price of material and others on file at Yanbu Plant. Moving to Riyadh
10 (Thu.)	Checking data
11 (Fri.)	Checking data

- 12 (Sat.) Explaining estimated cost of test plant facilities to SWCC
- 13 (Sun.) Discussing cost of similar project
- 14 (Mon.) Studying unit prices in similar project (I)
- 15 (Tue.) Studying unit prices in similar project (II)
- 16 (Wed.) Preparing data for building experts
- 17 (Thu.) Checking data
Leaving Tokyo (HARADA, TOYAMA, KIBE)
- 18 (Fri.) Arriving Riyadh (HARADA, TOYAMA, KIBE)
Discussing among advisors.
- 19 (Sat.) Discussing on cost estimation for building
- 20 (Sun.) Studying unit prices for Building Work, Electric Work and other work for building
- 21 (Mon.) Advising cost estimation for each work
- 22 (Tue.) Advising cost estimation for each work
- 23 (Wed.) Advising overall estimate
- 24 (Thu.) Checking data
- 25 (Fri.) Checking data
- 26 (Sat.) Reporting estimated cost to JICA and Embassy of Japan
- 27 (Sun.) Advising technical evaluation of the tender documents from tenderers
- 28 (Mon.) Advising technical evaluation of the document
- 29 (Tue.) Explanation to SWCC. Reporting to JICA
- 30 (Wed.) Leaving Riyadh. Arriving at Bangkok
- 31 (Thu.) Leaving Bangkok. Arriving at Tokyo

(6) Member of Meeting

(a) SWCC (Riyadh)

Mr. ABDULLAH A. ABANMY	Deputy Governor, SWCC
Mr. ABDULLAH A. AL-AZZAZ	General Director, Department of Research & Technical Affairs
Mr. ABDULLAH AL-ZAHRANI	Department of Research & Technical Affairs
Mr. KHAJA KAMULUDDIN	Construction Department
Mr. SALEH A. AL-WABEL	Construction Department
Mr. KHALID AL-RASABI	Construction Department

(b) SWCC (Yanbu)

Mr. NAJI A. DARWISH

Plant Manager

Mr. A.R. AL-HARBI

Efficiency Engineer

(c) Japanese Residents in Riyadh

Mr. E. HIRAOKA

First Secretary, Embassy of Japan

Mr. T. JIBIKI

Resident Representative,

JICA Riyadh Office

APPENDIX

1. Minutes of Meeting and Technical Memo
 - 1.1 Extension of R/D
 - 1.2 Detailed Design (I)
 - 1.3 Detailed Design (II)
 - 1.4 Technical Advisors for SWCC's Tendering Work
2. Research Themes
3. List of Equipment for Laboratory and Test Plants
 - 3.1 List of Additional Laboratory Equipment
 - 3.2 List of Laboratory Equipment stored in Yanbu
 - 3.3 List of Equipment for Test Plants stored in Yanbu
4. Major Drawings for the Research Center
5. Photographs

1. Minutes of Meeting and Technical Memo

1.1 Extension of R/D

1.2 Detailed Design (I)

1.3 Detailed Design (II)

1.4 Technical Advisors for SWCC's Tendering Work

1.1 Extension of R/D

MINUTES OF MEETINGS ON THE EXTENSION
OF THE TECHNICAL COOPERATION FOR
THE PROJECT OF THE SEA WATER
DESALINATION TECHNOLOGY

BETWEEN

SALINE WATER CONVERSION CORPORATION (SWCC)


AND

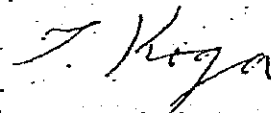
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

The JICA Mission, headed by Mr. Toshihiko KOGA, Executive Director of JICA, visited Riyadh from 23 October to 28 October 1987, and discussed with SWCC representatives the extension of the term of the technical cooperation for the Project of the Sea Water Desalination Technology (hereinafter referred to as the Project). After a series of discussions both sides agreed to the following matters, in accordance with the Article 15 of the Record of Discussions (hereinafter referred to as R/D) signed on January 12, 1982.

1. In connection with the Article 13 of R/D, the Term of Cooperation of the Project shall be extended for three (3) years until February 28, 1989.
2. These minutes of meetings do not supersede the Articles of R/D. While research cooperation and training cooperation for the extended period will be implemented within the scope of the attachments.

Riyadh October 25, 1987

ely
at 
ABDUL RAHMAN ABDUL AZIZ AL EL SHEIKH
MINISTER OF AGRICULTURE AND WATER,
CHAIRMAN OF THE BOARD OF DIRECTORS
OF SWCC


TOSHIHIKO KOGA
EXECUTIVE DIRECTOR
J I C A

Attachments/- 12

Attachment (I)
(Research Cooperation)

1. Naming of the Desalination Technology Institute

The name of the Desalination Technology Institute described in the R/D shall be changed to the Desalination Technology Research Center (hereinafter referred to as the Center).

2. Establishment of the Desalination Technology Center

(Article 1. (2) 2) and Article 2. (4) 1))

(1) Detailed design for remodeling of administration building to be suitable for the Desalination Technology Research Center shall be drawn up by Japanese side.

(2) Based on the detailed design prepared by Japanese side, SWCC will remodel the existing building and establish a test plant building at its own expenses in accordance with the working schedule attached herewith. (Annex I).

(3) Japanese side will dispatch technical advisor(s) from the tendering stage to the completion of remodeling and construction work stage for the Center and test Plants.

3. Research Cooperation Themes

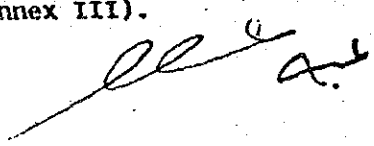
(Article 1. (2) 3))

Research cooperation activities shall be carried out on the basis of the same themes as detailed in the Minutes of Meetings dated November 20, 1984 which is attached herewith. (Annex II).

4. Budgetary Appropriations

(Article 11)

Implementation under this Minutes of Meetings shall be subject to the budgetary appropriations for JICA & SWCC. (Annex III).



J.K.

WORKING SCHEDULE

87/Jul Aug Sept Oct Nov Dec 88/Jan Feb Mar Apr May Jun Jul Aug Sept Oct Nov Dec 89/Jan Feb Mar Apr

ANNEX I

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Submission of the Detailed Design
(Middle of Oct/87)

Signature for the extension of R/D
End of Oct/87

Evaluation
(From middle of
Nov/87 to end of Dec/87)

Preparation for tender
(From end of Sept/87
in middle of Nov/87)

Tender
(Beginning of Jan/88)

Remodeling & Construction
Works (From Beginning of
Jan/88 to Middle of Dec/88)

Installation & Adjustment
of Equipment (From Middle
of Nov/88 to Middle of Feb/89)

Research Activities

THE RESEARCH THEMESREVERSE OSMOSISITEM NO.DESCRIPTION

- R-1 To examine sterilization effect of:
- 1) Chlorine
 - 2) Ultraviolet Radiation
 - 3) Sodium Bisulfite (SBS) and
 - 4) Copper Sulphate
- R-2 To optimize the use of coagulants and coagulant aids by Jar Tester and in line test and study the relationship between filter performance and quality of seawater. Evaluate the economic feasibility of using the coagulating agents.
- R-3 To study the pollution effect of membrane cleaning discharge in the laboratory.
- R-4 To study the performance of various membranes under local operating conditions. Studies to be carried out to test stability of the membranes with increased feed water temperature.
- R-5 To test the chemical cleaning methods when the module is fouled or deteriorated.
- R-6 To estimate a most reasonable process of a large scale plant for the prevailing conditions in the Kingdom of Saudi Arabia.
- R-7 To standardize the main Analytical methods.

TK
TK Q1

MULTI STAGE FLASH (MSF)

<u>ITEM NO.</u>	<u>DESCRIPTION</u>
M-1	To examine the effect of using acid + anti scale agent dosing to control scale deposition and use sponge ball cleaning system. Study the change in over all heat transfer coefficient as the measure of scale deposition through long term operation and to analyze the scales taken from the tube walls of the test plant.
M-2	To test alternative materials such as titanium, aluminum brass and any other new materials and in the case of aluminum brass. Cu-Ni 90/10 to examine if this would stand well against corrosion in a less oxidizing condition made by SBS addition to the effluent of the deaerator as de-oxidizer.
M-3	Corrator will be used to measure the corrosion tendency of the materials, the test pieces and the tubes pulled out from tube sheet.
M-4	To standardize the main Analytical-methods.

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J.K.

ANNEX III

Tentative Estimated Cost (Research Cooperation)

P--Person (*JUS\$ -- ¥250 in 1982
 m--million yen (**JUS\$ -- ¥150 in 1987
 M--Month ()-Amount already disbursed
 0.7--Travel Expenses per one trip
 Unit: US \$ 1,000

Items	Cost	JICA Portion	SWCC Portion	Remarks
1. The Institute				
1.1 General				
(1) Conceptual Design	135	135	-	** ¥20,200,000 ÷ ¥150 = \$135,000
(2) Detailed Design	405	405	-	** ¥20,200,000 ÷ ¥150 = \$135,000
(3) Construction	3400	-	3400	
1.2 Laboratory				
		(760)		* ¥190m ÷ ¥250 = \$760,000
(1) Laboratory Equipment	1027	267	-	* ¥40m ÷ ¥250 = \$267,000
(2) Inland Transportation of Equipment	11	-	11	
(3) Installation & Adjust- ment of Equipment	160	140	20	(¥1.5mX4PX3M+0.7mX4P) ** ÷ ¥150 = \$140,000
1.3 MSF & RO Test Plants				
(1) Design & Fabrication				
1) MSF Test Plant	624	(624)	-	* ¥156m ÷ ¥250 = \$624,000
2) RO Test Plant	416	(416)	-	* ¥104m ÷ ¥250 = \$416,000
(2) Seawater Intake & Discharge Facilities	305	-	305	
(3) Inland Transportation of Test Plants Equip- ment & Materials	9	-	9	
(4) Installation & Adjust- ment of Test Plants	230	140	90	(¥1.5mX4PX3M+0.7mX4P) ** ÷ ¥150 = \$140,000
(5) Civil Work	31	-	31	
1.4 Ancillary Facilities				
	581	-	581	
Sub Total	7334	2887	4447	

ANNEX III

Unit: US \$ 1,000

Items	Cost	JICA Portion	SWCC Portion	Remarks
2. Administrative and Operation Personnel				
(1) Researchers	350	350	((¥2mX6PX4M+0.7mX6P) ** ÷ ¥150 = \$350,000
(2) Assistants	1400	-	(1400	
3. Operation & Maintenance	1600	-	1600	
4. Transportation	551	-	551	
5. Joint Meeting	162	72	90	** (¥2m+0.7m) X4P ÷ ¥150 = \$72,000
Sub Total :	4063	422	3641	
Research Total :	11397	3309	8088	
Training Total :	2164	1850	314	
Grand Total :	13561	5159	8402	

- NOTE : (1) The above cost which will cover the extended period of cooperation is rough estimate, based on the price in 1987.
- (2) The JICA portion listed above includes the cost which has already been disbursed.
- (3) The above cost is subject to change within the frame work of this Minutes of Meetings.
- (4) The difference from agreed amount of \$9.451 million in the original R/D to \$5.159 million in JICA portion is due to the shorter period of activity under the present extension upto 28 February 1989. The remaining amount shall be utilized during further extension of the R/D for personnel and equipment when approved by both parties.

TENTATIVE SCHEDULE OF IMPLEMENTATION

ITEM	YEAR MONTH	1987			1988			1989	
		Oct	Dec	Jan	Apr	Aug	Dec	Jan	Feb
C/P Training in Japan				Jan				Oct	
Development of Teaching Materials					Feb			Nov	
Provision of the Equipment					Apr			Jan	
Dispatch of Short Term Experts								Nov	Feb
Rearrangement of Workshop				Jan		Jun			

NOTE : (1) This schedule is tentatively formulated on the assumption that the necessary budget will be allocated.

(2) This schedule is subject to change within the scope of this Minutes of Meetings, if necessary.

ATTACHMENT (II)
(Training Cooperation)

1. Objective of the Project

(Article 1. (2) 4)

The objective of the Project is to foster qualified technicians in the field of Electronics, Electronic Control.

2. Objective of the Japanese Technical Cooperation

(Article 1. (2) 4)

The objective of the Japanese Technical Cooperation is to transfer necessary knowledge and techniques to the Saudi Arabian instructors of Electronics and Electronic Control Training Course of the Al-Jubail Training Center through practical and theoretical training in Japan.

The technical cooperation is to be implemented in accordance with the Tentative Schedule of Implementation (Annex IV) according to the minutes of meeting dated August 26, 1987 (Annex VI).

It is indispensable that SWCC assigns the Saudi Arabian instructors at the earliest date, in order to ensure the successful implementation of the Project.

3. JICA will take necessary measures:

(Article 2)

- (1) to receive five (5) Saudi Arabian instructors for technical training in Japan.
- (2) to provide and install equipments and machinery which will be provided from Japan for the implementation of the course.
- (3) to prepare teaching material (in English).
- (4) to dispatch the short-term expert(s).

4. SWCC will take necessary measures:

(Article 3)

- (1) to assign two (2) engineers and three (3) technicians as instructors of the Al-Jubail Training Center.
- (2) to complete interior works with necessary furniture of Al-Jubail Training Center and to install equipments and machinery which will be provided from Japan for the implementation of the course.

5. Budgetary Appropriations

(Article 3)

Implementation under this Minutes of Meetings shall be subject to the budgetary appropriations for JICA & SWCC. (Annex V).

T.K.

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ANNEX V

Tentative Estimated Cost (Training Cooperation)

P--Person (*)US\$ -- ¥250 in 1982
 m--million yen (**)US\$ -- ¥150 in 1987
 M--Month ()-Amount already disbursed

Unit: US \$ 1,000

Items	Cost	JICA Portion	SWCC Portion	Remarks
1. The Institute				
1.2 Work shop				
(1) Conceptual Design	100	(100)	-	(was spent on Yanbu)
(2) A/E Construction	75	-	75	
(3) Equipment	975	900	75	Referred to the List of
(4) Inland Transportation of Equipment	10	-	10	Equipments submitted on 26th Aug. 1987
(5) Installation & Adjust- ment of Equipment	94	50	44	¥2m X 1P X 3.75M
2. Personnel		(320)		¥2m X 2P X 3M
2.1 Japanese Expert	400	80	-	
2.2 Counterpart Training in Japan	200	200	-	¥1m X 5P X 9M
2.3 Counterpart & Saudi Arabian Staff	50	-	50	
3. Maintenance & Operation	20	-	20	
4. Transportation	25	-	25	
5. Teaching Materials	210	200	10	¥1m X 6P X 9M
6. Reference Books	5	-	5	
Total	2164	1850	314	

NOTE : (1) The above cost which will cover the remaining period of cooperation is rough estimate, based on the price in 1987.

(2) The JICA portion listed above includes the cost which has already been disbursed.

(3) The above cost is subject to change within the frame work of this Minutes of Meetings.

KINGDOM OF SAUDI ARABIA
Saline Water Conversion Corporation

Our Ref. No. _____

ANNEX VI

Date _____

MINUTES OF MEETING BETWEEN
SWCC AND JICA (TRAINING COOPERATION)

JICA dispatched the Team to the Kingdom of Saudi Arabia from August 21 to August 26, 1987, for the purpose of discussing and exchanging views with the SWCC Officials, concerning the Training Plan for Electronics & Electronic Control Training Course at the SWCC Research Development and Training Center (RDTC) in Jubail.

During its stay in the Kingdom of Saudi Arabia, a series of meetings were held between the Team and the SWCC Officials, in accordance with the draft of the Training Plan attached hereto.

The results of the meetings are as follows:

1. Training Plan and Syallabus :

SWCC basically agreed to the proposed training plan and syllabus.

However, SWCC requested to modify the following matters:

- a) With regard to Entrance Qualification, the Graduates from Scientific High School and Industrial High School (Radio & TV Course) should be added together with equivalent qualified technicians from the SWCC Plants.
- b) With regard to Training Flow Chart, the examination for admission to the Electronics & Electronic Control Training Course should be taken after completion of the general subjects.
- c) With regard to the implementation of the above-mentioned examination and on the job training, necessary advice should be required from the Japanese experts.

2. Training Equipment and Furniture :

- a) SWCC agreed to the item and quantity of the proposed training equipment and furnitures.

KINGDOM OF SAUDI ARABIA
Saline Water Conversion Corporation

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Date _____

b) Both parties agreed that JICA will supply and install the training equipment, and SWCC will provide the workshop furnitures except the TP Maker and the Parts Case.

3. Workshop Lay-out Plan :

a) SWCC agreed to prepare the Room (No.2-308) in the SWCC RDTC in Jubail to be used as a workshop of the Electronics & Electronic Control Training Course, and to rearrange the above-mentioned Room, in accordance with the proposed workshop lay-out plan.

b) SWCC agreed to send the detailed design for the workshop rearrangement to JICA at the earliest date.

4. Instructor's Training in Japan :

SWCC agreed to the proposed training contents. However, SWCC requested that the training duration should be about nine (9) months.

5. Assignment of Instructors :

a) The Team strongly suggested that SWCC should assign the qualified Saudi Arabian instructors to the SWCC RDTC in Jubail as soon as possible.

b) The Team requested that the minimum number and qualification of the instructors should be as follows:

i) Two (2) Engineers - University graduates in the field of Electronics or Electrical Technology with more than two (2) years working experience.

ii) Three (3) Technicians - Industrial high school graduates in the Radio & Television Course or Electrical Course with more than two (2) years working experience.



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KINGDOM OF SAUDI ARABIA
Saline Water Conversion Corporation

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Date _____

6. Dispatch of Japanese experts :

SWCC requested that Japanese experts should be dispatched to Saudi Arabia soon after the completion of the Saudi Arabian Instructors' training in Japan, in order that the instructors can prepare the training plan and conduct the training activities in the SWCC plants in consultation with the Japanese experts .

The following personnel from SWCC and JICA attended the meetings :

SWCC

- 1) Mr. Khalid M. Al-Saawi
- 2) Mr. Abdul-Aziz A. Al-Hinti

JICA

- 1) Mr. Takashi Kaneko
- 2) Mr. Katsuzo Tsubata
- 3) Mr. Takanori Jibiki
(Resident Representative of
JICA Saudi Arabian Office)

Signed at: Riyadh, August 26, 1987



Khalid M. Al-Saawi
General Director,
Training Department, SWCC.



Takashi Kaneko
Member of the Team, JICA



Katsuzo Tsubata,
Member of the Team, JICA

FHK/OSA/32-34

Riyadh - Olaiya - Makkah St. ☒ 4631780 4631763 4632070 P.O. Box 5968 Riyadh 11432 Telex 200097 200401

1.2 Detailed Design (I)

MINUTES OF MEETING
(Research Cooperation)

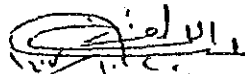
A meeting was held between the delegation of JICA headed by Mr. Masayoshi Enomoto and SWCC officials headed by Mr. Abdullah Al-Azzaz from 15 June, 1987 to 16 June, 1987 at SWCC office in Riyadh. A list of members attending the meeting is attached as appendix I. Technical members of the Japanese team headed by Mr. Takeo Sakamoto visited Yanbu from 16 June, 1987 to 20 June, 1987 for site confirmation and data collection which is necessary for further works of drawing detailed design.

The results of above meeting held at SWCC are as follows:

1. Conceptual design of desalination technology center which was drawn up by Japanese team was explained to SWCC side on 15 June, 1987 and SWCC side stated that comments if any for the conceptual design would be given to Japanese team on 21 June, 1987 at SWCC.
2. Although the Japanese team will do their best in preparing the detailed design, the responsibility and the defect liability on all documents and drawings shall be taken by SWCC side after their acceptance of the design in the middle of Aug. 1987.
3. Working schedule until commencement of Research Cooperation attached in Appendix II was mutually agreed upon. However SWCC will make its best effort to shorten the scheduled period of remodeling and construction
4. Signing of the extension of Record of Discussion was agreed upon to be done approximately in the middle of September 1987.
5. SWCC side requested Japanese side strongly to dispatch Japanese technical adviser(s) from tendering stage to completion of remodeling and construction work stage of the Desalination technology center. The Japanese side will reply.

6. Draft of extension of Record of Discussion except training field was discussed and agreed that Japanese idea of the draft including training field shall be presented to SWCC at the earliest possible time after the Japanese team's return to Japan and that finalization of the draft shall be made around the middle of Aug. 1987, when Japanese explanation team of detailed design is to be dispatched to SWCC.
7. The detail design will be submitted to SWCC (Research Dept.) on Aug. 10, 1987.
8. Contents of Research Cooperation was confirmed to be done with the same research themes as described in the ANNEX II of the Minutes of Meeting dated November 20, 1984 which is attached herewith as appendix III.

Signed in Riyadh on: June 16, 1987



Abdullah A. Al-Azzaz
Director General
Dept. of Research
and Technical Affairs



Masayoshi Enomoto
Leader
JICA Mission

MEETING

(Held on 15, June 1987)

NAMES

(Saudi Arabian Side)

1. Abdullah Al-Azzaz, Director General, Dept. of Research and Technical Affairs
2. Habeeb Mohammed Engineer, Research Dept.
3. Abdurahman Al-Asoos Engineer, " "
4. Habeeb H. Al-Shareef Engineer, Construction Dept.
5. Khaja Kamaluddin Engineer, " "
6. Nabeel Al-Gahtani Engineer, " "

NAMES

(Japanese Side)

1. Masayoshi Enomoto
 2. Shinji Shibata
 3. Takeo Sakamoto
 4. Toshio Harada
 5. Harukichi Okamura
 6. Kinji Toyama
 7. Toshio Kojitani
 8. Shohei Kibe
 9. Hiroshi Kajiya
- [Handwritten signature]*
- [Handwritten initials]*

APPENDIX II

TENTATIVE SCHEDULE

JUL/87 AUG SEPT OCT NOV DEC/87 JAN/88 SEP/88 DEC/88 JAN/89 FEB MAR/89

^A
 (10th August)
 Submission of the Detailed Design

^A
 (Middle of September)
 Signature for the extension of R/D

Preparation for tender
 (From end of Aug to
 Middle of Nov)

Evaluation
 (From middle of Nov
 to end of Dec/88)

Remodeling and Const-
 ruction works (From
 beginning of Jan to
 end of Dec/88)

7+

Installation and Ad-
 justment of equipment
 (From Dec/88 to end of
 Feb/89)

Beginning of Research
 (From beginning of
 March/89)

Preparation for extension of R/D
 (From Sep/88 to end of Feb/89)

^A
 (End of Mar/89)
 Extension of R/D

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Saline Water Conversion Corporation

Our Ref. No. _____

Date _____ ANNEX II

The revised Research themes and the schedules are as follows:

1- REVERSE OSMOSIS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>
R-1	To examine sterilization effect of : 1) Chlorine 2) Ultraviolet Radiation. 3) Sodium Bisulfite (SSS) and 4) Copper Sulphate
R-2	To optimize the use of coagulants and coagulant aids by Jar Tester and in line test and study the relationship between filter performance and quality of seawater. Evaluate the economic feasibility of using the coagulating agents.
R-3	To study the pollution effect of membrane cleaning discharge in the laboratory.
R-4	To study the performance of various membranes under local operating conditions. Studies to be carried out to test stability of the membranes with increased feed water temperature.
R-5	To test the chemical cleaning methods when the module is fouled or deteriorated.
R-6	To estimate a most reasonable process of a large scale plant for the prevailing conditions in the Kingdom of Saudi Arabia.
R-7	To standardize the main Analytical - methods.

contd.2.

KINGDOM OF SAUDI ARABIA
Saline Water Conversion Corporation

Our Ref. No. _____

Date _____

2- MULTI-STAGE FLASH (MSF)

ITEM NO.

DESCRIPTION

M-1

To examine the effect of using acid + anti scale agent dosing to control scale deposition and use sponge ball cleaning system. Study the change in over all heat transfer coefficient as the measure of scale deposition through long term operation and to analyze the scales taken from the tube walls of the test plant.

M-2

To test alternative materials such as titanium, aluminum brass and any other new materials and in the case of aluminum brass, Cu-Ni 90/10 to examine if this would stand well against corrosion in a less oxidizing condition made by SBS addition to the effluent of the deaerator as de-oxidizer.

M-3

To measure the corrosion tendency of the materials by the corrotor, the test pieces and the inspection of the tubes pulled out from tube sheet.

M-4

To standardize the main Analytical - methods.

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TECHNICAL MEMO
(Research Cooperation)

JICA Technical group discussed with Research Department and Construction Department of SWCC from 21st to 23rd June 1987 the following technical items which are relevant to the preparation of Detail Design and Tender Documents.

- 1) Survey Results and alternate proposals for layouts of buildings & structures, and the ancillary facilities required for the project.
- 2) Conceptual Design prepared by JICA.
- 3) The document titled "Detail Design Technical Specifications" which will form the basic for preparation of the detailed design and specifications.
- 4) Preparation of Tender Documents.

The outcome and results of above discussions are as follows:

- 1) Survey results and alternate proposals for layouts of buildings & structures and the ancillary facilities required for the project.
 - (1) JICA, after surveying the site, proposed alternates for Test Plants Area layout, and laboratory building room layout. These alternates were proposed because of the following reasons:
 - a) For optimum utilisation of the available space in the test plants area, without shifting the existing transformer.
 - b) For minimising the modification work in the administration building.

After detailed discussions on the proposed alternates & the C/D. SWCC and JICA agreed on the final layouts, as indicated in the attached sketches:

Attachment "A" for Laboratory Building

Attachment "B" for Test Plant Area

- (2) The two parties discussed about the ancillary facilities such as the raw seawater intake, waste water discharge lines, fuel pipe line and product water line.

SWCC requested that product water should be connected to two lines: one to discharge line; another to existing potable line.

Connections for the other facilities were agreed as indicated in Attachment "C".

2) Conceptual design prepared by JICA

SWCC agreed to the C/D with the following comments:

- (1) Additional building services (such as water supply, electrical supply, waste water disposal, HVAC system, etc) shall be provided where ever required. These additional facilities should be in conformity with the existing system.
- (2) Fire Detector & Fire Fighting Systems
The systems for the existing buildings should be suitably modified to conform to the requirements of laboratory buildings. Suitable new systems should be provided for the new building and test plant areas etc.
- (3) The W.C. basins to be provided in the new building should be 50% western type & 50% eastern type.

3) The document titled "Detail Design Technical Specification"

SWCC reviewed the above mentioned document and agreed to it, with the following comments:

For Additional new test plant building:

- structural frame shall be of reinforced concrete
- American or European codes and standards may be applied
- interior wooden doors shall be of Swedish type
- foundation design should be based on an assumed soil bearing capacity of 1 KG/Cm²

4) Preparation of Tender Documents

JICA stated that they will prepare the detailed design and tender documents for the buildings, the facilities inside the test plants areas, and the raw sea water intake. JICA felt that SWCC should prepare the designs for the ancillary facilities and all external works. SWCC expressed the view that JICA should take the job for the preparation of the design of all the works including the ancillary facilities and external works, because of the following reasons:

- a) Since the design of ancillary facilities could be done only after completion of the design of internal works, this will cause delay in the implementation of the project.
- b) If the complete project is designed by one party, it will avoid the need for coordination of the two designs, thereby saving time and also minimizing discrepancies in the documents.

JICA stated that they will convey SWCC's views to their headquarters for a final decision in this matter.

SWCC requested JICA to include all necessary technical information about the plants, equipment and specifications for the installation and connections to all facilities so as to enable the contractor to install and test the plants and equipment.

SWCC provided a set of sample tender documents to JICA for reference and for adoption in the design work. SWCC requested that these documents should be returned at the time of the submission of the detailed design, tender documents. The preparation of the various parts of the documents was agreed to be as follows:

Tender Documents

- | | |
|--------|--|
| Vol. 1 | Contract documents (legal parts),
condition of contract, site condition.....by SWCC |
| Vol. 2 | Project Requirements and General
Technical Specification.....by JICA |
| Vol. 3 | Technical Specifications.....by JICA |
| Vol. 4 | Detail Drawings.....by JICA |
| Vol. 5 | Bill of Quantities.....by JICA |

The arrangement and the number of vols, may be modified, if necessary, after completion of the design work.

Attendants:

SWCC

1. Abdullah A. Al-Azzaz Director General, Research Dept.
2. Abdul Rahman Al-Asoos Research Dept.
3. Habeeb H. Al-Shareef Construction Dept.
4. Khaja Kamaluddin Construction Dept.
5. Nabeel Al-Gahdani Construction Dept.
6. Awadallah Rashed Al-Harbi Yanbu Plant.

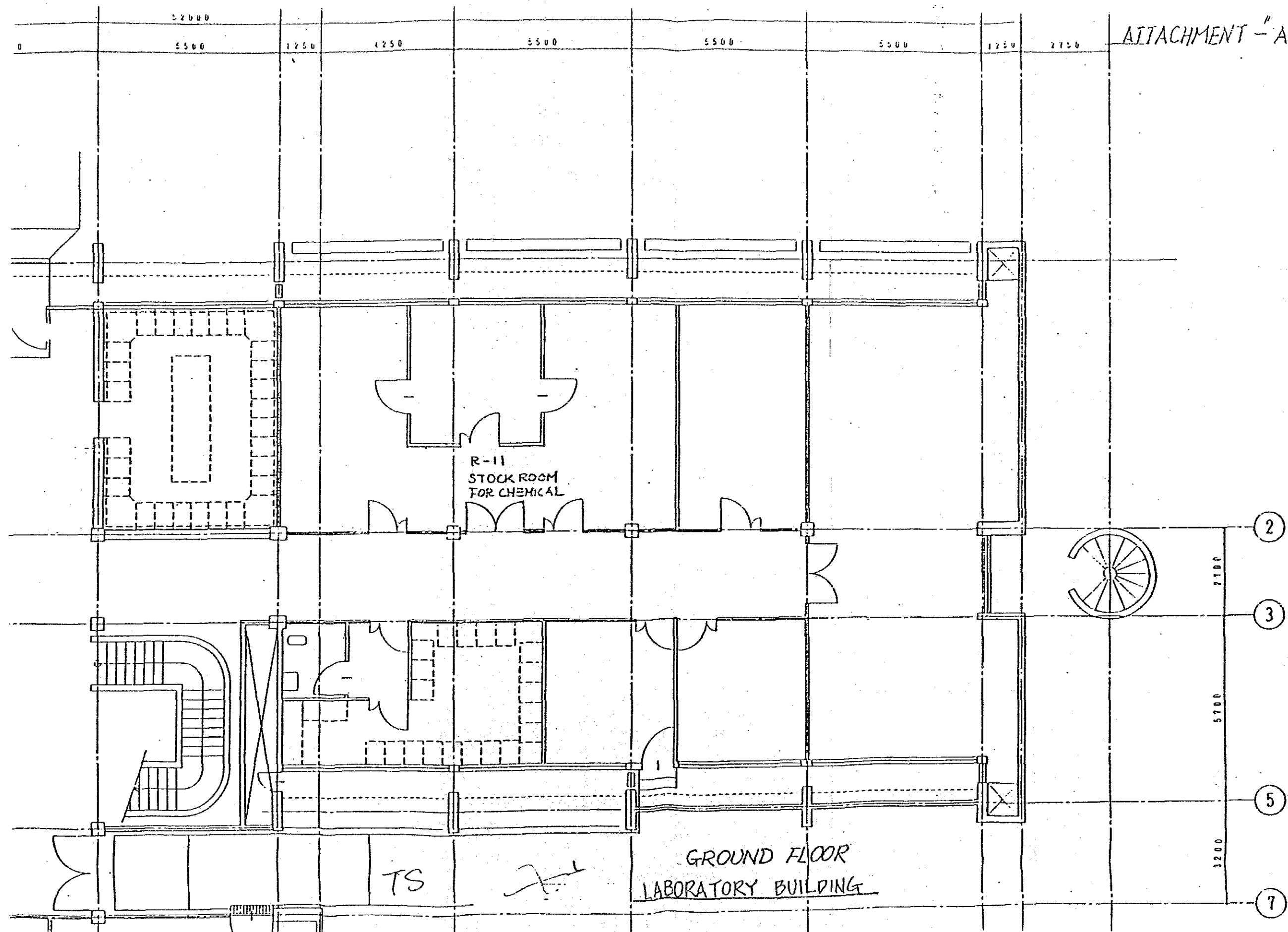
Handwritten signatures and initials:
F. W. M. A.
S. W. A. / C. A.
K. F. A.

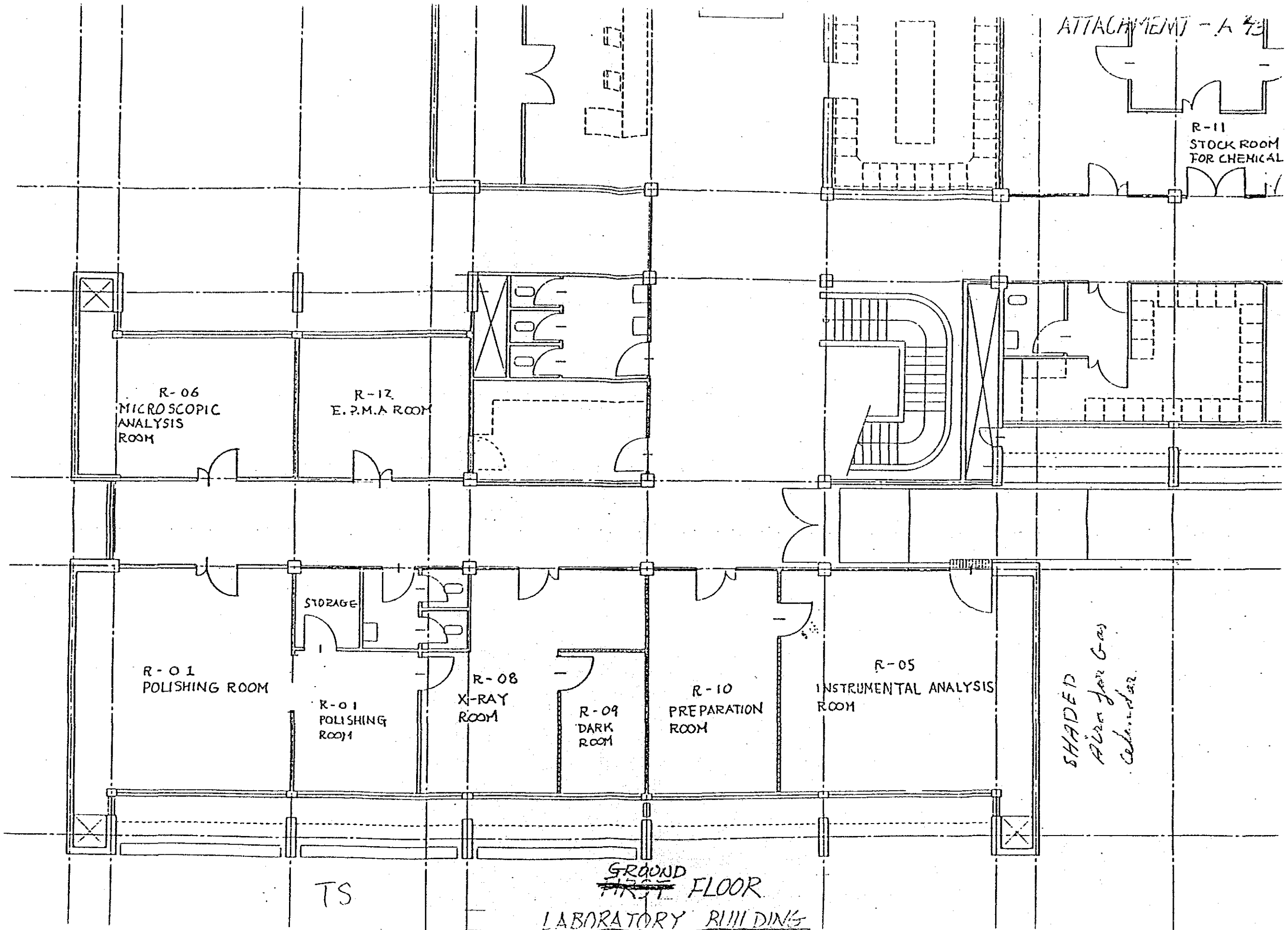
Handwritten signature and initials:
P. W. A. / 2. V / 1 / C. A.

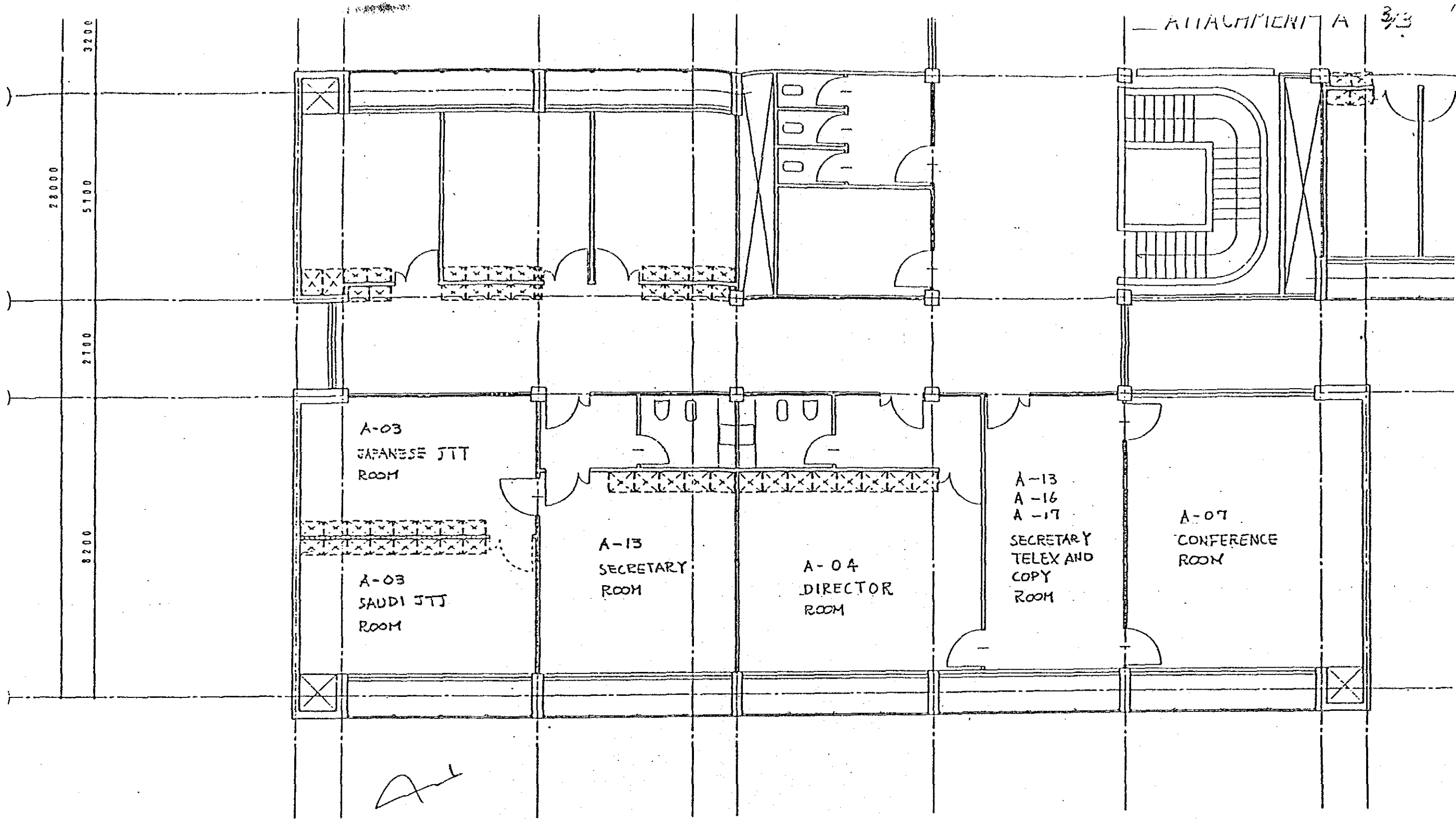
JICA

1. Takeo Sakamoto *For M. ENOMOTO
Takeo Sakamoto*
2. Harukichi Okamura
3. Toshio Harada
4. Kinji Toyama
5. Toshio Kojitani
6. Shohei Kibe
7. Hiroshi Kajiya

ATTACHMENT - "A" 1/3

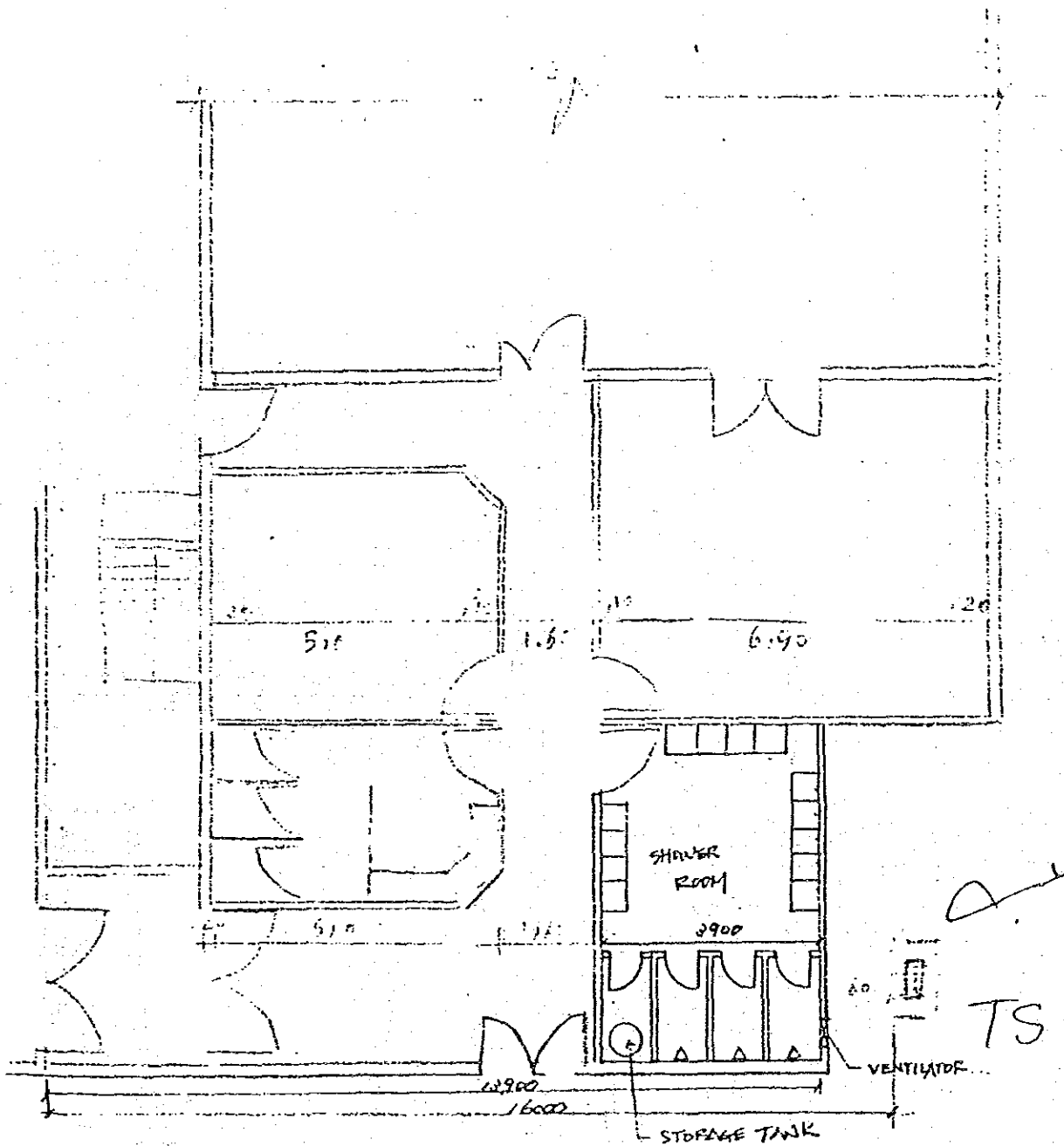






TS

FIRST
~~GROUND~~ FLOOR
LABORATORY BUILDING



* THE CHEMICAL ANALYSIS ROOM (R-04) HAS TO BE CHANGED TO HAVE A PARTITION THAT WILL DIVIDE THE TOTAL AREA TO TWO DIVIDED ROOMS, ONE AS A CHEMICAL & THE OTHER AS RECEPTION.

1.3 Detailed Design (II)

MINUTES OF MEETING BETWEEN SWCC AND JICA

The meetings were held between SWCC and the visiting JICA delegation from 16th to 25th August 1987 in Riyadh. A list of participants is attached as Appendix-I. The results of the meetings are as follows:

1. JICA has submitted the draft of detail design to SWCC as the technical parts (technical specifications, detail drawings and bill of quantities) of the tender documents.
2. The following technical parts will be included into the final detail design:
 - 1) The foundation of the test plants
 - 2) The ancillary facilities such as connections of utilities, drainage and product water, access road etc.
3. The bill of quantities and other technical documents related to installation of the laboratory equipment as well as the test plants are excluded from the draft of detail design, since these should be provided under the supervision of the relevant engineers and researchers for the smooth implementation of the installation.
4. The visiting JICA delegation explained the views, the constitution and the contents of the draft of detail design, and SWCC side questioned and commented on the contents. The detail of these and answers made by the JICA delegation are attached as appendix II, III.

SWCC intended to split the project work in two parts as follows:

Part A: Buildings and their related work.

Part B: Test plants and ancillary facilities work.

5. 30 copies of the final detail design for the technical parts of the tender documents including the missing parts shown in article 2 will be sent to SWCC in the middle of October. The documents should be numbered as follows: (i.e.) 2-7, 3-7 etc.
6. The project requirements and conditions of contract described in the "technical memo" prepared in last June should be done by SWCC.

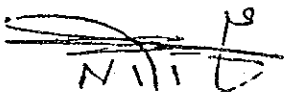
7. SWCC shall take the necessary measures, at its own expense, to provide all the required materials and others (including additionally required ones due to the change of design conditions) required for the installation of the test plants, the ancillary facilities and the laboratory equipment.

SWCC requested that JICA provide the specifications and B.Q. for the additional materials required for the installation of the test plants and the laboratory equipment at the end of December 1987.


8. The missing laboratory equipment sent by JICA to SWCC as mentioned in the minutes signed by SWCC and JICA in Yanbu in July 1985 have not been received by SWCC till now. SWCC is requesting JICA to provide these missing items at an early date.

AA

Yjin



Abdullah A. Abanmy
Deputy Governor for
Technical Affairs & Projects



Yoshio Murayama
Head, JICA Delegation

APPENDIX I
Participants of the meetings

SWCC:

- | | |
|-----------------------------|---|
| 1. Abdullah A. Al-Azzaz | Director General, Dept. of Research and Technical Affairs |
| 2. Nabil Qahtani | Engineer, Construction Dept. |
| 3. Khaja Kamaluddin | Engineer, Construction Dept. |
| 4. Habeeb H. Al-Sharif | Engineer, Construction Dept. |
| 5. Abdul Rehman A. Al-Asoos | Engineer, Dept. of Research and Technical Affairs |
| 6. Habeeb Mohammed Habeeb | Engineer, Dept. of Research and Technical Affairs |

Japanese Delegation:

- | | |
|----------------------|----------|
| 1. Kazuaki Koizawa | MITI |
| 2. Yoshio Murayama |) |
| 3. Takeo Sakamoto |) |
| 4. Harukichi Okamura |) |
| 5. Toshio Harada |) - JICA |
| 6. Toshio Kojitani |) |
| 7. Kinji Toyama |) |

APPENDIX II

Technical Memo on "Detail Design" Vol.1 to Vol.4

The delegation of JICA explained to SWCC the constitutions and contents of Detail Design (Vol 1 to Vol. 4 for Building and their related works).

The questions and comments by SWCC were discussed by both parties and the results are as follows:

1) More detailed specification to be added for:

- External finishing works (lithing spray) (Re: vol.1, bldg work 6.5)
- Neutralization pit (acid coating, limestone) (Re: vol.1, mech. work 3.07)
- Gravels under foundation (Re: vol. 1, bldg. work 2.4)
- Floating floor (informed by SWCC) (Re: vol.1, bldg work 10.5)
- Material specification for hot water pipe, (copper pipe with insulation) (Re: vol. 1, mech. work 2-02-4)
- Soil bearing capacities (1 kg/cm^2) (Re: vol. 1, bldg work 2.1)

2) Specification to be modified for;

- Roof waterproofing work; to be the same as existing administration building (Re: vol. 1, bldg. work 5)
- Outdoor air temperature; from 43°C to 48°C
- Indoor air temperature
 - from 79°F to 74°F for meeting room
 - from 82°F to 78°F for entrance hall, etc. (Re: vol.1 air cond. work 1.01-1)
- The type of compressor for air cooled condensing unit to be multi-type (Re: vol. 1, air cond. work 3.03-3)
- The domestic water pipe; from galvanized seamless steel to UPVC pipe (Re: vol. 1, mech. work 2.02-1)

3) Drawings

- existing solar energy building drawing shall be added for test plant building, for reference.
- electrical lighting shall be relocated for corridor of existing test plant building (Re: vol. 2, Dwg. No. SAJ-304-E201)

Appendix III, Technical Memo on Detail Design, Vol. 5

1. The fire fighting system will be included in the final documents of the test plants when it turned out to be required after checking of the S.S.D standard provided by SWCC.
2. A solid cover will be provided for the covering of the trench across the access road to the test plants.
3. Details of access road, parking, paving including shelter for the test plant area should be included in the building part of the final documents.

MSF AND RO TEST PLANTS

1. Materials of construction for piping material for connecting the chemical feed tanks to the necessary points in the MSF and RO test plants are to be specified in order to avoid galvanic corrosion effects at the joints.
2. Details of blowdown discharge not shown in the drawings.
3. Provision for fire protection equipment in the test plants area should be provided.
4. Safety showers and eyewashes shall be located in all labs and in the test plants areas.
5. Storm drainage and fire fighting hydrants and alarm system to be provided in the test plant area and connected to existing systems wherever possible.
6. All drawings should be of standard size and legible.

1.4 Technical Advisors for SWCC's Tendering Work

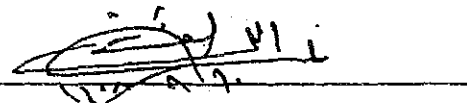
Technical Memo

The Japanese engineers stayed at the SWCC's headquarters from February 14 (two engineers) and March 20 (other three engineers) to March 29, for advising the tendering tasks(closing date of bid; March 26).

The results are as follows;

- 1.The Japanese team made the cost estimation of the Project and provided it to SWCC.
- 2.The Japanese team gave comments to SWCC concerning price's aspects of the bid documents.
- 3.Some query letters were sent from contractors.
SWCC gave necessary notices to contractors with cooperation of Japanese team.

Undersigned in Riyadh on : March 28, 1988



Abdullah A. Al-Azzaz
Director General
Dept. of Research &
Technical Affairs



Takeo SAKAMOTO
Leader of
JICA team

Participants

(SWCC)

Abdullah A. Al-Azzaz

Abdullah Al-Zahrani

Khaja Kamaluddin

Salleh A. Al-Wabel

Khalid Al-Kasabi

(JICA)

Takeo SAKAMOTO

Harukichi OKAMURA

Toshio HARADA

Kinji TOYAMA

Shohei KIBE

2. Research Themes

2. Research Themes

JICA drew up research themes for the research activities and discussed and agreed with SWCC in November 1984.

The research themes are as follows.

2.1 Items on Reverse Osmosis

- (1) To examine sterilization effect of :
 - 1] Chlorine
 - 2] Ultraviolet radiation
 - 3] Sodium bisulfite
- (2) To optimize the use of coagulants and coagulant aids by Jar Tester and in-line test.
- (3) To study the relationship between filter performance and quality of water.
- (4) To study the treatment of membrane cleaning discharge.
- (5) To study the performance of various membranes.
- (6) To study stability of the membranes through long term operation.
- (7) To test chemical cleaning methods and rejuvenating agents when the module is fouled or deteriorated.
- (8) To estimate a most reasonable process of a large scale plant for the prevailing conditions in the Kingdom of Saudi Arabia.
- (9) To standardize the main Analytical methods.

2.2 Items on Multi-Stage Flash

- (1) To examine the effect of using acid + anti scale agent dosing to control scale deposition and use sponge ball cleaning system.
- (2) To study the change in overall heat transfer coefficient and to analyze the scales taken from the tube walls of the test plant.
- (3) To test materials under a less oxidizing condition.
- (4) To measure corrosion tendency of the materials by the Corrotor, the test pieces and the inspection of the tubes pulled out from tube sheet.
- (5) To standardize the main Analytical methods.

3. List of Equipment for Laboratory & Test Plants

- 3.1 List of Additional Laboratory Equipment
- 3.2 List of Laboratory Equipment stored in Yanbu
- 3.3 List of Equipment for Test Plants stored in Yanbu

3.1 List of Additional Laboratory Equipment

3.1 List of Additional Laboratory Equipment

No.	Equipment Name	Quantity	Remarks
1-1	Ion Chromatograph (1) Measuring System (2) Recorder (3) Data Processor (4) Accessories and Spares	1 (1 set) (1) (1 set) (1 set)	These devices are used to conduct qualitative and quantitative analysis of positive and negative ions contained in seawater, concentrated seawater, produced water, waste water, etc. The results are employed in evaluating the MSF and RO processes for performance.
1-2	Total Organic Carbon Analyzer (1) Measuring System (2) Microsyringes (10, 50, 100 ml.; 3 each) (3) Spares and Consumables	1 (1 set) (1 set) (1 set) (1 set)	This device is used to conduct quantitative analysis of total carbon and total organic carbon contained in seawater, concentrated seawater, produced water waste water, etc. The objective of the analysis is to measure the overall quantity of those pollutants such as oil that cause reverse osmosis membranes to clog and deteriorate as well as produce sludge and scale in evaporators.
1-3	Biological Microscope (1) Measuring System (2) Devices for Adjusting samples (3) Consumables	1 (1 set) (1 set) (1 set)	These devices are used to observe microorganisms (planktons, bacteria, etc.) that exist in seawater and pretreated water for their effects on the pretreatment unit and reverse osmosis membranes.
1-4	High Performance Liquid Chromatograph (1) Measuring System (2) Data Processor (3) Columns and Fillers (4) Spares	1 (1 set) (1 set) (1 set) (1 set)	These devices are used to conduct component analysis of organic chemicals such as descaling and coagulating agents in order to check their relationship with overall performance.

No.	Equipment Name	Quantity	Remarks
1-5	Particle Counter (1) Measuring System (2) Measuring System	1 (1 set) (1 set)	This analyzer is used to count fine grains contained in seawater and pretreated water. Once the distribution of fine grains is found out, their effects on the pretreatment unit and reverse osmosis membranes are investigated.
1-6	Fouling Index Measuring Kit	1 set	This kit is used to check the fouling index of the seawater introduced into the reverse osmosis process.
1-7	High-pressure Sterilizer	1	This device is used to sterilize instruments employed in bacterial test as well as to conduct chemical analysis at high temperatures.
1-8	Water Samplers	1 set	These samplers are used to count live germs that exist in seawater and pretreated water.
1-9	Jar Tester	1	This tester is used to test coagulating agents for coagulation capability.
1-10	Low-temperature Thermostatic Chamber	1	This device is equipped with an external circulating pump (2 m of head, 10 l./min. or more of flow rate) for analysis in general tests. The accuracy for temperature adjustment is within $\pm 0.05^{\circ}\text{C}$, and the temperature distribution is 0.1°C or less.
1-11	Cooler for Constant Temperature Water-bath	1	This is an immersion-type chiller for use in general tests and analysis. The cooling capacity is 80 kcal/hr or more.

No.	Equipment Name	Quantity	Remarks
1-12	Centrifugal Separator	1	This is a desk-top type centrifugal separator for use in general analysis. A total of 20 decanters (50 or 100 ml. each) are provided.
1-13	Shaker	1	This is an oscillating type shaker for use in general analysis (in horizontal and vertical setups). A 60-minute timer is provided.
1-14	Reference Thermometer	1	This thermometer, made of glass, is used to calibrate other thermometers. (The thermometer is certified by the Measurement Laboratory of Japan.)
1-15	Barometer	1	This is an aneroid barometer certified by the Meteorological Agency of Japan.
1-16	Ice-making Machine	1	This machine is used to make ice for test purposes. The capacity is 50 to 100 kg of ice per day.
1-17	Platinum Instruments (1) Platinum Crucible (with lid): 25 ml., 30 g (2) Platinum pan: 100 ml., 55 g	1 set	These instruments are used in general analysis.

