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JORDAN WATER SYSTEMS AND SERVICES MANAGEMENT

PROJECT NUMBER 278-0259

FIRST INTERIM EVALUATION OF CONSTRUCTION SUPERVISION AND BASELINE EVALUATION OF CONSTRUCTION FIRMS

AGENCY FOR INTERNATIONAL DEVELOPMENT

CONTRACT NO. 278-0260-C-4003-00

JUNE 1986

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June 23, 1986

Mr. Lewis P. Reade
Mission Director
USAID/Jordan
Amman, Jordan

Dear Mr. Reade:

We are pleased to submit 12 copies of our report on the First Interim Evaluation of Construction Supervision and Baseline Evaluation of Construction Firms of three Jordanian consulting firms and four construction firms' capabilities. This report, by Mr. James Creager and the undersigned, is based on the findings of our trip to Jordan from April 19 through May 15, 1986.

This study and evaluation is the result of our Contract No. 278-0260-C-4003-00.

It was a pleasure working with the Mission on this study and evaluation, and I would like to express my thanks and appreciation to everyone in the Mission who provided assistance during the project. We look forward to the opportunity of working together with the USAID/Jordan Mission in the future.

Very truly yours,

David B. Bird
Project Team Leader

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TABLE OF CONTENTS

EXECUTIVE SUMMARY 1

Purpose of Evaluation 1
Background 1
Findings and Conclusions 1
Construction Supervision Improvements 1
Procedures 2
Conclusions 2
Construction Firms 2
Recommendations 3
Construction Supervision Firm Recommendations 3
Construction Firm Observations 4

ABBREVIATIONS 5

ACKNOWLEDGEMENTS 6

SECTION 1 - INTRODUCTION 1-1

1.1 Background 1-1
1.2 Objectives 1-2
1.2.1 First Interim Evaluation of Construction Supervision Firms 1-2
1.2.2 Baseline Evaluation of Construction Firms 1-2
1.3 Authorization 1-3

SECTION 2 - CONSTRUCTION SUPERVISION TECHNOLOGY TRANSFER - METHODS AND PROCEDURES 2-1

2.1 General 2-1
2.2 Arabtech Consulting Engineers/CH2M Hill International 2-1
2.2.1 Background 2-1
2.2.2 Project Organizational Structure 2-2
2.2.3 Technology Transfer Methods 2-3
2.3 Consulting Engineering Center/Black & Veatch International 2-4
2.3.1 Background 2-4
2.3.2 Project Organizational Structure 2-5
2.3.3 Technology Transfer Methods 2-6
2.4 Jouzy and Partners/Engineering-Science, Inc. 2-6
2.4.1 Background 2-7

3

Table of Contents

2.4.2 Project Organizational Structure 2-7
2.4.3 Technology Transfer Methods 2-8

SECTION 3 - EVIDENCE OF TECHNOLOGY TRANSFER 3-1

3.1 General 3-1
3.2 Procedures and Observations 3-1
3.2.1 Critical Path Method (CPM) Scheduling 3-1
3.2.2 Project Records and Reports 3-2
3.2.3 Quality of Construction 3-2
3.3 Exposure to Construction Supervision Instruction 3-3
3.3.1 Arabtech Consulting Engineers/ CH2M Hill International 3-3
3.3.2 Consulting Engineering Center/ Black & Veatch International 3-3
3.3.3 Jouzy and Partners/Engineering-Science, Inc. 3-4

SECTION 4 - CONSTRUCTION SUPERVISION TECHNOLOGY TRANSFER - INFLUENCES AND EFFECTIVENESS 4-1

4.1 Introduction 4-1
4.2 Long-Range Goals of USAID Technology Transfer Program 4-1
4.3 Observed Influences 4-1

SECTION 5 - RECOMMENDATIONS 5-1

5.1 Introduction 5-1
5.2 Technology Transfer Techniques Employed 5-1
5.2.1 Lectures 5-2
5.2.2 One-on-One Training 5-2
5.2.3 Line Position Responsibility for the Subconsultants 5-3
5.2.4 Administrative Procedures 5-3
5.2.5 Diplomacy 5-4
5.2.6 Technical Support 5-4

SECTION 6 - FIRST CONSTRUCTION SUPERVISION INTERIM EVALUATION 6-1

6.1 Introduction 6-1
6.2 Methodology 6-1
6.3 Baseline Evaluations 6-1
6.3.1 Arabtech Consulting Engineers 6-6
6.3.2 Consulting Engineering Center 6-6
6.3.3 Jouzy and Partners Consulting Engineering Bureau 6-7
6.4 First Construction Supervision Interim Evaluation - Summary Assessment 6-7
6.4.1 Arabtech Consulting Engineers 6-8

H

Table of Contents

6.4.2 Consulting Engineering Center 6-9
6.4.3 Jouzy and Partners Consulting Engineering Bureau 6-11
6.5 Comparison of Baseline and First Interim Evaluations 6-13

SECTION 7 - CONSTRUCTION FIRM BASELINE EVALUATION 7-1

7.1 General 7-1
7.1.1 Construction Firms and Project Information 7-1
7.1.1.1 Haddad Engineering & Contracting Co. 7-1
7.1.1.2 Madanat Contracting Co. 7-1
7.1.1.3 Sinimmar Engineering and Contracting 7-2
7.1.1.4 Trans Orient Engineering & Contracting Co. Ltd. 7-2
7.1.2 Present Project Status 7-2
7.2 Baseline Evaluation - Construction Firms 7-3
7.2.1 Criteria 7-3
7.2.2 Approach 7-4
7.2.3 Construction Firm Capability Index 7-4
7.2.3.1 General Concepts 7-4
7.2.3.2 Rating Format 7-5
7.2.3.3 Category Weighting 7-5
7.2.3.4 Uses of the Rating Forms and Rating Definitions 7-11
7.3 Ratings and Assessments 7-11
7.3.1 Haddad Engineering & Contracting Co. 7-11
7.3.2 Madanat Contracting Co. 7-12
7.3.3 Sinimmar Engineering and Contracting 7-13
7.3.4 Trans Orient Engineering & Contracting Co. Ltd. 7-14

SECTION 8 - TECHNOLOGY TRANSFER FOR CONSTRUCTION FIRMS 8-1

8.1 Introduction 8-1
8.2 Appropriate Deliverable Items for Each Construction Firm 8-1
8.2.1 Haddad Engineering & Contracting Co. 8-1
8.2.2 Madanat Contracting Co. 8-2
8.2.3 Sinimmar Engineering and Contracting 8-2
8.2.4 Trans Orient Engineering & Contracting Co. Ltd. 8-2
8.3 Transfer Techniques 8-2
8.3.1 Lectures 8-2
8.3.2 Reference Materials 8-3
8.3.3 Field Trips 8-3
8.3.4 One-on-One Training 8-3

Table of Contents

8.3.5 Methods Proposed by U.S. Subcontractors 8-3
8.3.5.1 Caddie Construction Company 8-4
8.3.5.2 ETI of North America 8-4
8.3.5.3 Carl P. Wallace International Inc. 8-4
8.4 Evidence of Technology Transfer 8-5

APPENDIX A - PERSONS CONTACTED

APPENDIX B - REFERENCES

APPENDIX C - QUESTIONNAIRES - CONSTRUCTION SUPERVISION

APPENDIX D - QUESTIONNAIRES - CONSTRUCTION FIRMS

APPENDIX E - GENERAL CONTRACT REQUIREMENTS FOR TECHNOLOGY TRANSFER TO CONSTRUCTION FIRMS FROM U.S. SUBCONSULTANTS

APPENDIX F - CURRICULUM VITAE - CONSTRUCTION SUPERVISION PROJECT MANAGERS AND KEY PERSONNEL

APPENDIX G - ORGANIZATION CHARTS - CONSTRUCTION FIRMS

APPENDIX H - CURRICULUM VITAE - CONSTRUCTION FIRM PROJECT MANAGERS

Table of Contents

LIST OF TABLES

Table No.	Title	Page No.
6-1	Definition of Elements and Ratings	6-2
7-1	Definition of Elements and Ratings	7-6

7

Table of Contents

LIST OF FIGURES

Figure No.	Title	Following Page No.
6-1	Construction Supervision Development Index	6-1
6-2	Construction Supervision Development Index, Arabtech Consulting Engineers, March 1985	6-6
6-3	Construction Supervision Development Index, Consulting Engineering Center, March 1985	6-6
6-4	Construction Supervision Development Index, Jouzy and Partners, March 1985	6-6
6-5	Construction Supervision Development Index, Arabtech Consulting Engineers, May 1986	6-8
6-6	Construction Supervision Development Index, Consulting Engineering Center, May 1986	6-8
6-7	Construction Supervision Development Index, Jouzy and Partners, May 1986	6-8
6-8	Construction Supervision Development Indices Rating Comparison	6-13
6-9	Construction Supervision Development Index, Arabtech Consulting Engineers, March & May 1986	6-13
6-10	Construction Supervision Development Index, Consulting Engineering Center, March & May 1986	6-13
6-11	Construction Supervision Development Index, Jouzy and Partners, March & May 1986	6-13
7-1	Construction Firm Capability Index	7-5
7-2	Construction Firm Capability Index, Haddad Engineering & Contracting Co., May 1986	7-11
7-3	Construction Firm Capability Index, Madanat Contracting Co., May 1986	7-11
7-4	Construction Firm Capability Index, Sinimmar Engr & Contracting, May 1986	7-11
7-5	Construction Firm Capability Index, Trans Orient Engineering & Contracting Co. Ltd., May 1986	7-11

EXECUTIVE SUMMARY

PURPOSE OF EVALUATION

Background

In the latter part of 1984, three Jordanian consulting engineering firms were selected by the Water Authority of Jordan and signed contracts to design water reservoirs, water distribution systems, wastewater collection systems, treatment plants, and stormwater drainage systems for 10 municipalities in Jordan. The size of the municipalities ranged in population from approximately 4,000 to 30,000 inhabitants. The systems for the six smallest towns were designed by one firm, while the systems for the larger four cities were divided between two firms with two cities each. The populations of the larger cities were all greater than 10,000 inhabitants.

Each of the three Jordanian engineering firms subcontracted a U.S. engineering firm to provide transfer of technology during the design. A baseline evaluation of their capabilities was completed in March 1984. An interim evaluation of these three firms was made a year later (February/March 1985), near the end of the design period. Measurable improvement of their capabilities to complete a similar project was determined.

At the same time as the first interim evaluation, a baseline evaluation was made of the construction supervision capabilities of the same three Jordanian engineering firms that had been indicated by the client, Water Authority of Jordan, as the firms that would provide the construction supervision because of their knowledge regarding the design of the water and wastewater systems to be constructed.

FINDINGS AND CONCLUSIONS

This evaluation consists of two parts: an interim evaluation of the three Jordanian consulting firms' capabilities to adequately perform construction supervision; and, a baseline evaluation of the four Jordanian construction firms' capabilities that are constructing the water and wastewater systems for two of the large cities, Karak and Tafila.

Construction Supervision Improvements

At the time of this study, 2 of the 22 projects had not started; and none of the construction projects were complete. As a consequence, the consulting firms providing the construction supervision services had not received the full benefit of the technology transfer program. The majority of the construction projects had started about three to five months before this evaluation was made. Most of the projects require another five to seven months before the facilities will be

completed. The technology transfer programs should continue throughout these projects.

Each of the Jordanian consulting firms is uniquely different from the other. Arabtech Consulting Engineers is a solid, midsized firm which, prior to this project, did not have experience in sanitary engineering but did have an experienced construction supervision group. Consulting Engineering Center (CEC) is a small firm with a good reputation but with a limited number of experienced full-time engineers on staff. They have completed several construction supervision projects in the recent past. Jouzy and Partners Consulting Engineering Bureau is a large, well-respected firm. Their Jordanian office is not their main office. They have completed a number of major construction supervision projects in the past.

Procedures

The procedures employed by the U.S. subconsultants to transfer technology to the Jordanian consulting engineering firms varied somewhat during the period of time prior to this evaluation. Arabtech and Jouzy and Partners have their U.S. subconsultants at or near the job sites. CEC has been using their U.S. subconsultant in their main office to provide needed technical submittal review assistance. It is expected that CEC's subconsultant will begin to spend more time at the job sites in the near future. All subconsultants are using lectures and one-on-one training methods, and are assisting with administrative and technical matters.

Conclusions

All three firms have shown some improvement in construction supervision skills. The principal areas of improvement were in the project administration and construction techniques utilized by the project staff. Additionally, the firms have obtained or developed better construction supervision project procedures and manuals.

The following table is a numerical evaluation of each firm's changes since the baseline evaluation was made. The numerical values are only to show changes in the qualifications of each firm and are not a comparison between firms.

Name of Firm	Baseline	Interim	Change
Arabtech Consulting Engineers	152.8	166.2	14.3
Consulting Engineering Center	108.8	146.7	37.9
Jouzy and Partners	124.1	146.9	22.8

Construction Firms

A baseline evaluation of the general capabilities of four construction firms was made. The four firms are: Haddad Engineering & Contracting Co., Madanat Contracting Co., Sinimmar Engineering and Contracting, and Trans Orient Engineering and Contracting Co. Ltd. All of the firms have good reputations in

10

Jordan. Haddad is a small firm; the owner and the technical director are directly involved in their contracts. They have two of the five contracts within the scope of this evaluation. Madanat is a small- to medium-sized construction firm with good financial strength. Sinimmar is a small- to medium-sized firm with an excellent reputation. Trans Orient (TROCON) is a large firm that has construction projects in various parts of the world. Haddad, Madanat, and Sinimmar are expected to benefit the most from their U.S. subcontractors, especially in the areas of project management, submittals, cost accounting, scheduling, and reporting.

The technical abilities of the project personnel were considered to be quite good, as noted by the quality of work and their knowledge of the projects and construction techniques during our job site visits.

Only one of the U.S. subcontractors was in Jordan at the time of the study. A second U.S. subcontractor had been in Jordan, but returned to the U.S. for reserve military training, and was expected to return to Jordan in early June 1986.

RECOMMENDATIONS

The recommendations are limited to those noted from the interim evaluation of the construction supervision services being provided by the three engineering firms. Observations are included that apply to the construction firms noted while collecting the baseline data during interviews and job site visits.

Construction Supervision Firm Recommendations

Each engineering firm should have a subcontracted construction supervision advisor at the project site at least 80 to 90 percent of the time. This continuous presence enables the U.S. subconsultant to observe the projects on a continued basis and to observe problems and areas of weakness of the engineering firm. He can then provide advice and assistance immediately.

It appears that the technology transfer is best accomplished through a combination of lectures supported by adequate lecture notes and handouts, and one-on-one training. All lectures and one-on-one training must be on current topics of interest or a noted weakness of the local engineering firm. The continuous presence of the U.S. subconsultants will encourage and strengthen the confidence of the local personnel. Confidence and respect for the U.S. subconsultants is essential in maximizing the transfer of the technology process.

For lesser experienced and small local firms, a second U.S. subconsultant may be needed and, if so, should be provided to assist in reviewing the equipment and drawing submittals. The type of technical problems encountered during the drawing and submittal approval period are considerably different from those encountered during the design period. This subconsultant should be able to respond to treatment process questions and to mechanical and electrical as well as civil engineering matters. He should remain on the project only during the period that the majority of the equipment and process submittals from the construction firm are received.

11

The U.S. subconsultant should not be responsible for any aspect of the project. He should act only as an advisor to the local firm. On large projects, the U.S. advisor could act in a counterpart role; but the responsibility should always lie with the local personnel.

Construction Firm Observations

Various interpretations of the U.S. subcontractor's role were made by the local construction firms. They all appear to be made with regard to how the subcontract arrangement with a U.S. firm could best benefit them. The better and larger construction firms tended to interpret the U.S. firm's involvement as a support role rather than as an advisory role. This is not the intent of the technology transfer program, and steps should be taken to clearly identify the role of the U.S. firm in the tender documents.

12

ABBREVIATIONS

AID	-	Agency for International Development
Arabtech	-	Arabtech Consulting Engineers
BVI	-	Black & Veatch International
CEC	-	Consulting Engineering Center
CFCI	-	Construction Firm Capability Index
CH2M Hill	-	CH2M Hill International
CSDI	-	Construction Supervision Development Index
ESI	-	Engineering-Science, Inc.
GOJ	-	Government of Jordan
Haddad	-	Haddad Engineering & Contracting Co.
JMM	-	James M. Montgomery, Consulting Engineers, Inc.
Jouzy and Partners	-	Jouzy and Partners Consulting Engineering Bureau
Madanat	-	Madanat Contracting Co.
MOP	-	Ministry of Planning
OCI	-	Overall Capability Index
Project Team	-	JMM Personnel Involved in the Evaluation Study
Sinimmar	-	Sinimmar Engineering and Contracting
TROCON	-	Trans Orient Engineering & Contracting Co. Ltd.
U.S.	-	United States of America
USAID/Jordan	-	United States Agency for International Development Mission in Amman, Jordan
WAJ	-	Water Authority of Jordan

ACKNOWLEDGEMENTS

This study and set of evaluations would not have been possible without the full support and cooperation of the United States Agency for International Development (USAID) Mission in Amman, the Water Authority of Jordan, the Ministry of Planning, the six participating consulting engineering firms: Arabtech Consulting Engineers and CH2M Hill International, Consulting Engineering Center and Black & Veatch International, and Jouzy and Partners Consulting Engineering Bureau and Engineering-Science, Inc.; and the four Jordanian construction firms and their subcontractors: Haddad Engineering & Contracting Co., Madanat Contracting Co., Sinimmar Engineering and Contracting, Trans Orient Engineering and Construction Co. Ltd., Caddie Construction Company, ETI of North America, and Carl P. Wallace International, Inc.

The guidance and assistance of the USAID/Jordan personnel were most welcome. Our thanks to: Mr. Bernard Donnally, Mr. William Libby, Mr. Aied Sweis, and Mrs. Nancy Carmichael Hardy. The extra efforts of Mr. Aied Sweis in assisting the Project Team contributed greatly to the success of this study and were appreciated and recognized.

The Project Team would like to express their gratitude to all of the many individuals who cooperated and assisted in this undertaking. It was an assignment made easier and personally rewarding as a result of your efforts.

SECTION 1

INTRODUCTION

1.1 BACKGROUND

In 1983, AID began financing a Water Systems and Services Management Project (WSSM) in Jordan. Among its objectives was to provide for preparation of final design for new water and sewerage systems in ten small Jordanian cities. At that time, three Jordanian consulting firms were selected and contracted to do those designs. Each Jordanian firm was assisted by a subcontracted U.S. consulting engineering firm.

The goal of that project was effective development, management, conservation, protection, and utilization of Jordan's scarce water resources. The broad purposes of the project were to develop and improve the institutional capability of private and public organizations; to conserve and manage Jordan's water resources; and, as part of that effort, to extend and improve certain municipal water distribution, wastewater collection, and treatment facilities.

In that context, the ten-cities design work was a vehicle for the training and strengthening of the long-term capability of the three Jordanian consulting engineering firms to independently design and supervise the construction of municipal water and wastewater facilities. The purpose of the U.S. subconsultants was to provide sufficient managerial and technical upgrading to their respective Jordanian partners during the design and construction supervision phases of a project.

The design of the water distribution, wastewater collection, and treatment systems is complete. Baseline evaluations of the three Jordanian consulting engineering firms were completed at the beginning of the design effort in March 1984; followed by an interim evaluation, in March 1985, to measure the increased capabilities—learned through the technology transfer efforts of their U.S. subconsultants—of those three Jordanian firms to independently design similar facilities.

At the same time as the interim evaluations were made after completion of the design of the water distribution, wastewater collection, and treatment systems for the ten small Jordanian cities, a baseline evaluation of the construction supervision capabilities for the same three Jordanian consulting engineering firms was made. Because of their knowledge of the projects, they were designated to do the construction supervision of these projects. James M. Montgomery, Consulting Engineers, Inc., (JMM) made the baseline survey of the capabilities of the three Jordanian firms during February/March 1984, and the first interim evaluation and construction supervision baseline survey during March 1985. Copies of these two JMM reports covering these surveys are available at AID

15

Washington (NE/PD/MEMA, AID/W) and at the AID mission in Amman (USAID/Jordan).

1.2 OBJECTIVES

1.2.1 First Interim Evaluation of Construction Supervision Firms

The primary objective of this study was to conduct the First Interim Evaluation of the Construction Supervision Capabilities of the Jordanian Engineering Firms: Arabtech Consulting Engineers, Consulting Engineering Center, and Jouzy and Partners Consulting Engineering Bureau. The evaluation results were compared with the baseline evaluation, conducted in March 1985, to determine the improved technical and administrative capabilities of these three firms obtained through the technology transfer program.

Related secondary objectives of this study were to:

- define the various approaches and means of technology transfer utilized in these projects;
- define those mechanisms which were effective and why, and those mechanisms which were not effective and why not;
- define the factors which influenced the technology transfer;
- define the evidence of technology transfer for this project; and
- suggest any improvements the mechanisms of the U.S. subconsultants transferring technology to the Jordanian prime consultants.

At the time of this survey, none of the contracts had been completed. In fact, the oldest contract had been in effect for about nine months, with the average time the contracts had been in effect being about four to five months with seven to nine months required for completion. This interim evaluation therefore represents only the changes that have taken place during the limited time period the contracts have been in effect and during the time their U.S. subconsultants have been in Jordan for the purpose of technology transfer. A second interim evaluation is required to measure the full effect of the technology transfer contracts between the Jordanian construction supervision consulting firms and their U.S. subconsultants.

1.2.2 Baseline Evaluation of Construction Firms

The primary objective of the Construction Firm Baseline Evaluation is to assess the baseline capabilities of four Jordanian construction firms,

16

responsible for five contracts in the Cities of Karak and Tafila, to successfully complete their contracts in accordance with the contract documents using up-to-date construction scheduling and management techniques. The four construction firms are: Haddad Engineering & Contracting Co., Madanat Contracting Co., Sinimmar Engineering and Contracting Co., and Trans Orient Engineering & Contracting Co. Ltd.

The baseline assessment of the four construction firms is to be used, for comparative purposes, in conjunction with anticipated future assessments. It is not a procedure or way of comparing one firm against another. The analysis of these various assessments will be useful in determining if the project was successful in achieving capability enhancement through the transfer of technology.

1.3 AUTHORIZATION

This study was undertaken by JMM on 19 April 1986 by means of Cost Reimbursement Type Contract Number 278-0260-C-4003-00 as amended. The Cognizant Technical Office was Director, Office of Engineering, USAID Jordan.

17

SECTION 2

CONSTRUCTION SUPERVISION TECHNOLOGY TRANSFER - METHODS AND PROCEDURES

2.1 GENERAL

The methods and procedures employed by each of the U.S. consulting engineering firms to transfer technology to their local associated Jordanian consulting engineering firms are described in this section. It should be noted that each firm used a somewhat different approach to comply with their contractual obligations regarding technology transfer. It is presumed that technology transfer techniques incorporated were a function of the experience of the U.S. firms in this field, their project personnel and their technical competence, as well as the experience and size of the local firm.

2.2 ARABTECH CONSULTING ENGINEERS/CH2M HILL INTERNATIONAL

Arabtech has the contract to provide the construction supervision services for construction projects in the Cities of Tafila and Ma'an. The projects are:

Contract T1 -	The Tafila wastewater treatment plant
Contract T2 -	The water distribution system including reservoir and the sewage collection system
Contract T3 -	This contract has not been signed. It is expected that the contract will be signed in May 1986 with construction to be started within 60 days.
Contract MN1 -	The Ma'an wastewater treatment plant
Contract MN2 -	The Ma'an water distribution system including storage reservoirs and 26 km of sewage collection system
Contract MN3 -	27 km of sewer line of various sizes

2.2.1 Background

Arabtech is a privately owned company that is well regarded by their competitors. Their reputation has been built on successful highway and building design and construction supervision projects. Historic experience includes the design of major highways throughout Jordan, the design of government office buildings, low-cost housing developments, hospitals, schools, and industrial complexes. They also have an excellent reputation

18

in the area of construction supervision. One of Arabtech's major clients in this area is the Ministry of Transportation.

Arabtech designed all the water and wastewater systems for the Cities of Tafila and Ma'an, including writing the technical specifications. Because of this, they were sole source contracted by WAJ to perform the construction supervision services.

This firm has provided construction supervision services to Jordanian clients for a number of years. This service is provided through a separate Construction Services group within the firm. The majority of their past experience has been in highways, bridges, and buildings. This is their first water and wastewater related construction project.

The Construction Services group was formed in 1966. This group has been active since its formation and has done a large number of projects including major housing and human settlement projects in the Sudan Valley.

A separate staff is maintained for construction services and appears to have been able to hire qualified people, both on a full- and part-time basis. When necessary, Arabtech draws from their roster of design engineers and technicians to staff projects.

Prior to the design of the water and wastewater facilities for Tafila and Ma'an, Arabtech did not use a structured project organization concept or project manager to manage their projects. Each discipline, within the project, was the responsibility of the discipline head. The coordination of the entire project was dependent upon the ability of the project personnel to coordinate their designs among themselves.

CH2M Hill, their U.S. subconsultant, has one person in the country who is an experienced construction supervision person with many years of experience both in the U.S. and other lesser developed countries. His past performance indicates that he is well qualified for the assignment.

2.2.2 Project Organizational Structure

Arabtech has created an organizational structure to staff all six construction projects in the two Cities of Tafila and Ma'an. The organization and staff are as follows:

> Project Manager - Eng Yousef Naji Abdalla. Eng Abdalla is located in Amman and is responsible to WAJ for the project. He is assisted by Ali Hattar, Project Coordinator, who was Project Manager for the design of the water and wastewater facilities for the two cities. Ziad Nabani is Chief Engineer of the Construction Supervision Department of Arabtech.

Resident Engineers. One for each project city is located in the project city and is responsible to the Project Manager for the three projects in each of their respective cities.

Site Engineers. There is one for each of the projects. In the case of Contract T2, two site engineers are provided; one for monitoring the water distribution network and reservoir construction, and another for the construction of the sewage collection system.

Under these persons are inspectors and surveyors. The quality control engineer and his assistant work somewhat in parallel to the site engineer and report to the resident engineer.

2.2.3 Technology Transfer Methods

The training methods and procedures being employed by the U.S. subconsultant appear to have been greatly influenced by what he observed after arriving at the project site and working with the local staff. Also the subject of his technology transfer program appears to follow or fill the current needs of the project team, and all transfer items have been developed as the need becomes apparent. The methods used are listed below.

- Lectures

  Lectures on timely subjects are scheduled and given on a weekly basis. In some cases, the lecture is given by a local expert on the subject. An example was one given by one of the construction firm's local subcontractors explaining their CPM schedules and reports. He lectured on the preparation, updating, and benefits of developing and using CPM schedules and related reports. Other lectures cover construction techniques, testing procedures, record keeping, and reports.

- One-On-One Training

  One-on-one training is being provided as the need arises. This type of training is possible due to the long-term presence of the U.S. subconsultant.

- Manuals

  Construction Inspection Manuals were provided to Arabtech from CH2M Hill. These manuals contain check lists of inspection and procedures as well as reporting forms to better ensure all inspections are made and proper records maintained.

20

2.3 CONSULTING ENGINEERING CENTER/BLACK & VEATCH INTERNATIONAL

Consulting Engineering Center (CEC) has the contract to provide the construction supervision services for projects in the Cities of Madaba and Karak. The projects are:

Contract M1 -	The Madaba wastewater treatment plant
Contract M2 -	The water distribution system and reservoirs in Madaba
Contract M3 -	The sewage collection system for Madaba
Contract K1 -	The Karak wastewater treatment plant
Contract K2 -	The sewage collection system and treatment plant effluent discharge pipeline for Karak
Contract K3 -	A 330-meter long tunnel for the placement of a sewer trunk line for Karak

2.3.1 Background

CEC is a relatively small, privately owned firm. It was founded as a soils investigation and testing company. They only recently expanded into sanitary and highway engineering with some capabilities in building design. CEC's first project of any consequence in sanitary engineering started about 1979. They have since participated in a number of projects as a subcontractor to various foreign firms for performance of studies and design projects. Until this project, CEC's experience has been mostly related to sewage collection and water distribution systems with limited experience in sewage treatment processes.

CEC is generally considered to be a reputable firm that does quality work despite its limited size. CEC was not previously considered as a major competitor by the other firms. It is presumed that the reason for this is its relative small size and its past history of specializing in soils engineering and testing.

This firm designed all the water and wastewater systems for the Cities of Madaba and Karak, including writing the technical specifications. Due to their knowledge of the project and technical specifications of the systems, they were selected by WAJ to perform the construction supervision services without having to submit a proposal.

CEC has provided construction supervision services on sanitary and other civil type projects. The majority of their work in construction supervision has been on highway projects.

21

Because CEC was originally a materials and soils testing laboratory, this activity still accounts for a large portion of their income. They were one of the original materials and soils testing firms in Jordan and are considered to be one of the best and most reputable firms in this field.

CEC is a small firm and did not have a construction supervision group within the company that performed activities related solely to construction supervision. Instead people were hired or transferred from design activities.

Black & Veatch International, CEC's U.S. subconsultant, has one person in Jordan on a full-time basis. This person is a construction supervision person with many years of experience. His credentials indicate he is well qualified to provide the technology transfer needed to improve the abilities of CEC.

At the time the first interim evaluation was conducted, the first construction project had been signed for approximately 5 months. Allowing for a 60-day mobilization period, the actual construction had only been underway for approximately 3 months, with another 7 to 9 months required for completion. Due to CEC's limited technical capabilities to review equipment submittals and to resolve design review matters, the U.S. subconsultant was spending all of his time in CEC's home office tending to these matters rather than being full time in the field providing technology transfer to the field personnel at the project site. He was conducting lectures to the field personnel at one-or two-week intervals. It was anticipated by CEC that the number of submittals would diminish as the major equipment submittals were approved, and the U.S. subconsultant could devote more time to responding to the needs of the field personnel.

2.3.2 Project Organizational Structure

CEC set up an organizational structure to staff all six construction projects in Madaba and Karak. The organization and staff are as follows:

Project Director - Eng Aziz Abdo Sajdi. Eng Sajdi is President of CEC and maintains final control of the project. He participates in all important decisions and meetings.

Project Manager - Eng Lutfi Hallak. He is located in the head office in Amman and is responsible to the Project Director and to WAJ.

Resident Engineers. There is one for each project city. Each is located in his respective project city and is responsible to the Project Manager for all projects within his city.

Site Engineers. There is one for each of the projects. Each is responsible to his Resident Engineer for his respective project.

22

Under these persons are surveyors, inspectors, and quality control and laboratory technicians.

2.3.3 Technology Transfer Methods

The training methods and procedures being employed by the Black & Veatch International (BVI) engineer were not clearly defined at the time this interim evaluation was performed. It did appear that no preset or prepared training program had been developed or was being implemented. The subjects being taught or transmitted through the technology transfer program were based on apparent needs noted by the consultant.

- Lectures

  Lectures were being conducted at intervals of one or two weeks to the project staff at both project sites. The subject matter varied and was selected by the subconsultant to best meet the immediate needs of the local engineers. The subjects included specification interpretation, CPM scheduling, how to efficiently conduct meetings, correct record keeping, and technical problems related to construction supervision.

- Manuals

  Construction Inspection Manuals were provided to CEC by BVI. These manuals contain procedures, check lists, and forms to aid the field inspectors and construction supervision personnel in better performance of their tasks, and properly documents their findings.

2.4 JOUZY AND PARTNERS CONSULTING ENGINEERING BUREAU/ ENGINEERING-SCIENCE, INC.

Jouzy and Partners has the contract to provide the construction supervision services for the construction of the water and wastewater system improvements for the six northern Cities of Ramtha, Mafraq, Anjara, Ajloun, Ein Janneh, and Kufranjeh. The projects are:

K1	-	Ajloun and Ein Janneh sewerage and water systems
K2	-	Anjara and Kufranjeh sewage collection and water distribution network
K3	-	Kufranjeh wastewater treatment plant
M1	-	Mafraq sewage collection and water distribution system
M1E	-	Mafraq sewer trunk line extension
M2R	-	Mafraq wastewater treatment plant
R1	-	Ramtha water, sewerage, and storm water drainage systems
R2	-	Ramtha water, sewerage, and storm water drainage systems
R3	-	Ramtha wastewater treatment plant

73

R4 - Ramtha water, sewerage, and storm water drainage systems

2.4.1 Background

Jouzy and Partners is a highly respected consulting firm. They have been directly involved in the design of a number of water distribution and sewage collection and treatment systems. They are well regarded by their competitors and the WAJ. Their reputation has been built on the design and construction of numerous facilities and transportation systems. They have designed highways and related structures, industrial facilities and buildings, as well as water and wastewater facilities. They have also developed a reputation in the area of construction supervision.

Jouzy and Partners designed the water distribution, sewage collection systems, treatment facilities, and stormwater drainage facilities for the northern six cities mentioned above. Due to their knowledge of the design and technical specifications of the systems for these six cities, they were contracted directly by WAJ without going out for public competition.

Jouzy and Partners has provided construction supervision services to Middle East clients for a number of years. They appear to be successful and sincere about doing a good job. Jouzy and Partners has provided construction supervision services for a number of years that include experience with highways and bridge projects. They have also worked on several water and wastewater related construction projects.

Engineering-Science, Inc., their U.S. subconsultant for construction supervision services, has two long-term persons in Jordan for the full length of the contracts. Both of these persons are experienced and appear to be fully capable of transferring technology to the construction firms.

2.4.2 Project Organizational Structure

The project organizational structure established by Jouzy and Partners for these projects is as follows:

> Construction Project Manager - S.A. Smadi. Located at the main project office in Irbid, he is responsible for the project to WAJ. Dr. Smadi is supported by Mr. Robert Keaten of Engineering-Science, Inc., whose primary objective is to provide technology transfer.
>
> At the time of this evaluation, Mr. Keaten, a U.S. subconsultant, was filling a line position, reporting to Dr. Smadi. Mr. Keaten is attempting to provide technology transfer by initially providing direct technical assistance to the project to see if it proceeds correctly from the beginning, and gradually transferring all responsibilities to the Construction Project Manager.

Resident Engineers. Resident Engineers have been assigned to each project. Depending on the size and complexity of the project, one person may be Resident Engineer for more than one project. The Resident Engineer reports directly to the Construction Project Manager.

Site Engineer. One Site Engineer is assigned to each project involving water system and sewage collection systems. The Site Engineer reports directly to the Resident Engineer.

Assistant Resident Engineer. An Assistant Resident Engineer has been assigned to each wastewater treatment plant project. This person is essentially equivalent to Site Engineers on the water and sewerage systems.

Under the Site Engineers and the Assistant Resident Engineers are the inspectors, testing laboratory technicians, surveyors, and others in support of the project.

2.4.3 Technology Transfer Methods

The training methods and procedures being employed by the U.S. subconsultant differ somewhat from those being employed by the U.S. subconsultants of the other two Jordanian consulting firms. In this case, two U.S. Construction Supervision persons are located on the project in Jordan on a long-term basis.

Mr. Robert Keaten started on the project in a line position reporting to the Construction Project Manager. As the project progresses and he has been able to transfer sufficient technology to the Construction Project Manager, he will be free to provide technology transfer to other project personnel. The other long-term U.S. subconsultant is the Resident Engineer on the wastewater treatment plant for the Towns of Anjara, Ajloun, Ein Janneh, and Kufranjeh. This person is primarily responsible for the supervision of the construction of that wastewater treatment plant. If he is responsive, the Assistant Resident Engineer will learn from being exposed to and working with the U.S. subconsultant. This arrangement may change as the project progresses, however, that did not appear to be the plan at the time this evaluation was made.

- Lectures

  Lectures on timely subjects are given on a regular basis. The lecturer covers a variety of subjects including construction supervision documentation and procedures, CPM development, utilization and updating techniques.

- One-on-One Training

  One-on-one training is being provided as the need arises. A rapport appears to have developed wherein the Jordanian engineers and technicians regularly ask for explanations and assistance. The result is technology transfer.

- Manuals

  Construction Supervision Manuals developed by Engineering-Science for their use have been provided to Jouzy and Partners. These manuals contain procedures, check lists of inspections and their procedures, as well as report forms.

36

SECTION 3

EVIDENCE OF TECHNOLOGY TRANSFER

3.1 GENERAL

Evidence of technology transfer in the area of construction supervision is subjective in nature. It is accomplished through exposure of the Jordanian consulting firms and their engineers to construction supervision projects and persons who are experienced in proper procedures and methods. Technology transfer consists of increased technical knowledge of the materials and equipment being constructed or installed and proper record keeping techniques to monitor the progress of the contractor, for future construction evidence if a failure or claim should develop, and to provide adequate documentation of the owner/contractor relationship.

3.2 PROCEDURES AND OBSERVATIONS

The following paragraphs discuss what was observed or learned from the three Jordanian firms and their U.S. subconsultants regarding what new techniques or procedures were taught or used through the technology transfer program. Information learned through interviews with WAJ and other sources are also included. It should also be noted that the construction projects have only recently started. In most cases, the local engineers have been exposed for only a few months to the procedures promoted by their U.S. subconsultants. A greater change should be noted nearer to the completion of these construction projects in approximately one year.

3.2.1 Critical Path Method (CPM) Scheduling

CPM networks for scheduling construction projects were rarely used by the contractors before these projects. This applies to all projects included under the scope of this evaluation study. Despite the CPM not being used much before in Jordan, it is a common and essential tool to schedule all project activities and is used extensively throughout the developed world. Its technology is readily available, as well as computer-assisted services of the highest degree of sophistication. All three construction supervision firms have been exposed to and can review the construction firm's CPM's to verify their accuracy and completeness. This exposure and use will ultimately enhance their qualifications and overall capabilities to modify project planning in an effort to complete construction progress within budgeted cost and time frames.

All of the firms constructing the systems for the southern four cities have started or are developing CPM network diagrams to schedule their construction work. The consulting firms for these projects are reviewing the

27

diagrams for logic errors and appropriate durations as they are being made available. Considerable work has yet to be done in this area, but the construction firms for the projects are learning and appear to be starting to use the networks to identify and control their critical activities.

For the northern six cities, CPM's were provided at or near the beginning of the projects; but, with only two exceptions, the contractors have not updated them. As a result, Jouzy and Partners is not getting the benefit of the CPM's inherent management tools and neither are the construction firms. The only two construction firms updating and using their CPM's are the firms constructing the two wastewater treatment plants. Both of these firms have good reputations as being of high quality.

3.2.2 Project Records and Reports

Keeping adequate records on all aspects of the construction project is an essential element of construction supervision. It provides the client with supporting data to monitor the progress of the project, documentation of errors and omissions, justification to support payment amounts, a record to evaluate any claims and purpose settlements, and data to estimate future project costs more accurately. The types of records range from the daily log and progress report of each inspector on the project to minutes of meetings, submittal files, photographic records, and correspondence files. All three firms—Arabtech, CEC, and Jouzy—are maintaining these records.

Reports summarizing progress are needed on a regular basis and are considered an important element in informing the client. Good reports give a concise statement of the progress of the construction project, scheduling, status of completion, problem areas, and special events or occurrences.

All three firms are producing and submitting regular monthly reports on all construction projects to the owner, WAJ. They are also insisting upon and receiving regular reports from the construction firms.

3.2.3 Quality of Construction

Assuring that the quality of construction complies with the design drawings and specifications is the primary responsibility of the construction supervision teams. In that regard, there appears to be some variation in the quality of the construction among the projects. It also appears there is a direct link between the quality or intensity of construction supervision, the quality of construction, and the reputation of the construction firm.

There are a total of 11 contracts in the southern 4 cities with an additional contract to be initiated shortly. On all of these projects, the construction supervision firms have assembled qualified teams of engineers and technicians to monitor and maintain quality control. The result is good quality workmanship in compliance with the contract documents.

For the northern six cities, a total of nine contracts are under construction. The tenth and final contract is currently in the mobilization phase. The quality of construction of the two wastewater treatment plants is considered quite acceptable. In both of these cases, the contractors appear to be well-respected for their professional approach and quality of work. They also are using and updating their CPM network diagrams. It should be noted that one of the two U.S. subconsultants is the Resident Engineer for the construction of one of the treatment plants and does not provide technology transfer on any other projects. On the remaining eight projects under construction, all of which are for the installation of water distribution networks and sewage collection systems, the construction is considered by some to be of lesser quality. In addition, none of these contractors are updating or using their CPM network diagrams. There have been complaints by local representatives that "all the streets are torn up to install water pipes and sewers but none are ever complete," which would imply a lack of construction scheduling. It also appears that too much attention may be being placed on only a few projects and administrative functions, rather than spreading the technical expertise from the U.S. subconsultant to all the projects where help is needed. These projects are the responsibility of Jouzy and Partners.

3.3 EXPOSURE TO CONSTRUCTION SUPERVISION INSTRUCTION

Different approaches have been taken by the three Jordanian engineering firms and their U.S. subconsultants regarding technology transfer.

3.3.1 Arabtech Consulting Engineers/CH2M Hill International

The U.S. construction supervision subconsultant is located in Tafila, one of Arabtech's two project cities. Tafila, because of its physical terrain, presents the greatest and most unique construction problems. The U.S. expert works directly with Arabtech's field personnel to teach and familiarize them with efficient construction procedures. He visits the construction sites regularly, attends meetings, gives lectures, and provides one-on-one instruction as needed.

The result has been a continuous flow of information to the local engineers. They appear to have developed a good level of confidence and quality control expertise, and are getting good quality construction. At the same time, they are maintaining a good relation with the construction firms.

3.3.2 Consulting Engineering Center/Black & Veatch International

The U.S. subconsultant has been located in CEC's main office in Amman. Because of CEC's limited expertise in reviewing and approving equipment submittals from the construction firm to be installed in the wastewater treatment plants, the majority of the U.S. subconsultant's time has been used to review these submittals. He has been able to devote only two days every two weeks to visit the project sites and give lectures.

Despite the limited input by the U.S. subconsultant, the quality of the construction is quite good. This is mainly due to CEC having been able to field an experienced team of construction supervision personnel.

3.3.3 Jouzy and Partners Consulting Engineering Bureau/ Engineering-Science, Inc.

Two foreign experts are on the project. One is assisting the Construction Project Manager in their project office in Irbid. The second U.S. subconsultant is the Resident Engineer on one of the wastewater treatment plant construction projects. As mentioned earlier, there are 10 construction contracts; eight water pipeline and sewer contracts and two wastewater treatment plants.

Certain elements of Jouzy's construction supervision project have been improved, however, they are mostly administrative. This includes record keeping and reports. Except on the project where the U.S. subconsultant is the Resident Engineer, technology transfer to the Resident Engineers and their project personnel has been limited to their asking specific questions. According to some reports, the scheduling and quality of work is not as good as it should be, except on the two treatment plant projects where the quality of the construction firms and the Resident Engineers is reported to be good.

SECTION 4

CONSTRUCTION SUPERVISION TECHNOLOGY TRANSFER - INFLUENCES AND EFFECTIVENESS

4.1 INTRODUCTION

This section attempts to identify the principal factors that had an influence on the technology transfer processes and their results. An attempt has also been made to define the results in such a manner that the reader can judge the effectiveness of the transfer of technology.

Each of the Jordanian consulting firms and their U.S. subconsultant counterpart used different approaches to supplement their needs and technology transfer goals throughout the constructions phase. Some of the observations relative to the long-range goals of the USAID technology transfer program are discussed herein.

4.2 LONG-RANGE GOALS OF USAID TECHNOLOGY TRANSFER PROGRAM

USAID has for a number of years promoted technology transfer and included this in Invitations for Proposals. For this project, a more concerted effort was made to have the local consulting firms learn modern and effective techniques from their U.S. subconsultants. The goal is to eventually develop enough in-country expertise to be fully capable of designing and constructing water distribution networks, sewage collection systems, and wastewater treatment plants.

The degree of effectiveness of a long-range program is a function of adequate involvement and direction during the program goal setting, during the proposal evaluation and contract negotiation periods, as well as during the actual execution of the program. The design phase has been completed, and the facilities are now under construction with the construction supervision programs underway accordingly. The quality of workmanship on these projects is expected to be improved and quite acceptable as a result of the of the construction supervision program of the local consulting firms with the guidance of the U.S. subconsultants.

4.3 OBSERVED INFLUENCES

All the local consulting firms and the U.S. subconsultants were interviewed, and all construction supervision projects are being implemented. There is evidence of technology transfer occurring.

In all the interviews with the local consultants performing the construction supervision and WAJ, only one negative influence of the technology transfer programs was observed. In this case, the U.S. subconsultant was performing the

submittal review function, which is an intricate and very important part of the construction supervision program and was not able to spend enough time in the field at the job sites. In this case, the local firm did not have personnel qualified to perform this review function. The submittal review is often overlooked when selecting personnel to perform construction supervision services, and it is important to have, as a part of the construction supervision team, discipline engineers familiar with the design and capable of determining whether materials and equipment selected by the contractor are applicable. In many cases, construction supervisors are very good project managers and, within their own engineering discipline, can provide adequate submittal reviews; however, this effort must be supplemented by expertise outside of their own discipline.

Other factors that appear to have influenced the amount of technology transfer were the personalities of the local and foreign project staff, individual and company motivation, and the impact of the WAJ. The impact of the WAJ, although unanticipated, had a major influence on the designs of the facilities themselves and the amount of technology transfer to the local project staff. This influence has also prevailed throughout the initial stages of the construction supervision program.
As an example, WAJ has interpreted the contracts in a way that does not allow the construction firms to request compensation for claims incurred due to erros, omissions or changes to the designs and specification, until the end of the projects. This affects the attitude of the construction firms and their relationship with the construction supervision personnel.

Throughout our interviews with all construction management personnel, it was obvious that a key influence to the degree of success of the technology transfer program was the presence of the U.S. subconsultant at the place where the need exists, whether it be the design office where the design was being created or the construction site where the design was being constructed. Another important observation was the influence of the role of the Jordanian counterpart to the U.S. subconsultant. There must be almost continual working contact between the U.S. subconsultant and the local counterpart or personnel to maximize the technology transfer effort. In no case should the U.S. subconsultant be in a line position. This reduces the responsibility of the local personnel and the amount of knowledge they will obtain. Also puts the local personnel in the position where they are required to make important decisions and handle social and political situations best handled by the local personnel.

SECTION 5

RECOMMENDATIONS

5.1 INTRODUCTION

The procedure involved in collecting the data needed to evaluate the improved technical and administrative capabilities of the Jordanian engineering firms consisted mainly of interviews and discussions with the project managers and engineers from both the Jordanian and U.S. engineering firms, WAJ, USAID, and the Ministry of Planning. The interviews were conducted to obtain the information indicated on the questionnaires (included as an appendix of this report) and other information useful to get a more complete picture of the firms, the people involved, the technology transfer process, and the working relationships between the client and the engineering firms. The interviews and discussions were informal in manner, and discussion was encouraged on all matters pertaining to the project and the transfer of technology. Opinions and suggestions were encouraged.

One of the subjects specifically addressed during the discussion was what mechanisms worked and why; and what did not work and why not. From these, and from other topics of discussion, a series of techniques used for technology transfer emerged that appeared to work better than others. Also a number of procedures or steps were identified that would facilitate the transfer of technology, if agreed upon by both USAID and the client before the contracting of consulting firms.

This section is divided into two areas. The first section covers those techniques specifically related to the technology transfer process from the U.S. firms to the Jordanian firms. The second section discusses a few steps USAID and the client agency should take to maximize the effectiveness of the overall technology transfer program on a long-range basis.

5.2 TECHNOLOGY TRANSFER TECHNIQUES EMPLOYED

The following is a discussion of the various technology transfer methods and procedures used by the U.S. consultants and their effectiveness. It is the intent to describe factors affecting implementation and results in order to help improve the technology transfer process on future projects. Whenever possible, comments and suggestions are included on either methods that worked well or, in other cases, were felt to be ineffective. This is not intended to be a complete list of what to do or how to best effect technology transfer. It is a summary of what the experiences were on this project and, to the extent possible, why. In many cases, the effectiveness of a procedure was confirmed during interviews with persons from other firms who used similar procedures or closely related variants.

All of the U.S. subconsultants arrived in Jordan with a general idea of what they were going to do and how, but did not arrive with any pre-established program. In all cases, the U.S. subconsultants attempted to evaluate what was needed most and adjusted or set their technology transfer program accordingly.

5.2.1 Lectures

Formal classroom type lectures are being employed by all three of the construction supervision firms. One case, lectures are being given at weekly intervals by the U.S. subconsultant who lives in the immediate vicinity of the project and works with the lecture attendees on an almost daily basis. In another case, lectures have been given approximately every two weeks by a U.S. subconsultant who has been visiting the job site only when he gives the lectures. In the third case, lectures are being conducted at irregular intervals as the need becomes apparent or time is made available. In all cases, the subjects are based on observed needs rather than prearranged or preset topics.

Lectures are an effective tool for transfer of technology; however, they must be timely. Adequate notes and lecture materials must be provided to the attendees, and there must be follow-up. The lecturer must follow up with individual or group discussions to reinforce the subject. Another important element to maximize the transfer of technology through lectures is rapport with the students. They must be willing and encouraged to ask questions and discuss the subject.

5.2.2 One-on-One Training

One-on-one training is perhaps the most effective method of accomplishing technology transfer. It provides the personal attention the student needs and the opportunity to ask questions that will maximize technology transfer.

This type of training is being utilized by all the U.S. subconsultants as their availability permits. In all but one case, the U.S. subconsultants are at or visit the project sites on a fairly frequent basis. In the one case, the U.S. subconsultant has been confined to the local consultant's home office, devoting his attention to reviewing equipment and drawing submittals. He is, however, working closely with their Project Manager and providing substantial one-on-one training to improve his efficiency and capabilities.

Presence of the U.S. subconsultant at the project sites is an all-important factor in technology transfer and one-on-one training. Presence, through frequent visits, allows the subconsultant to observe the project both from the point of view of the construction firm as well as the construction supervision team. It also provides the frequent encounter of the U.S. subconsultant and the permanent project staff, enabling him to gain their confidence and respect and encouraging a good exchange of ideas and information. The project staff will feel comfortable with the U.S. subconsultant and will solicit his help to improve their skills. His presence

will also enable the U.S. subconsultant to learn more about the unique problems of the project so that he can help solve those problems in a manner best suited to the location, rather than the way he may have solved them in his country or as may have been done on a previous project. The subconsultant should visit every project site a minimum of one time per week and spend a minimum of several hours on the small projects. For large projects, more presence at the site is required.

5.2.3 Line Position Responsibility for the Subconsultants

On one important project, a U.S. subconsultant has been assigned a line position, responsible for the construction supervision of that project. He has an Assistant Resident Engineer and a team of inspectors, surveyors, and quality control personnel; however, he has the responsibility for the construction quality of the project, instead of a Jordanian engineer.

This situation, while assuring the client a quality project, does not provide for the maximum amount of technology transfer to the local engineers. There is technology transfer of the staff through their involvement on the project, but not to the extent it would be if they were responsible and the subconsultant assisted and instructed as the project progressed.

It is recommended that the U.S. subconsultant not be put into a position of responsibility, such as a Resident Engineer. Local personnel should be selected and assigned these positions. The U.S. subconsultants should act as a counterpart to train and assist in developing the skills and confidence of the local engineer. This will also provide more time for the U.S. subconsultant to assist other personnel on other projects; thus, he will spread his knowledge to more people and projects.

Another advantage of this organizational arrangement is to put the local engineer in a position where he can better handle situations in which he, as a citizen of the country, is more sensitive and understanding to the social and political environment. If the transfer of technology is properly done in a way that will maximize his skills, he will be able to provide the same technology transfer after the foreign advisor leaves.

5.2.4 Administrative Procedures

On all three construction supervision projects, the U.S. subconsultant provided procedures, forms, manuals, and assistance to improve the project record keeping system for project control and future records. In all cases, the system and procedures were modified as needed to comply with the local environment and requirements.

The items introduced include correct procedures for maintaining daily logs and preparing informative progress and special reports. The types of forms include progress, submittal, and shop drawing transmittal to document the approval status, completion reports, and other inspection forms to name a few. All of these are important and provide the means for the local

engineering companies to adequately control their construction supervision projects.

5.2.5 Diplomacy

To maximize technology transfer, the U.S. subconsultant should be selected for his diplomatic character as well as his technical ability. Properly selected subconsultants must be sensitive to the conditions of the local environment, position, and status of their counterparts, and must know how to present themselves and develop a friendly working atmosphere.

5.2.6 Technical Support

Small and underskilled firms must be provided with sufficient technical support during the construction supervision phase as well as during the design. Specifically, the local firm will learn from its U.S. subconsultant how to design a facility during the design phase; however, there are additional technical skills to be transferred that relate to the design and equipment during the construction phase. These generally are skills needed to alter the treatment process or plant layout at the suggestion of the owner or construction contractor, and the review of shop drawings and equipment submittals. It is inevitable that submittals will differ from the specifications, and the reviewer must be qualified to make technical decisions whether to accept or reject the submittals.

It is recommended that, in addition to a full-time U.S. subconsultant to act as an advisor in the field during construction, a second person or persons be made available to small and lesser experienced firms for the period when the majority of the most important equipment submittals is received by the local consulting firm for checking. In most cases, this second person will not be needed for more than several months in-country, depending on the size of the project.

SECTION 6

FIRST CONSTRUCTION SUPERVISION INTERIM EVALUATION

6.1 INTRODUCTION

This section contains the First Interim Evaluation of the three Jordanian firms, responsible for the construction supervision of the water and wastewater facilities in the ten Jordanian cities. The Baseline Survey Evaluation was effectively completed based on the conditions at the end of the design phase of this project, prior to any construction being initiated. The First Interim Evaluation was conducted when approximately one-third of the construction was complete. Some of the contracts had only recently been initiated; one had just been signed and the construction firm was in the mobilization phase and the final contract had yet to be signed. In summary, the construction supervision effort was still gearing up to full strength with somewhere between two-thirds to three-fourths of the work yet to be done. A comparison of these evaluations will provide information and indications on improved capabilities of the Jordanian firms due to transfer of technology.

6.2 METHODOLOGY

The methodology employed in the First Interim Evaluation was virtually identical to the methodology of the Baseline Construction Supervision Survey Evaluation.

Sources of information included: reviewing the available data and obtaining or developing such appropriate additional data as was available; conducting discussions with the Water Authority of Jordan, USAID/Jordan, and the Ministry of Planning; conducting discussions with the three Jordanian firms, specifically the project managers and appropriate project-related staff; and conducting discussions and/or correspondence with the U.S. subconsultants' Project Managers and other project-related staff when possible.

The basic system utilized was the baseline evaluation system and rating format; therefore, the results of the First Construction Supervision Interim Evaluation are consistent and comparable to the Baseline Survey Evaluation. The basic rating form is shown in Figure 6-1, Construction Supervision Development Index (CSDI). The definition of the rating categories and elements is included in Table 6-1, Definition of Elements and Ratings.

6.3 BASELINE EVALUATIONS

The Construction Supervision Baseline Survey Evaluations from the previous survey report of March 1985 are included for reference purposes. The format for the ratings and assessments consisted of a short summary assessment followed by the completed Construction Supervision Development Index (CSDI) rating forms,

FIGURE 6-1

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX

Company _____ CSDI as of _____

Categories - Elements	Ratings 0	1	2	3	4
I. Staffing and Personnel a. Construction personnel, full-time employees b. Average years of experience, full-time construction supervision personnel c. Project managers with comparable experience d. Available in-house disciplines					
Category Points ____ X 3.0 (W.F.) = __			Subtotal I		
II. Management Tools and Techniques a. Project activity scheduling b. Project documentation systems c. Construction supervision manual - policies and procedures					
Category Points ____ X 3.5 (W.F.) = __			Subtotal II		
III. Experience a. Total construction supervision projects - last 3 years b. Comparable construction supervision projects c. Construction supervision fees as % of total fees d. Geographic location of projects for construction supervision e. Construction supervision on projects designed by others					
Category Points ____ X 1.8 (W.F.) = __			Subtotal III		

FIGURE 6-1

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX (CONTINUED)

Company _____ CSDI as of _____

Categories - Elements	Ratings 0	1	2	3	4
IV. Past Performance a. Timely initiation of preconstruction activities b. Complete projects within budget c. Professional reputation d. Relationships with clients, contractors, and designers					
Category Points ____ X 1.75 (W.F.) = __			Subtotal IV		
V. Available In-House Resources a. Equipment and facilities b. Reference materials c. Standard forms and reports d. Test equipment and facilities					
Category Points ____ X 1.25 (W.F.) = __			Subtotal V		
VI. Financial Indicators a. Ratio of current assets to current liabilities b. Adjusted average annual growth c. Professional liability insurance					
Category Points ____ X 1.5 (W.F.) = __			Subtotal VI		

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX _____

Evaluated by: _____

_____

Date: _____

TABLE 6-1

DEFINITION OF ELEMENTS AND RATINGS

Categories Elements	Ratings				
	0	1	2	3	4
I. Staffing and Personnel					
a. Construction personnel, full-time employees	0	1-2	3-4	5-8	9+
b. Average years of experience, full-time construction personnel	Less than 3	4-6	7-9	10-15	16+
c. Project managers with comparable previous experience	0	1	2	3-4	5+
d. Available in-house disciplines	Civil Structural	+ Mechanical	+ Sanitary	+ Architects	All disciplines
II. Management Tools and Technology					
a. Project activity scheduling	Generally not used	N/A	Available, but used marginally	N/A	Available, monitored and used
b. Project documentation systems	Generally not used	N/A	Available, but used marginally	N/A	Available, monitored and used
c. Construction supervision manual	Generally not used	N/A	Available, but used marginally	N/A	Available, monitored and used

TABLE 6-1

DEFINITION OF ELEMENTS AND RATINGS (CONTINUED)

Categories Elements	Ratings				
	0	1	2	3	4
III. Experience					
a. Total construction supervision projects last 3 years	0	1	2-3	4-5	6 or more
b. Comparable construction supervision projects	0	N/A	1	N/A	2 or more
c. Construction supervision fees as a % of total fees	0	1-10	11-25	26-50	50+
d. Geographic location of construction supervision projects	None	Area of Amman	Only in Jordan	Only in Middle East	Worldwide
e. Construction supervision on projects designed by others	0	1	2	3-4	5 or more

TABLE 6-1

DEFINITION OF ELEMENTS AND RATINGS (CONTINUED)

Categories Elements	Ratings				
	0	1	2	3	4
c. Standard construction supervision reports and forms	None	N/A	1-5 Forms & daily diary	N/A	6 or more + daily diary
d. Testing equipment and capabilities	None	N/A	Minimal equip. (sieves screens, scales, slump cone)	N/A	Complete line of inspection tools & equip.
VI. Financial Indicators					
a. Ratio of current assets to current liabilities	Less than 0.8	N/A	0.8 to 1.5	N/A	Greater than 1.5
b. Adjusted average annual growth rate	Less than -1.0	N/A	-1.0 to 1.0	N/A	Greater than 1.0
c. Professional liability insurance	None	N/A	Project specific	N/A	Coverage for all projects

TABLE 6-1

DEFINITION OF ELEMENTS AND RATINGS (CONTINUED)

Categories Elements	Ratings				
	0	1	2	3	4
IV. Past Performance					
a. Timely initiation of preconstruction activities	Never	Sometimes	Often	Usually	Always
b. Complete projects within budget	Never	Sometimes	Often	Usually	Always
c. Professional reputation	Unacceptable	Marginal	Acceptable	Good	Excellent
d. Relationships with clients, contractors, and designers	Unacceptable	Marginal	Acceptable	Good	Excellent
V. Available In-House Resources					
a. Equipment and facilities	None	Basic office equip.	+ Word processor	+ Computer	All plus additional equip.
b. Standard construction supervision reports and forms	None	Textbooks, reference books, & inspectors manuals	+ Tech. papers, & int'l publications	+ Catalogs, & equip. mfgrs data	+ Tech. periodicals

Figures 6-2 through 6-4. These references will be included for each firm in the following order: Arabtech Consulting Engineers, Consulting Engineering Center, and Jouzy and Partners Consulting Engineering Bureau.

6.3.1 Arabtech Consulting Engineers

Following is the summary assessment for Arabtech Consulting Engineers.

Reputation, Performance - Arabtech has a good reputation as a consulting engineering firm, and their past performance has been consistent with their reputation. Projects are generally started and completed on time and within the client's budget. The quality of the design work has been consistently acceptable to good.

Experience - The majority of Arabtech's experience has been in highways, bridges, and buildings; not on sanitary construction projects. They have performed well on comparably sized nonsanitary projects. The water and wastewater systems for Tafila and Ma'an was their first sanitary design project.

Arabtech has had a separate Construction Services group within their firm since 1966. They have completed a large number of projects, including major housing and human settlement projects in the Sudan Valley.

Arabtech has some field testing equipment and is familiar with reporting procedures.

Staffing, Project Understanding - Arabtech has a separate staff for construction services. Whenever necessary and possible, they draw from their in-house staff of design engineers and technicians. As they tend to retain a high percentage of permanent staff, there have been periods when capacity exceeded workload. They have been able to hire qualified staff (either part time or full time) when the workload exceeded capacity.

Financial Strength - Arabtech appears to have the financial strength to undertake this project.

6.3.2 Consulting Engineering Center

Following is the summary assessment for Consulting Engineering Center.

Reputation, Performance - CEC has a good reputation, and their past performance has been consistent with their reputation. Projects are generally started and completed on time and within the client's budget. The quality of their work has been consistently acceptable to good.

CEC has provided construction services on a number of sanitary and other civil type projects including highways and overpasses.

44

FIGURE 6-2

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX

Company Arabtech Consulting Engineers CSDI as of March 1985

Categories - Elements	Ratings 0	1	2	3	4
I. Staffing and Personnel					
a. Construction personnel, full-time employees					X
b. Average years of experience, full-time construction supervision personnel			X		
c. Project managers with comparable experience				X	
d. Available in-house disciplines					X
Category Points 13 X 3.0 (W.F.) = 39.0			Subtotal I		
II. Management Tools and Techniques					
a. Project activity scheduling		N/A		N/A	X
b. Project documentation systems		N/A		N/A	X
c. Construction supervision manual - policies and procedures		N/A		N/A	X
Category Points 12 X 3.5 (W.F.) = 42.0			Subtotal II		
III. Experience					
a. Total construction supervision projects - last 3 years				X	
b. Comparable construction supervision projects		N/A		N/A	X
c. Construction supervision fees as % of total fees				X	
d. Geographic location of projects for construction supervision			X		
e. Construction supervision on projects designed by others					X
Category Points 16 X 1.8 (W.F.) = 28.8			Subtotal III		

FIGURE 6-2

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX (CONTINUED)

Company Arabtech Consulting Engineers CSDI as of March 1985

Categories - Elements	Ratings 0	1	2	3	4
IV. Past Performance					
a. Timely initiation of preconstruction activities				X	
b. Complete projects within budget				X	
c. Professional reputation				X	
d. Relationships with clients, contractors, and designers				X	
Category Points 12 X 1.75 (W.F.) = 21.0			Subtotal IV		
V. Available In-House Resources					
a. Equipment and facilities		X			
b. Reference materials				X	
c. Standard forms and reports		N/A	X	N/A	
d. Test equipment and facilities		N/A	X	N/A	
Category Points 8 X 1.25 (W.F.) = 10.0			Subtotal V		
VI. Financial Indicators					
a. Ratio of current assets to current liabilities		N/A		N/A	X
b. Adjusted average annual growth		N/A		N/A	X
c. Professional liability insurance	X	N/A		N/A	
Category Points 8 X 1.5 (W.F.) = 12.0			Subtotal VI		

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX 152.8

Evaluated by: John D. Knoll, Jr.

David B. Bird

Date: March 1985

FIGURE 6-3

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX

Company Consulting Engineering Center CSDI as of March 1985

Categories - Elements	Ratings 0	1	2	3	4
I. Staffing and Personnel					
a. Construction personnel, full-time employees				X	
b. Average years of experience, full-time construction supervision personnel				X	
c. Project managers with comparable experience		X			
d. Available in-house disciplines			X		
Category Points 9 X 3.0 (W.F.) = 27.0			Subtotal I		
II. Management Tools and Techniques					
a. Project activity scheduling		N/A	X	N/A	
b. Project documentation systems		N/A	X	N/A	
c. Construction supervision manual - policies and procedures	X	N/A		N/A	
Category Points 4 X 3.5 (W.F.) = 14.0			Subtotal II		
III. Experience					
a. Total construction supervision projects - last 3 years					X
b. Comparable construction supervision projects	X	N/A		N/A	
c. Construction supervision fees as % of total fees				X	
d. Geographic location of projects for construction supervision			X		
e. Construction supervision on projects designed by others			X		
Category Points 11 X 1.8 (W.F.) = 19.8			Subtotal III		

FIGURE 6-3

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX (CONTINUED)

Company Consulting Engineering Center CSDI as of March 1985

Categories - Elements	Ratings 0	1	2	3	4
IV. Past Performance					
a. Timely initiation of preconstruction activities				X	
b. Complete projects within budget				X	
c. Professional reputation				X	
d. Relationships with clients, contractors, and designers				X	
Category Points 12 X 1.75 (W.F.) = 21.0			Subtotal IV		
V. Available In-House Resources					
a. Equipment and facilities				X	
b. Reference materials				X	
c. Standard forms and reports		N/A	X	N/A	
d. Test equipment and facilities		N/A		N/A	X
Category Points 12 X 1.25 (W.F.) = 15.0			Subtotal V		
VI. Financial Indicators					
a. Ratio of current assets to current liabilities		N/A		N/A	X
b. Adjusted average annual growth		N/A		N/A	X
c. Professional liability insurance	X	N/A		N/A	
Category Points 8 X 1.5 (W.F.) = 12.0			Subtotal VI		

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX 105.2

Evaluated by: John D. Knoll, Jr.

David B. Bird

Date: March 1985

FIGURE 6-4

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX

Company Jouzy and Partners CSDI as of March 1985

Categories - Elements	Ratings 0	1	2	3	4
I. Staffing and Personnel					
a. Construction personnel, full-time employees					X
b. Average years of experience, full-time construction supervision personnel			X		
c. Project managers with comparable experience				X	
d. Available in-house disciplines		X			
Category Points 10 X 3.0 (W.F.) = 30.0		Subtotal I			
II. Management Tools and Techniques					
a. Project activity scheduling		N/A	X	N/A	
b. Project documentation systems		N/A	X	N/A	
c. Construction supervision manual - policies and procedures		N/A	X	N/A	
Category Points 6 X 3.5 (W.F.) = 21.0		Subtotal II			
III. Experience					
a. Total construction supervision projects - last 3 years					X
b. Comparable construction supervision projects					X
c. Construction supervision fees as % of total fees		N/A		N/A	X
d. Geographic location of projects for construction supervision				X	
e. Construction supervision on projects designed by others		X			
Category Points 16 X 1.8 (W.F.) = 28.8		Subtotal III			

FIGURE 6-4

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX (CONTINUED)

Company Jouzy and Partners CSDI as of March 1985

Categories - Elements	Ratings 0	1	2	3	4
IV. Past Performance					
a. Timely initiation of preconstruction activities				X	
b. Complete projects within budget				X	
c. Professional reputation				X	
d. Relationships with clients, contractors, and designers				X	
Category Points 12 X 1.75 (W.F.) = 21.0			Subtotal IV		
V. Available In-House Resources					
a. Equipment and facilities		X			
b. Reference materials					X
c. Standard forms and reports		N/A	X	N/A	
d. Test equipment and facilities		N/A	X	N/A	
Category Points 9 X 1.25 (W.F.) = 11.25			Subtotal V		
VI. Financial Indicators					
a. Ratio of current assets to current liabilities		N/A		N/A	X
b. Adjusted average annual growth		N/A		N/A	X
c. Professional liability insurance	X	N/A		N/A	
Category Points 8 X 1.5 (W.F.) = 12.0			Subtotal VI		

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX 124.05

Evaluated by: John D. Knoll, Jr.

David B. Bird

Date: March 1985

Experience - Their strength is in the soils, foundation, and concrete testing areas. They have a fully equipped laboratory to conduct most soils and concrete tests. They also have field testing equipment.

Staffing, Project Understanding - CEC has a limited range of in-house personnel capable of doing major construction supervision projects.

Because of their experience and areas of expertise, CEC's personnel have a fair knowledge of construction supervision. Technology transfer is needed most in the process and mechanical areas, as well as in proper record keeping and reporting systems.

Financial Strength - CEC appears to have the financial strength to undertake this project.

6.3.3 Jouzy and Partners Consulting Engineering Bureau

Following is the summary assessment for Jouzy and Partners.

Reputation, Performance - Jouzy and Partners has a good reputation, and their past performance has been consistent with their reputation. They reported that their projects are started and completed on time and generally within the client's budget. The quality of the design work has been consistently acceptable to good.

Experience - Jouzy and Partners has broad experience in the civil engineering field relating to highways, structures, planning and urban development, and sanitary projects. They have work experience, and presently maintain offices in the region outside Jordan. They have performed well on comparably sized projects.

Jouzy and Partners has completed a number of construction services projects, mainly for highways, bridges, and major buildings.

Staffing, Project Understanding - Jouzy and Partners has civil, architectural, and planning disciplines in-house, in addition to construction services personnel.

Financial Strength - Jouzy and Partners appears to have the financial strength to undertake this project.

6.4 FIRST CONSTRUCTION SUPERVISION INTERIM EVALUATION - SUMMARY ASSESSMENT

Using the same techniques as the Construction Supervision Baseline Evaluation, the CSDI for each of the three Jordanian engineering firms was determined as of May 1986. The CSDI's reflect the evaluation of each firm as of that time. It should be remembered that the construction projects are not complete and, in some cases, could possibly continue for another year. Also the construction

S1

supervision services have been furnished only for periods ranging from about four to nine months, depending on the construction project.

The First Construction Supervision Interim Evaluations are shown as Figures 6-5 through 6-7.

The questionnaires utilized in the data collection process are in Appendix C. They were developed specifically for interviews with the Jordanian engineering firms, their U.S. subconsultants, and the GOJ agencies.

6.4.1 Arabtech Consulting Engineers

The findings of the First Construction Supervision Interim Evaluation of Arabtech are summarized in the following paragraphs.

Reputation, Performance - Arabtech is a midsized consulting engineering firm. It has developed and maintained a good reputation in Jordan through its quality of engineering services. Prior to the design of the water and wastewater projects for the Cities of Tafila and Ma'an, they never designed or supervised the construction of a sanitary project other than for small residential and commercial building type systems. They maintained their reputation and were able to develop respect as a sanitary engineering firm based on their design efforts on these two projects. WAJ expressed satisfaction with their performance and indicated that they would recommend Arabtech to other clients as a competent sanitary engineering firm.

Arabtech has continued to demonstrate their competence during the construction supervision services. They have been able to make intelligent design decisions regarding modifications to the project requested by WAJ or suggested by the construction firms.

Staffing, Project Understanding - Arabtech has provided a full staff to perform the necessary functions and services to complete the project. The Project Manager for all six projects (three in Tafila and three in Ma'an) is Eng Yousef Naji Abdalla. He has over fifteen years of construction supervision experience and is located in the head Arabtech office in Amman. He travels to both cities at least once each week to meet with his people as well as to meet with the contractors and WAJ personnel. The Project Manager is supported by technical personnel in the home office, including the Technical Coordinator who was the Project Manager during the design of the facilities.

One Resident Engineer is located in each project city. He is responsible for the projects in that city. Under the Resident Engineer are Site Engineers. Each project has been assigned to one Site Engineer who is responsible for that project to the Resident Engineer. In addition to these key people are inspectors, surveyors, and quality control personnel.

The construction supervision team located in the field appeared relatively well-qualified to assure quality projects. This was confirmed by the U.S.

82

FIGURE 6-5

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX

Company Arabtech Consulting Engineers CSDI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
I. Staffing and Personnel					
a. Construction personnel, full-time employees					X
b. Average years of experience, full-time construction supervision personnel			X		
c. Project managers with comparable experience					X
d. Available in-house disciplines					X
Category Points 14 X 3.0 (W.F.) = 42.0			Subtotal I		
II. Management Tools and Techniques					
a. Project activity scheduling					X
b. Project documentation systems					X
c. Construction supervision manual - policies and procedures					X
Category Points 12 X 3.5 (W.F.) = 42.0			Subtotal II		
III. Experience					
a. Total construction supervision projects - last 3 years					X
b. Comparable construction supervision projects					X
c. Construction supervision fees as % of total fees				X	
d. Geographic location of projects for construction supervision			X		
e. Construction supervision on projects designed by others					X
Category Points 17 X 1.8 (W.F.) = 30.6			Subtotal III		

FIGURE 6-5

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX (CONTINUED)

Company Arabtech Consulting Engineers CSDI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
IV. Past Performance					
a. Timely initiation of preconstruction activities				X	
b. Complete projects within budget				X	
c. Professional reputation					X
d. Relationships with clients, contractors, and designers				X	
Category Points 13 X 1.75 (W.F.) = 22.8			Subtotal IV		
V. Available In-House Resources					
a. Equipment and facilities			X		
b. Reference materials				X	
c. Standard forms and reports					X
d. Test equipment and facilities			X		
Category Points 11 X 1.25 (W.F.) = 13.8			Subtotal V		
VI. Financial Indicators					
a. Ratio of current assets to current liabilities					X
b. Adjusted average annual growth					X
c. Professional liability insurance			X		
Category Points 10 X 1.5 (W.F.) = 15.0			Subtotal VI		

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX 166.2

Evaluated by: David B. Bird

James H. Creager

Date: May 1986

FIGURE 6-6

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX

Company Consulting Engineering Center CSDI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
I. Staffing and Personnel					
a. Construction personnel, full-time employees					X
b. Average years of experience, full-time construction supervision personnel				X	
c. Project managers with comparable experience				X	
d. Available in-house disciplines			X		
Category Points 12 X 3.0 (W.F.) = 36.0			Subtotal I		
II. Management Tools and Techniques					
a. Project activity scheduling					X
b. Project documentation systems			X		
c. Construction supervision manual - policies and procedures					X
Category Points 10 X 3.5 (W.F.) = 35.0			Subtotal II		
III. Experience					
a. Total construction supervision projects - last 3 years				X	
b. Comparable construction supervision projects					X
c. Construction supervision fees as % of total fees				X	
d. Geographic location of projects for construction supervision			X		
e. Construction supervision on projects designed by others			X		
Category Points 14 X 1.8 (W.F.) = 25.2			Subtotal III		

FIGURE 6-6

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX (CONTINUED)

Company Consulting Engineering Center CSDI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
IV. Past Performance					
a. Timely initiation of preconstruction activities				X	
b. Complete projects within budget				X	
c. Professional reputation				X	
d. Relationships with clients, contractors, and designers				X	
Category Points 12 X 1.75 (W.F.) = 21.0			Subtotal IV		
V. Available In-House Resources					
a. Equipment and facilities			X		
b. Reference materials					X
c. Standard forms and reports					X
d. Test equipment and facilities					X
Category Points 14 X 1.25 (W.F.) = 17.5			Subtotal V		
VI. Financial Indicators					
a. Ratio of current assets to current liabilities					X
b. Adjusted average annual growth			X		
c. Professional liability insurance			X		
Category Points 8 X 1.5 (W.F.) = 12.0			Subtotal VI		

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX 146.7

Evaluated by: David B. Bird

James Creager

Date: 15 May 1986

FIGURE 6-7

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX

Company Jouzy and Partners CSDI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
I. Staffing and Personnel					
a. Construction personnel, full-time employees					X
b. Average years of experience, full-time construction supervision personnel			X		
c. Project managers with comparable experience					X
d. Available in-house disciplines			X		
Category Points 12 X 3.0 (W.F.) = 36.0			Subtotal I		
II. Management Tools and Techniques					
a. Project activity scheduling			X		
b. Project documentation systems			X		
c. Construction supervision manual - policies and procedures					X
Category Points 8 X 3.5 (W.F.) = 28.0			Subtotal II		
III. Experience					
a. Total construction supervision projects - last 3 years					X
b. Comparable construction supervision projects					X
c. Construction supervision fees as % of total fees					X
d. Geographic location of projects for construction supervision				X	
e. Construction supervision on projects designed by others		X			
Category Points 17 X 1.8 (W.F.) = 30.6			Subtotal III		

FIGURE 6-7

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX (CONTINUED)

Company Jouzy and Partners CSDI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
IV. Past Performance					
a. Timely initiation of preconstruction activities				X	
b. Complete projects within budget				X	
c. Professional reputation				X	
d. Relationships with clients, contractors, and designers				X	
Category Points 12 X 1.75 (W.F.) = 21.0			Subtotal IV		
V. Available In-House Resources					
a. Equipment and facilities				X	
b. Reference materials					X
c. Standard forms and reports					X
d. Test equipment and facilities			X		
Category Points 13 X 1.25 (W.F.) = 16.3			Subtotal V		
VI. Financial Indicators					
a. Ratio of current assets to current liabilities					X
b. Adjusted average annual growth					X
c. Professional liability insurance			X		
Category Points 10 X 1.5 (W.F.) = 15.0			Subtotal VI		

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX 146.9

Evaluated by: David B. Bird

James Creager

Date: 15 May 1986

subconsultant responsible for providing technology transfer. Certain weaknesses were apparent, but the overall balance of the team is good. Any weak technical or administrative areas were balanced by other strong areas; plus the U.S. subconsultant is there to provide any assistance and guidance as needed.

Project understanding appears quite good. The U.S. subconsultant indicated that one of his first activities was to get the construction supervision staff to thoroughly study and understand the project specifications, thereby assuring that the construction supervision personnel thoroughly understood the project requirements and were able to adequately monitor the construction process.

It was evident from our interviews and discussions with the Arabtech staff that they are fairly good at their job, and they are learning and applying new techniques and procedures to further improve their construction supervision abilities.

Curriculum vitae for key project personnel and for Arabtech's U.S. subconsultant, CH2M Hill, are in Appendix F.

Experience, Past Performance - Arabtech had completed many construction supervision projects prior to this project. They have a separate department that only does construction supervision; however, these are the first water and wastewater systems construction projects they have performed. Their previous experience was mainly in buildings, highways, and related structures. They designed most of their previous construction supervision projects.

For this project, Arabtech conducted preconstruction meetings and discussed all aspects of the project with the contractor. They also discussed what was required from the contractors in terms of quality and reports.

It appeared they have developed a good working relationship with both the client and the contractors. A number of project design changes have been made, and problems have occurred relative to the soils and foundation of the wastewater treatment plant. In all cases, the problems have been or are being worked out satisfactorily. Both WAJ and the contractors indicated they had excellent working relations with Arabtech.

Financial Strength - Arabtech appears to have the financial strength to maintain their staff and complete this project.

6.4.2 Consulting Engineering Center

The findings of the First Construction Supervision Interim Evaluation of Consulting Engineering Center are summarized in the following paragraphs.

Reputation, Performance - Consulting Engineering Center is a relatively small consulting engineering firm. Despite its size, CEC has developed an excellent reputation as an engineering firm.

S9

CEC was originally a materials testing laboratory and soils and foundation studies firm. It has continued to provide those services as well as to branch out into the engineering area. Much of its strength in the engineering area is due in part to the frequency it associated with foreign engineering firms to design highways, buildings, and sanitary facilities. It has been directly involved in sanitary projects, including studies and designs, for about 10 years. Through association with foreign firms, it was able to develop a good reputation despite its small size.

Since they were awarded the design of the water and wastewater facilities in 1983/1984, with BVI as the subconsultant to provide the technology transfer, they have learned management as well as technical skills. They appear to have continued to apply those skills on other projects including construction supervision of highway projects.

According to all persons interviewed, their performance as construction supervisors on the Madaba and Karak projects has been quite satisfactory. The quality of work is fully acceptable, and they are assuring that the construction firm complies with contractual obligations, including the construction specifications. The only limitation noted is their limited technical depth to check project equipment submittals and shop drawings and to verify suggested modifications to the wastewater treatment plant. They are relying heavily on their U.S. subconsultant for this service and, as a consequence, minimizing the technology transfer opportunities.

Staffing - CEC has assembled a highly qualified staff of construction supervision engineers for this project. The project staff is organized with the Project Director and Project Manager located in their man office in Amman. The Project Director is Mr. Azzis Adbo Sajdi, the owner of CEC. The Project Manager, Mr. Lufti Mallak, is an experienced engineer who reports directly to the Project Director.

One Resident Engineer is located in each project city and is responsible for the projects in that city. There are three projects in Madaba and three projects in Karak. Both of these Resident Engineers report to the Project Manager.

Reporting to the Resident Engineers are Site Engineers. There is one Site Engineer for each project. They are each responsible for their project. Under the Site Engineers are inspectors. Other personnel at the project site are surveyors and quality control technicians.

The U.S. subconsultant from BVI is Mr. Malcolm Ross Leatch.

The qualifications of the project personnel are quite good. They are collectively qualified for the project. During visits to the project sites and in interviews with project personnel from WAJ, the evaluation team was impressed with their dedication to assuring that the quality of construction comply with the designs and specifications.

Certain individuals on the project team appear stronger or more experienced than others; however, they have the necessary skills as a team, and the less technically qualified persons should learn additional skills by the completion of the project.

It should also be noted that the construction projects are just getting started, and the technology transfer program to be provided by BVI has not been put into full effect. To date, only a few lectures to the field staff have been conducted. It is anticipated that this will change in the near future, and the U.S. construction supervision expert will be able to dedicate more time to the field personnel. Curriculum vitae for key project personnel and the U.S. subconsultant are in Appendix F.

Experience, Past Performance - CEC has considerable experience on construction supervision projects. Due to their size, they do not have a separate group or department exclusively for construction supervision. The firm's owner has been associated with materials and soils testing most of his career and has provided substantial services to the Ministry of Transportation. Through that experience and association, he has been able to acquire and perform construction supervision services on a number of projects, mainly on highway projects; however, he has also provided construction supervision on a number of sanitary projects.

A team of good engineers and technicians have been assigned to, or hired for, this project. It is presumed that, due to the size of CEC and the limited amount of construction in Jordan, many of these people will leave at the end of these projects to seek work with other companies or in other countries.

According to all available information, the past performance of CEC on construction supervision projects has been acceptable. They followed accepted record keeping and reporting procedures.

For this project, CEC conducted preconstruction meetings with the construction firms and WAJ. As can be expected, a number of design changes have been made which CEC has discussed in detail with the contractors and which have caused some concern on the part of the construction firm. It appears that CEC has handled the discussions with professional care. WAJ has indicated that the quality of the work and their dealings with the construction firms has been good.

Financial Strength - CEC appears to have the financial strength to successfully complete this project.

6.4.3 Jouzy and Partners Consulting Engineering Bureau

The findings of the First Construction Supervision Interim Evaluation of Jouzy and Partners are summarized in the following paragraphs.

Reputation, Performance - Jouzy and Partners is one of the larger consulting engineering firms in Jordan. Their Jordanian office is not their head office, but it has most of the engineering disciplines and facilities to do complete engineering projects. Jouzy and Partners has been providing sanitary engineering study and design services for many years and, perhaps, has the most experience in this area in Jordan. It also provides a full line of other engineering and construction supervision services. It is highly respected by its competition and clients including WAJ.

With Engineering Science as their subconsultant, Jouzy and Partners designed and prepared the tender documents for the ten projects for the six northern cities. They have also worked with other foreign consulting engineering firms.

According to those persons interviewed from WAJ, their performance on this project is considered satisfactory, especially in some areas. Jouzy and Partners has demonstrated a genuine interest in doing a good job and in learning new and improving existing skills and procedures from their U.S. subconsultant. Some comments were made that too much of the U.S. subconsultant's efforts were being directed to administrative details and to one construction project, the Ajloun wastewater treatment plant. Consequently, the quality of the other projects was suffering, complicated by the fact that the firms responsible for the construction of the water distribution networks and sewage collection systems were the firms which needed the most help and monitoring.

Staffing - Jouzy and Partners has assembled a fairly well-qualified staff of engineers and technicians for this project. The Director of North Jordan Projects is Mr. Najeeb Tleel, who is located in Amman. Reporting to Mr. Tleel is the Construction Project Manager, Dr. Suleiman A. Smadi. Dr. Smadi is located in the City of Irbid, central to the projects. Reporting to Dr. Smadi is a U.S. subconsultant, Mr. R. Keaten. Under Mr. Keaten are the Resident Engineers. Some Resident Engineers are responsible for more than one construction project. Inspectors, surveyors, and quality control technicians report to the Resident Engineers. It should be noted that one of the Resident Engineers is a U.S. subconsultant who is aided by an Assistant Resident Engineer. This was done, according to Jouzy and Partners, because of the complexity of the wastewater treatment plant, and technology transfer is being made to the Assistant Resident Engineer.

According to Mr. Keaten, considerable technology has already been transferred. Mr. Keaten, who is the U.S. subconsultant responsible for coordinating and providing technology transfer, indicated that he is now performing very minimal actual work on the project. Dr. Smadi has assumed most of the project duties.

Curriculum vitae for all of the key personnel and U.S. subconsultants are in Appendix F.

62

Experience, Past Performance - Jouzy and Partners has been providing consulting engineering and supervision services for many years. Their construction supervision experience includes highways, major structures, and sanitary projects. Their past projects have been completed to the satisfaction of the project owners.

During interviews and discussions with the WAJ, the quality of Jouzy and Partners' work was reported to be quite good. Comments were also made on how well the technology transfer program is being accomplished on this project.

Financial Strength - By Jordanian standards, Jouzy and Partners is a large consulting engineering firm with a good reputation. They are considered to have sufficient financial strength to maintain their staff and complete this project.

6.5 COMPARISON OF BASELINE AND FIRST INTERIM EVALUATIONS

A summary comparison of the CSDI's for the Baseline and First Interim Evaluations of the three Jordanian consulting engineering firms providing the construction supervision is included as Figure 6-8. The purpose of this figure is to quickly show the overall improvement in each firm's capability to perform construction supervision projects.

An item-by-item comparison of each of the three Jordanian firms is included in Figures 6-9 through 6-11. The categories and elements of the comparisons are identical to those on the CSDI evaluation form.

FIGURE 6-8

CONSTRUCTION SUPERVISION DEVELOPMENT INDICES RATING COMPARISON

FORM

Evaluation	Evaluation Date	CSDI
Arabtech Consulting Engineers		
Baseline Survey	March 1985	152.8
First Interim Evaluation	May 1986	166.2
Net CSDI Improvement		13.4
Consulting Engineering Center		
Baseline Survey	March 1985	108.8
First Interim Evaluation	May 1986	146.7
Net CSDI Improvement		37.9
Jouzy and Partners		
Baseline Survey	March 1985	124.1
First Interim Evaluation	May 1986	146.9
Net CSDI Improvement		22.8

FIGURE 6-9

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX

Company Arabtech Consulting Engineers CSDI as of March 1985 May 1986

Categories - Elements	Ratings Values		
	Baseline Survey	First Interim	Variance
I. Staffing and Personnel			
a. Construction personnel, full-time employees	4	4	0
b. Average years of experience, full-time construction supervision personnel	2	2	0
c. Project managers with comparable experience	3	4	1
d. Available in-house disciplines	4	4	0
Category I - Weighting Factor = 3.0	39.0	42.0	3.0
II. Management Tools and Techniques			
a. Project activity scheduling	4	4	0
b. Project documentation systems	4	4	0
c. Construction supervision manual - policies and procedures	4	4	0
Category II - Weighting Factor = 3.5	42.0	42.0	0
III. Experience			
a. Total construction supervision projects - last 3 years	3	4	1
b. Comparable construction supervision projects	4	4	0
c. Construction supervision fees as % of total fees	3	3	0
d. Geographic location of projects for construction supervision	2	2	0
e. Construction supervision on projects designed by others	4	4	0
Category III - Weighting Factor = 1.8	28.8	30.6	1.8

FIGURE 6-9

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX (CONTINUED)

Company Arabtech Consulting Engineers CSDI as of March 1985 May 1986

Categories - Elements	Ratings Values		
	Baseline Survey	First Interim	Variance
IV. Past Performance			
a. Timely initiation of preconstruction activities	3	3	0
b. Complete projects within budget	3	3	0
c. Professional reputation	3	4	1
d. Relationships with clients, contractors, and designers	3	3	0
Category IV - Weighting Factor = 1.75	21.0	22.8	1.8
V. Available In-House Resources			
a. Equipment and facilities	1	2	1
b. Reference materials	3	3	0
c. Standard forms and reports	2	4	2
d. Test equipment and facilities	2	2	0
Category V - Weighting Factor = 1.25	10.0	13.8	3.8
VI. Financial Indicators			
a. Ratio of current assets to current liabilities	4	4	0
b. Adjusted average annual growth	4	4	0
c. Professional liability insurance	0	2	2
Category VI - Weighting Factor = 1.5	12.0	15.0	3.0
CONSTRUCTION SUPERVISION DEVELOPMENT INDICES	152.8	166.2	13.4

Evaluated by: David B. Bird

James Creager

Date: 15 May 1986

FIGURE 6-10

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX

Company Consulting Engineering Center CSDI as of March 1985 May 1986

Categories - Elements	Ratings Values		
	Baseline Survey	First Interim	Variance
I. Staffing and Personnel			
a. Construction personnel, full-time employees	3	4	1
b. Average years of experience, full-time construction supervision personnel	3	3	0
c. Project managers with comparable experience	1	3	2
d. Available in-house disciplines	2	2	0
Category I - Weighting Factor = 3.0	27.0	36.0	9.0
II. Management Tools and Techniques			
a. Project activity scheduling	2	4	2
b. Project documentation systems	2	2	0
c. Construction supervision manual - policies and procedures	0	4	4
Category II - Weighting Factor = 3.5	14.0	35.0	21.0
III. Experience			
a. Total construction supervision projects - last 3 years	4	3	(1)
b. Comparable construction supervision projects	0	4	4
c. Construction supervision fees as % of total fees	3	3	0
d. Geographic location of projects for construction supervision	2	2	0
e. Construction supervision on projects designed by others	2	2	0
Category III - Weighting Factor = 1.8	19.8	25.2	5.4

FIGURE 6-10

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX (CONTINUED)

Company Consulting Engineering Center CSDI as of March 1985 May 1986

Categories - Elements	Ratings Values		
	Baseline Survey	First Interim	Variance
IV. Past Performance			
a. Timely initiation of preconstruction activities	3	3	0
b. Complete projects within budget	3	3	0
c. Professional reputation	3	3	0
d. Relationships with clients, contractors, and designers	3	3	0
Category IV - Weighting Factor = 1.75	21.0	21.0	0
V. Available In-House Resources			
a. Equipment and facilities	3	2	(1)
b. Reference materials	3	4	1
c. Standard forms and reports	2	4	2
d. Test equipment and facilities	4	4	0
Category V - Weighting Factor = 1.25	15.0	17.5	2.5
VI. Financial Indicators			
a. Ratio of current assets to current liabilities	4	4	0
b. Adjusted average annual growth	4	2	(2)
c. Professional liability insurance	0	2	2
Category VI - Weighting Factor = 1.5	12.0	12.0	0
CONSTRUCTION SUPERVISION DEVELOPMENT INDICES	108.8	146.7	37.9

Evaluated by: David B. Bird

James Creager

Date: May 1986

FIGURE 6-11

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX

Company Jouzy and Partners CSDI as of March 1985 May 1986

Categories - Elements	Ratings Values		
	Baseline Survey	First Interim	Variance
I. Staffing and Personnel			
a. Construction personnel, full-time employees	4	4	0
b. Average years of experience, full-time construction supervision personnel	2	2	0
c. Project managers with comparable experience	3	4	1
d. Available in-house disciplines	1	2	1
Category I - Weighting Factor = 3.0	30.0	36.0	6.0
II. Management Tools and Techniques			
a. Project activity scheduling	2	2	0
b. Project documentation systems	2	2	0
c. Construction supervision manual - policies and procedures	2	4	2
Category II - Weighting Factor = 3.5	21.0	28.0	7.0
III. Experience			
a. Total construction supervision projects - last 3 years	4	4	0
b. Comparable construction supervision projects	4	4	0
c. Construction supervision fees as % of total fees	4	4	0
d. Geographic location of projects for construction supervision	3	3	0
e. Construction supervision on projects designed by others	1	2	1
Category III - Weighting Factor = 1.8	28.8	30.6	1.8

FIGURE 6-11

CONSTRUCTION SUPERVISION DEVELOPMENT INDEX (CONTINUED)

Company Jouzy and Partners CSDI as of March 1985 May 1986

Categories - Elements	Ratings Values		
	Baseline Survey	First Interim	Variance
IV. Past Performance			
a. Timely initiation of preconstruction activities	3	3	0
b. Complete projects within budget	3	3	0
c. Professional reputation	3	3	0
d. Relationships with clients, contractors, and designers	3	3	0
Category IV - Weighting Factor = 1.75	21.0	21.0	0
V. Available In-House Resources			
a. Equipment and facilities	1	3	2
b. Reference materials	4	4	0
c. Standard forms and reports	2	4	2
d. Test equipment and facilities	2	2	0
Category V - Weighting Factor = 1.25	11.3	16.3	5.0
VI. Financial Indicators			
a. Ratio of current assets to current liabilities	4	4	0
b. Adjusted average annual growth	4	4	0
c. Professional liability insurance	0	2	2
Category VI - Weighting Factor = 1.5	12.0	15.0	3.0
CONSTRUCTION SUPERVISION DEVELOPMENT INDICES	124.1	146.9	22.8

Evaluated by: David B. Bird

James Creager

Date: May 1986

SECTION 7

CONSTRUCTION FIRM BASELINE EVALUATION

7.1 GENERAL

The primary objective of the Construction Firm Baseline Evaluation is to establish baseline data for evaluating the four Jordanian firms constructing water and wastewater facilities in Karak and Tafila. This data will then be used as a reference point of origin for future comparisons in an effort to measure the transfer of technology from the U.S. subcontractor counterpart to the applicable construction firm. This information should not be used to compare one construction firm against another, as the variation in construction firm size, financial status, and growth pattern affects the technology needs of a construction firm.

7.1.1 Construction Firms and Project Information

7.1.1.1 Haddad Engineering & Contracting Co.

Haddad Engineering & Contracting Co. is constructing the Karak tunnel (K-3) and the Tafila water distribution and sewage collection system (T-2).

The K-3 project consists of approximately 330 meters of tunneling valued at 377,688 J.D. and is to be completed in 180 calendar days, beginning 22 February 1986.

The T-2 project consists of approximately 17 km of distribution pipeline, 2 reservoirs, and 17 km of sewer line. This project is valued at 981,852 J.D. and is to be completed in 360 calendar days, beginning 8 December 1985.

The U.S. subcontractor for the technology transfer is Caddie Construction Company of Casselberry, Florida. The value of their contract with Haddad Engineering & Contracting Co. is $70,000, plus in-country expenses and airfare estimated at $40,000. This total cost represents approximately 2.8 percent of the total value of construction.

7.1.1.2 Madanat Contracting Co.

Madanat Contracting Co. is constructing the Karak sewage collection system (K-2). The K-2 project consists of approximately 37 km of sewer line valued at approximately 850,000 J.D. and is to be completed in 365 calendar days, beginning 19 December 1985.

The U.S. subcontractor for the technology transfer is ETI of North America from Overland Park, Kansas. The value of their contract with Madanat Contracting Co. is $34,000, plus estimated in-country expenses and airfare at $14,000. This cost represents approximately 2.0 percent of the total value of construction.

7.1.1.3 Sinimmar Engineering and Contracting

Sinimmar Engineering and Contracting is constructing the Tafila wastewater treatment plant (T-1) with an average daily flow capacity of 1,600 m^3. The project consists of screens and flow meters, splitter boxes, 2 imhoff tanks, 2 trickling filters, recirculation pump station, 2 solids contact chambers, secondary clarifiers, effluent ponds, outfall, and related appurtenances valued at approximately 850,000 J.D. and is to be completed in 360 calendar days, beginning 17 December 1985.

The U.S. subcontractor for the technology transfer is Caddie Construction Company of Casselberry, Florida. The value of their contract is approximately $100,000 which represents approximately 4.2 percent of the total construction value.

7.1.1.4 Trans Orient Engineering & Contracting Co. Ltd.

Trans Orient Engineering & Contracting Co. Ltd. (TROCON) is constructing the Karak wastewater treatment plant (K-1) with an average dailiy flow of 800 m^3. The K-1 project consists of 2 imhoff tanks, 2 trickling filters, final settling basin, recirculation pumping station, chlorine feed system, sludge lagoons, drying beds, and other appurtenances valued at approximately 827,000 J.D. and is to be completed in 360 calendar days, beginning 19 December 1985.

The U.S. subcontractor for the technology transfer is Carl P. Wallace International Inc. of Irving, Texas. The value of their contract with TROCON is $100,000. This cost represents approximately 4.2 percent of the total construction value.

7.1.2 Present Project Status

All of these projects have started and the facilities are being constructed. During our job site visits in Karak and Tafila, we were able to meet with the Project Managers and Resident Site Engineers, together with the consultant's construction supervision team and the WAJ Construction Managers, to discuss each project in detail and to review the project files. Varing degrees of interest in the technology transfer program were noted by the construction firms' key personnel with deliverables varying according to the education and past experience of each individual. A subjective assessment of the Project Managers and Project Engineers has been made in order to determine their capabilities in the beginning of the

72

projects so that technology deliverables could be identified and compared at some future point in time. The individual assessment form found in Appendix D shows the consideration given to various elements of exposure by the project staff. Emphasis was placed on project management and quality control skills to coincide with our efforts to achieve a high-quality and well-documented end product through technology transfer.

7.2 BASELINE EVALUATION - CONSTRUCTION FIRMS

The development of an evaluation process is comprised of three main components: criteria development, the approach to quantifying capabilities, and the design of an index to measure the capabilities of the construction firm now and at some future time.

7.2.1 Criteria

The criteria considered in developing the objective evaluation must have the following characteristics:

Objectivity - The evaluation format must minimize, or eliminate, subjective results and be as purely objective as possible. Future evaluations are anticipated during the life cycle of this project. The results of these various evaluations must be consistent and comparable regardless of differing personalities which may be involved in the evaluations.

Applicability/Flexibility - The system must be applicable in determining, or indicating, construction firms' capabilities. It must apply to project specific needs throughout the life of the project. The system must apply to project specific and firm specific evaluations, yet it must retain the flexibility to apply to general construction projects or other construction firms with little, or no, modification.

Detailed Documentation - The system must be clearly detailed and fully documented. The detail is needed to provide a clear understanding of the initial evaluation, as well as to provide the direction for future evaluations. The documentation will provide a rational means of adjusting previously completed evaluations should the system be modified in the future.

7.2.2 Approach

The primary motivation in developing an evaluation system must be to incorporate features that would, in some fashion, quantify increased capabilities and also show evidence of technology transfer. At the same time, the system has to be capable of producing consistently objective evaluations over time with the possibility of differing evaluators.

The approach used involved the selection of general categories under which the various elements applied in evaluating the baseline capabilities could be logically grouped. These categories were defined as: key personnel, work planning and project control, in-house resources, relevant experience, past performance, and financial indicators.

Following the identification of the general categories, the elements of each general category were developed. The various elements were considered and selected for inclusion on the basis of:

- Applicability to both the project specific considerations and to larger general field considerations.

- Ability to objectively define both the element and the boundary conditions used in rating the element.

- Reasonable availability of information relating to each element. The information should not be burdensome for the Jordanian firm to gather or prepare, nor should it be confidential in nature.

The final step in the approach was to devise a method for rating the elements and actually quantifying the construction firm's capabilities. The selected method utilizes a numeric rating of 0 to 4 for each element. Each category has been assigned a weighting factor. The numeric sum of ratings for all elements is multiplied by the categorical weighting factor to produce a weighted category subtotal. The category subtotals are then added together to produce a single number termed the Construction Firm Capability Index (CFCI).

It is appreciated that the individual categories and elements selected by the Project Team for inclusion in this system may not be universally agreeable. However, they were selected and included after due consideration of the project specific objectives, criteria, conditions existing at the time of the study, and the time constraints present in preparing the study. Continued or widespread usage will introduce change and permit the system to grow in response to varying needs and conditions.

7.2.3 Construction Firm Capability Index

7.2.3.1 General Concepts

The Construction Firm Capability Index (CFCI) is designed for objectivity with the purpose of eliminating subjective influences. The intent is to quantify the construction capabilities of a particular firm, at any given point in time.

The CFCI is a single dimensionless number which is derived from the sum of the weighted category subtotals. Each category is divided into elements which are individually rated. Thus, comparisons between any two different

evaluations can be made on the whole (using just the CFCI), on any specific category, or on individual elements.

7.2.3.2 Rating Format

A standardized matrix format has been developed for the Construction Firm Capability Index (CFCI). See Figure 7-1.

Rating opportunities and point values have been limited to five possible choices, from 0 to 4. This eliminates the need for, and the possibility of, finely shaped judgmental distinctions. The majority of the elements can be rated with a choice of any of the five rating values. Certain elements are, however, more appropriately rated through a range of less than five values. Elements having a lesser number of rating options were subjectively valued relative to other elements within a particular category. For details of the ratings of the CFCI, see Table 7-1.

7.2.3.3 Category Weighting

The relative weights assigned to the general categories as shown in Table 7-1 were subjectively designated, and involved consideration of the conditions prevailing at the time of the study, the project specific needs, overall balance, and the relative value of the categories. Because of the importance of the key personnel including the Project Manager and Project Site Engineer to the success of any construction project, a separate category was developed for key personnel to assess their capabilities as previously mentioned. For a detailed description of how to rate the key Personnel see the Questionnaires and Completion Instructions in Appendix D, Questionnaires-Construction Firms.

Key Personnel and Work Planning and Project Control were judged to be the more critical categories. They were given emphasis with higher possible scores. Following in descending order of importance are Available In-House Resources, Relevant Company Experience, Past Performance, and Financial Indicators.

Relevant Company Experience and Available In-House Resources were considered less important in terms of the overall rating than Key Personnel and Work Planning and Project Control.

Past Performance was given a lesser weighting than the first four in this evaluation since there is not a plethora of historic projects with truly comparable conditions. It is still a very reliable indicator of the general attitudes, capabilities, and method of operations for the individual firms.

Financial Indicators must be considered in relation to the firm's ability to undertake the project and to maintain cash flow throughout the project life. Financial Indicators was given an equal categorical rating to Past Performance.

FIGURE 7-1

CONSTRUCTION FIRM CAPABILITY INDEX

Company _____ CFCI as of _____

Categories - Elements	Ratings 0	1	2	3	4
I. Key Personnel					
A. Project Manager					
1. Education and Registration					
2. Experience					
3. Project Related Exposure					
a. Engineering					
b. Project Management					
c. Quality Control					
B. Project Site Engineer					
1. Education and Registration					
2. Experience					
3. Project Related Exposure					
a. Engineering					
b. Project Management					
c. Quality Control					
Category Points ____ X 1.05 W.F. = ___			Subtotal		
II. Work Planning and Project Control					
A. Field Testing Capabilities					
1. In-House					
2. Subcontract/Laboratory					
B. CPM Network Generation					
1. Number of Projects in Last Year for which CPM Networks were Developed and Used					
2. Number of CPM Networks Developed In-House					
C. Master Plan Developed and Updated for this Project					
D. Project Documentation					
1. Control					
a. Manpower					
b. Equipment					
c. Materials					
d. Change Orders					
e. Shop Drawing Submittals					
f. Progress Payment Requests					
g. Standardized Filing System					

FIGURE 7-1

CONSTRUCTION FIRM CAPABILITY INDEX (CONTINUED)

Company _____ CFCI as of _____

Categories - Elements	Ratings 0	1	2	3	4
II. Work Planning and Project Control (Cont'd)					
D. Project Documentation					
2. Daily Diary					
3. Daily Progress Report					
4. Photographic Record					
5. Subcontractor/Vendor Management					
6. Meeting Minutes Generation					
E. Field Office					
1. Furnishings					
a. Office Furniture					
b. Typewriter/Word Processor					
c. Copy Machine					
d. Field Testing Equipment					
F. Equipment and Materials Procurement Scheduling and Tracking					
G. Preliminary Project Reconnaissance					
1. On-Site					
2. Off-Site					
a. Government Agencies					
b. Local Consulting Firms					
Category Points ____ X 0.68 W.F. = __			Subtotal		
III. Relevant Company Experience					
A. Similar Projects Constructed					
1. Own Design					
2. Design by Others					
B. Geographical Arena of Past Projects					
C. Use of the Technology Transfer Program					
D. Knowledge of CSI Format - Technical Specifications					
E. Ability to Perform Work in Accordance with the Contract Documents Without Subcontractor Support					
F. General Competence					

FIGURE 7-1

CONSTRUCTION FIRM CAPABILITY INDEX (CONTINUED)

Company _____ CFCI as of _____

Categories - Elements	Ratings 0	1	2	3	4
III. Relevant Company Experience (Cont'd) G. Home Office Backup Support H. Overseas Equipment and Materials Procurement					
Category Points ____ X 1.00 W.F. = ___			Subtotal		
IV. Past Performance A. Job Completion 1. Exceed Cost Budgeted 2. Exceed Time Allotment B. Project Documentation C. Relationships 1. Owner 2. Construction Manager 3. Subcontractors D. Claims History E. Professional Reputation F. Quality of Workmanship					
Category Points ____ X 1.17 W.F. = ___			Subtotal		
V. Financial Indicators A. Ratio of Current Assets to Current Liabilities B. Average Annual Growth C. Professional Liability Insurance (Car)					
Category Points ____ X 3.11 W.F. = ___			Subtotal		

FIGURE 7-1

CONSTRUCTION FIRM CAPABILITY INDEX (CONTINUED)

Company _____ CFCI as of _____

Categories - Elements	Ratings				
	0	1	2	3	4
VI. Available In-House Resources					
A. Home Office Support Capabilities					
1. Technical Discipline Engineers					
2. Field Office Quality Control					
3. Project Control Monitoring					
B. Resource Allocation					
1. Materials					
2. Appropriate Equipment					
3. Manpower					
4. Supervision Ratio (Foreman/ Crew Size)					

Category Points ____ X 1.14 W.F. = __ Subtotal

CONSTRUCTION FIRM CAPABILITY INDEX _____

Evaluated by: _____

_____

Date: _____

TABLE 7-1

DEFINITION OF ELEMENTS AND RATINGS

Categories Elements	Rating				
	0	1	2	3	4
I. Key Personnel					
A. Project Manager					
1. Education and Registration	0-6	7	8	9	10
2. Experience	0-5	6-10	11-15	16-24	25+
3. Project Related Exposure					
a. Engineering	0-1	2-3	4-5	6-9	10+
b. Project Management	0-10	11-15	16-25	26-35	36+
c. Quality Control	0-10	11-19	20-29	30-39	40+
B. Project Engineer					
1. Education and Registration	0-6	7	8	9	10
2. Experience	0-1	2-5	6-10	11-19	20+
3. Project Related Exposure					
a. Engineering	0-1	2	3-6	7-9	10+
b. Project Management	0-4	5-13	14-20	21-30	31+
c. Quality Control	0-8	9-15	16-24	25-35	36+
II. Work Planning and Project Control					
A. Field Testing Capabilities					
1. In-House	None	Sometimes	N/A	N/A	Always
2. Subcontract/Laboratory	None	Always	Sometimes	N/A	N/A
B. CPM Network Generation					
1. Number of Projects in Last Year for which CPM Networks were Developed and Used	None	1	2	3	4
2. Number of CPM Networks Developed In-House	None	1	2	3	4

TABLE 7-1

DEFINITION OF ELEMENTS AND RATINGS (CONTINUED)

Categories Elements	Rating 0	1	2	3	4
II. Cont'd					
C. Master Plan Developed and Updated for this Project	No	N/A	N/A	N/A	Yes
D. Project Documentation					
1. Control					
a. Manpower	No	Yes	N/A	N/A	N/A
b. Equipment	No	Yes	N/A	N/A	N/A
c. Materials	No	Yes	N/A	N/A	N/A
d. Change Orders	No	Yes	N/A	N/A	N/A
e. Shop Drawing Submittals	No	Yes	N/A	N/A	N/A
f. Progress Payment Requests	No	Yes	N/A	N/A	N/A
g. Standardized Filing System	No	Yes	N/A	N/A	N/A
2. Daily Diary	No	N/A	Yes	N/A	N/A
3. Daily Progress Report	No	N/A	Yes	N/A	N/A
4. Photographic Record	No	N/A	Yes	N/A	N/A
5. Subcontractor/Vendor Management	No	N/A	Yes	N/A	N/A
6. Meeting Minutes Generation	No	N/A	Yes	N/A	N/A
E. Field Office					
1. Furnishings					
a. Office Furniture	No	N/A	N/A	N/A	Yes
b. Typewriter/Word Processor	No	N/A	N/A	Yes	N/A
c. Copy Machine	No	N/A	N/A	N/A	Yes
d. Field Testing Equipment	No	N/A	Some	N/A	All

TABLE 7-1

DEFINITION OF ELEMENTS AND RATINGS (CONTINUED)

Categories Elements	Rating				
	0	1	2	3	4
II. Cont'd					
F. Equipment and Materials Procurement Scheduling and Tracking	No	N/A	N/A	N/A	Yes
G. Preliminary Project Reconnaissance					
1. On-Site	No	N/A	Yes	N/A	N/A
2. Off-Site					
a. Government Agencies	No	Yes	N/A	N/A	N/A
b. Local Consulting Firms	No	Yes	N/A	N/A	N/A
III. Relevant Company Experience					
A. Similar Projects Constructed					
1. Own Design	0-1	2	3	4	5
2. Design by Others	0	1	2	3	4
B. Geographical Arena of Past Projects	0	Amman	Jordan	International	N/A
C. Use of the Technology Transfer Program	0-1	2	3	4	5
D. Knowledge of CSI Format - Technical Specifications	No	N/A	Yes	N/A	N/A
E. Ability to Perform Work in Accordance with the Contract Documents Without Subcontractor Support	No	Some	Most	All	N/A
F. General Competence	Poor	N/A	Fair	Good	Excellent
G. Home Office Backup Support	None	N/A	Some	N/A	Full

TABLE 7-1

DEFINITION OF ELEMENTS AND RATINGS (CONTINUED)

Categories Elements	Rating				
	0	1	2	3	4
III. Cont'd					
H. Overseas Equipment and Materials Procurement	Never	N/A	1	N/A	2+
IV. Past Performance					
A. Job Completion					
1. Exceed Cost Budgeted	1	0	N/A	N/A	N/A
2. Exceed Time Allotment	2	1	0	N/A	N/A
B. Project Documentation	Poor	Fair	Good	Excellent	N/A
C. Relationships					
1. Owner	Poor	Fair	Good	Excellent	N/A
2. Construction Manager	Poor	Fair	Good	Excellent	N/A
3. Subcontractors	Poor	Fair	Good	Excellent	N/A
D. Claims History	3	2	1	None	N/A
E. Professional Reputation	Poor	Fair	Good	Excellent	N/A
F. Quality of Workmanship	Poor	Fair	Good	Excellent	N/A
V. Financial Indicators					
A. Ratio of Current Assets to Current Liabilities	Less than 1.1	1.1-1.6	1.6-2.0	2.0-2.5	2.5+
B. Average Annual Growth in Volume	Less than 1.0	1-5%	6-10%	10-15%	15%+
C. Professional Liability Insurance (Car)	No	Yes	N/A	N/A	N/A

TABLE 7-1

DEFINITION OF ELEMENTS AND RATINGS (CONTINUED)

Categories Elements	Rating				
	0	1	2	3	4
VI. Available In-House Resources					
A. Home Office Support Capabilities					
1. Technical Discipline Engineers	None	N/A	Some	N/A	All
2. Field Office Quality Control	None	N/A	Some	N/A	All
3. Project Control Monitoring	None	N/A	Some	N/A	All
B. Resource Allocation					
1. Materials	Does not pass	N/A	Meets spec.	N/A	Exceeds spec.
2. Appropriate Equipment	None	N/A	Some	N/A	All
3. Manpower	None	N/A	Some but Could Increase	N/A	Adequate
4. Supervision Ratio (Foreman/ Crew Size)	Less than 0.24	N/A	0.25	N/A	0.33+

7.2.3.4 Uses of the Rating Forms and Rating Definitions

The CFCI was formulated as a useful tool to quantify the capabilities of the construction firms and, when measured against a similar evaluation made at another time will indicate transfer of technology that occurred during that time span. Some emphasis was given to sanitary engineering projects, but it does have application to other types of construction projects. Since the CFCI was developed for this evaluation, it is somewhat project and site specific. However, with minor modifications, broader applications can be possible.

Comparisons of future evaluations using the CFCI, for any given firm, will be meaningful. An increasing CFCI implies an increasing capability; conversely, a decreasing CFCI implies a regression in capability. While it would be difficult for capabilities to degenerate within the span of a single project, it could reasonably occur over extended periods of time.

As mentioned earlier, more detailed comparisons are possible by comparing the individual category subtotals, or individual element ratings. These comparisons would show more specific areas of capability enhancement or regression. Such comparisons would also pinpoint target areas for additional detailed study, if so desired.

Since the CFCI is general in nature it cannot, and should not, be used to select a firm for a specific project. The CFCI does not evaluate nor quantify company specific considerations such as the firm's existing workload versus the firm's capacity, the specific experience and availability of management staff for the company, or the level of commitment by the management staff to a specific project.

The principal use of the CFCI is to indicate the change in capability and the transfer of technology within a given single firm over time. The highest valued CFCI does not infer that the firm is the "best" construction firm. The CFCI is not a means to compare and rank various firms for projects.

7.3 RATINGS AND ASSESSMENTS

Following is a short summary assessment of each construction firm and completed CFCI rating forms, Figures 7-2 through 7-5. The summary assessment and CFCI's are in the following order: Haddad Engineering & Contracting Co., Madanat Contracting Co., Sinimmar Engineering and Contracting, and Trans Orient Engineering & Contracting Co. Ltd.

7.3.1 Haddad Engineering & Contracting Co.

Key Personnel - Haddad is considered to have an above-average project management staff at the projects in Karak and Tafila. The Project Managers are George Billeh and Bishara Ghawi. Their curriculum vitae are in Appendix H.

55

FIGURE 7-2

CONSTRUCTION FIRM CAPABILITY INDEX

Company Haddad Engineering & Contracting Co. CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
I. Key Personnel					
A. Project Manager					
1. Education and Registration			X		
2. Experience			X		
3. Project Related Exposure					
a. Engineering			X		
b. Project Management			X		
c. Quality Control			X		
B. Project Site Engineer					
1. Education and Registration			X		
2. Experience		X			
3. Project Related Exposure					
a. Engineering			X		
b. Project Management			X		
c. Quality Control		X			

Category Points 18 X 1.05 W.F. = 18.90 Subtotal

II. Work Planning and Project Control					
A. Field Testing Capabilities					
1. In-House		X			
2. Subcontract/Laboratory			X		
B. CPM Network Generation					
1. Number of Projects in Last Year for which CPM Networks were Developed and Used	X				
2. Number of CPM Networks Developed In-House	X				
C. Master Plan Developed and Updated for this Project					
D. Project Documentation					
1. Control					
a. Manpower	X				
b. Equipment	X				
c. Materials	X				
d. Change Orders	X				
e. Shop Drawing Submittals		X			
f. Progress Payment Requests		X			
g. Standardized Filing System	X				

FIGURE 7-2

CONSTRUCTION FIRM CAPABILITY INDEX (CONTINUED)

Company Haddad Engineering & Contracting Co. CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
II. Work Planning and Project Control (Cont'd)					
D. Project Documentation					
2. Daily Diary			X		
3. Daily Progress Report			X		
4. Photographic Record	X				
5. Subcontractor/Vendor Management			X		
6. Meeting Minutes Generation			X		
E. Field Office					
1. Furnishings					
a. Office Furniture					X
b. Typewriter/Word Processor	X				
c. Copy Machine	X				
d. Field Testing Equipment			X		
F. Equipment and Materials Procurement Scheduling and Tracking	X				
G. Preliminary Project Reconnaissance					
1. On-Site			X		
2. Off-Site					
a. Government Agencies		X			
b. Local Consulting Firms		X			

Category Points 27 X 0.68 W.F. = 18.36 Subtotal

III. Relevant Company Experience					
A. Similar Projects Constructed					
1. Own Design	X				
2. Design by Others		X			
B. Geographical Arena of Past Projects			X		
C. Use of the Technology Transfer Program	X				
D. Knowledge of CSI Format - Technical Specifications			X		
E. Ability to Perform Work in Accordance with the Contract Documents Without Subcontractor Support		X			
F. General Competence			X		

FIGURE 7-2

CONSTRUCTION FIRM CAPABILITY INDEX (CONTINUED)

Company Haddad Engineering & Contracting Co. CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
III. Relevant Company Experience (Cont'd)					
G. Home Office Backup Support	X				
H. Overseas Equipment and Materials Procurement			X		
Category Points 10 X 1.00 W.F. = 10.00			Subtotal		
IV. Past Performance					
A. Job Completion					
1. Exceed Cost Budgeted		X			
2. Exceed Time Allotment			X		
B. Project Documentation			X		
C. Relationships					
1. Owner			X		
2. Construction Manager			X		
3. Subcontractors			X		
D. Claims History				X	
E. Professional Reputation			X		
F. Quality of Workmanship			X		
Category Points 18 X 1.17 W.F. = 21.06			Subtotal		
V. Financial Indicators					
A. Ratio of Current Assets to Current Liabilities			X		
B. Average Annual Growth					X
C. Professional Liability Insurance (Car)		X			
Category Points 7 X 3.11 W.F. = 21.77			Subtotal		

FIGURE 7-2

CONSTRUCTION FIRM CAPABILITY INDEX (CONTINUED)

Company Haddad Engineering & Contracting Co. CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
VI. Available In-House Resources					
A. Home Office Support Capabilities					
1. Technical Discipline Engineers	X				
2. Field Office Quality Control			X		
3. Project Control Monitoring			X		
B. Resource Allocation					
1. Materials			X		
2. Appropriate Equipment			X		
3. Manpower			X		
4. Supervision Ratio (Foreman/ Crew Size)			X		

Category Points 12 X 1.14 W.F. = 13.68 Subtotal

CONSTRUCTION FIRM CAPABILITY INDEX 104

Evaluated by: James Creager

David Bird

Date: May 1986

FIGURE 7-3

CONSTRUCTION FIRM CAPABILITY INDEX

Company Madanat Contracting Co. CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
I. Key Personnel					
A. Project Manager					
1. Education and Registration			X		
2. Experience			X		
3. Project Related Exposure					
a. Engineering	X				
b. Project Management					X
c. Quality Control			X		
B. Project Site Engineer					
1. Education and Registration			X		
2. Experience		X			
3. Project Related Exposure					
a. Engineering		X			
b. Project Management	X				
c. Quality Control		X			

Category Points 15 X 1.05 W.F. = 15.75 Subtotal

II. Work Planning and Project Control					
A. Field Testing Capabilities					
1. In-House		X			
2. Subcontract/Laboratory			X		
B. CPM Network Generation					
1. Number of Projects in Last Year for which CPM Networks were Developed and Used	X				
2. Number of CPM Networks Developed In-House	X				
C. Master Plan Developed and Updated for this Project					X
D. Project Documentation					
1. Control					
a. Manpower	X				
b. Equipment		X			
c. Materials	X				
d. Change Orders	X				
e. Shop Drawing Submittals		X			
f. Progress Payment Requests		X			
g. Standardized Filing System	X				

FIGURE 7-3

CONSTRUCTION FIRM CAPABILITY INDEX (CONTINUED)

Company Madanat Contracting Co. CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
II. Work Planning and Project Control (Cont'd)					
D. Project Documentation					
2. Daily Diary			X		
3. Daily Progress Report			X		
4. Photographic Record	X				
5. Subcontractor/Vendor Management			X		
6. Meeting Minutes Generation			X		
E. Field Office					
1. Furnishings					
a. Office Furniture					X
b. Typewriter/Word Processor				X	
c. Copy Machine	X				
d. Field Testing Equipment			X		
F. Equipment and Materials Procurement Scheduling and Tracking					X
G. Preliminary Project Reconnaissance					
1. On-Site			X		
2. Off-Site					
a. Government Agencies		X			
b. Local Consulting Firms		X			

Category Points 35 X 0.68 W.F. = 23.80 Subtotal

III. Relevant Company Experience					
A. Similar Projects Constructed					
1. Own Design	X				
2. Design by Others					X
B. Geographical Arena of Past Projects			X		
C. Use of the Technology Transfer Program	X				
D. Knowledge of CSI Format - Technical Specifications			X		
E. Ability to Perform Work in Accordance with the Contract Documents Without Subcontractor Support		X			
F. General Competence				X	

FIGURE 7-3

CONSTRUCTION FIRM CAPABILITY INDEX (CONTINUED)

Company Madanat Contracting Co. CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
III. Relevant Company Experience (Cont'd)					
G. Home Office Backup Support			X		
H. Overseas Equipment and Materials Procurement			X		
Category Points 16 X 1.00 W.F. = 16.00			Subtotal		
IV. Past Performance					
A. Job Completion					
1. Exceed Cost Budgeted		X			
2. Exceed Time Allotment		X			
B. Project Documentation			X		
C. Relationships					
1. Owner			X		
2. Construction Manager			X		
3. Subcontractors			X		
D. Claims History				X	
E. Professional Reputation			X		
F. Quality of Workmanship			X		
Category Points 17 X 1.17 W.F. = 19.89			Subtotal		
V. Financial Indicators					
A. Ratio of Current Assets to Current Liabilities					X
B. Average Annual Growth					X
C. Professional Liability Insurance (Car)		X			
Category Points 9 X 3.11 W.F. = 27.99			Subtotal		

FIGURE 7-3

CONSTRUCTION FIRM CAPABILITY INDEX (CONTINUED)

Company Madanat Contracting Co. CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
VI. Available In-House Resources					
A. Home Office Support Capabilities					
1. Technical Discipline Engineers			X		
2. Field Office Quality Control			X		
3. Project Control Monitoring			X		
B. Resource Allocation					
1. Materials			X		
2. Appropriate Equipment					X
3. Manpower					X
4. Supervision Ratio (Foreman/ Crew Size)			X		

Category Points 18 X 1.14 W.F. = 20.52 Subtotal

CONSTRUCTION FIRM CAPABILITY INDEX 124

Evaluated by: James Creager

David Bird

Date: May 1986

FIGURE 7-4

CONSTRUCTION FIRM CAPABILITY INDEX

Company Sinimmar Engr & Contracting CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
I. Key Personnel					
A. Project Manager					
1. Education and Registration			X		
2. Experience			X		
3. Project Related Exposure					
a. Engineering				X	
b. Project Management				X	
c. Quality Control			X		
B. Project Site Engineer					
1. Education and Registration			X		
2. Experience		X			
3. Project Related Exposure					
a. Engineering		X			
b. Project Management		X			
c. Quality Control			X		
Category Points 19 X 1.05 W.F. = 19.95 Subtotal					
II. Work Planning and Project Control					
A. Field Testing Capabilities					
1. In-House		X			
2. Subcontract/Laboratory			X		
B. CPM Network Generation					
1. Number of Projects in Last Year for which CPM Networks were Developed and Used		X			
2. Number of CPM Networks Developed In-House	X				
C. Master Plan Developed and Updated for this Project					X
D. Project Documentation					
1. Control					
a. Manpower		X			
b. Equipment		X			
c. Materials		X			
d. Change Orders	X				
e. Shop Drawing Submittals		X			
f. Progress Payment Requests		X			
g. Standardized Filing System	X				

FIGURE 7-4

CONSTRUCTION FIRM CAPABILITY INDEX (CONTINUED)

Company Sinimmar Engr & Contracting CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
II. Work Planning and Project Control (Cont'd)					
D. Project Documentation					
2. Daily Diary			X		
3. Daily Progress Report			X		
4. Photographic Record			X		
5. Subcontractor/Vendor Management			X		
6. Meeting Minutes Generation			X		
E. Field Office					
1. Furnishings					
a. Office Furniture					X
b. Typewriter/Word Processor				X	
c. Copy Machine					X
d. Field Testing Equipment			X		
F. Equipment and Materials Procurement Scheduling and Tracking	X				
G. Preliminary Project Reconnaissance					
1. On-Site			X		
2. Off-Site					
a. Government Agencies		X			
b. Local Consulting Firms		X			

Category Points 40 X 0.68 W.F. = 27.20 Subtotal

III. Relevant Company Experience					
A. Similar Projects Constructed					
1. Own Design	X				
2. Design by Others		X			
B. Geographical Arena of Past Projects			X		
C. Use of the Technology Transfer Program	X				
D. Knowledge of CSI Format - Technical Specifications			X		
E. Ability to Perform Work in Accordance with the Contract Documents Without Subcontractor Support			X		
F. General Competence				X	

FIGURE 7-4

CONSTRUCTION FIRM CAPABILITY INDEX (CONTINUED)

Company Sinimmar Engr & Contracting CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
III. Relevant Company Experience (Cont'd)					
G. Home Office Backup Support					X
H. Overseas Equipment and Materials Procurement	X				
Category Points 14 X 1.00 W.F. = 14.00			Subtotal		
IV. Past Performance					
A. Job Completion					
1. Exceed Cost Budgeted		X			
2. Exceed Time Allotment			X		
B. Project Documentation			X		
C. Relationships					
1. Owner			X		
2. Construction Manager			X		
3. Subcontractors			X		
D. Claims History				X	
E. Professional Reputation			X		
F. Quality of Workmanship			X		
Category Points 18 X 1.17 W.F. = 21.06			Subtotal		
V. Financial Indicators					
A. Ratio of Current Assets to Current Liabilities		X			
B. Average Annual Growth					X
C. Professional Liability Insurance (Car)		X			
Category Points 6 X 3.11 W.F. = 18.66			Subtotal		

FIGURE 7-4

CONSTRUCTION FIRM CAPABILITY INDEX (CONTINUED)

Company Sinimmar Engr & Contracting CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
VI. Available In-House Resources					
A. Home Office Support Capabilities					
1. Technical Discipline Engineers			X		
2. Field Office Quality Control			X		
3. Project Control Monitoring			X		
B. Resource Allocation					
1. Materials			X		
2. Appropriate Equipment					X
3. Manpower			X		
4. Supervision Ratio (Foreman/ Crew Size)			X		

Category Points 16 X 1.14 W.F. = 18.24 Subtotal

CONSTRUCTION FIRM CAPABILITY INDEX 119

Evaluated by: James Creager

David Bird

Date: May 1986

FIGURE 7-5

CONSTRUCTION FIRM CAPABILITY INDEX

Company Trans Orient Engineering & Contracting Co. Ltd. CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
I. Key Personnel					
A. Project Manager					
1. Education and Registration			X		
2. Experience		X			
3. Project Related Exposure					
a. Engineering			X		
b. Project Management		X			
c. Quality Control		X			
B. Project Site Engineer					
1. Education and Registration			X		
2. Experience			X		
3. Project Related Exposure					
a. Engineering			X		
b. Project Management		X			
c. Quality Control	X				

Category Points 14 X 1.05 W.F. = 14.70 Subtotal

II. Work Planning and Project Control					
A. Field Testing Capabilities					
1. In-House		X			
2. Subcontract/Laboratory			X		
B. CPM Network Generation					
1. Number of Projects in Last Year for which CPM Networks were Developed and Used			X		
2. Number of CPM Networks Developed In-House			X		
C. Master Plan Developed and Updated for this Project					X
D. Project Documentation					
1. Control					
a. Manpower	X				
b. Equipment		X			
c. Materials		X			
d. Change Orders	X				
e. Shop Drawing Submittals		X			
f. Progress Payment Requests		X			
g. Standardized Filing System		X			

FIGURE 7-5

CONSTRUCTION FIRM CAPABILITY INDEX (CONTINUED)

Company Trans Orient Engineering & Contracting Co. Ltd. CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
II. Work Planning and Project Control (Cont'd)					
D. Project Documentation					
2. Daily Diary			X		
3. Daily Progress Report			X		
4. Photographic Record	X				
5. Subcontractor/Vendor Management			X		
6. Meeting Minutes Generation			X		
E. Field Office					
1. Furnishings					
a. Office Furniture					X
b. Typewriter/Word Processor				X	
c. Copy Machine					X
d. Field Testing Equipment			X		
F. Equipment and Materials Procurement Scheduling and Tracking					X
G. Preliminary Project Reconnaissance					
1. On-Site			X		
2. Off-Site					
a. Government Agencies		X			
b. Local Consulting Firms		X			
Category Points 45 X 0.68 W.F. = 30.68			Subtotal		
III. Relevant Company Experience					
A. Similar Projects Constructed					
1. Own Design	X				
2. Design by Others		X			
B. Geographical Arena of Past Projects				X	
C. Use of the Technology Transfer Program	X				
D. Knowledge of CSI Format - Technical Specifications			X		
E. Ability to Perform Work in Accordance with the Contract Documents Without Subcontractor Support			X		
F. General Competence				X	

FIGURE 7-5

CONSTRUCTION FIRM CAPABILITY INDEX (CONTINUED)

Company Trans Orient Engineering & Contracting Co. Ltd. CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
III. Relevant Company Experience (Cont'd)					
G. Home Office Backup Support					X
H. Overseas Equipment and Materials Procurement			X		
Category Points 17 X 1.00 W.F. = 17.00			Subtotal		
IV. Past Performance					
A. Job Completion					
1. Exceed Cost Budgeted		X			
2. Exceed Time Allotment			X		
B. Project Documentation			X		
C. Relationships					
1. Owner		X			
2. Construction Manager		X			
3. Subcontractors		X			
D. Claims History				X	
E. Professional Reputation			X		
F. Quality of Workmanship			X		
Category Points 15 X 1.17 W.F. = 17.55			Subtotal		
V. Financial Indicators					
A. Ratio of Current Assets to Current Liabilities			X		
B. Average Annual Growth					X
C. Professional Liability Insurance (Car)		X			
Category Points 7 X 3.11 W.F. = 21.77			Subtotal		

FIGURE 7-5

CONSTRUCTION FIRM CAPABILITY INDEX (CONTINUED)

Company Trans Orient Engineering & Contracting Co. Ltd. CFCI as of May 1986

Categories - Elements	Ratings 0	1	2	3	4
VI. Available In-House Resources					
A. Home Office Support Capabilities					
1. Technical Discipline Engineers			X		
2. Field Office Quality Control			X		
3. Project Control Monitoring			X		
B. Resource Allocation					
1. Materials			X		
2. Appropriate Equipment					X
3. Manpower			X		
4. Supervision Ratio (Foreman/ Crew Size)			X		

Category Points 16 X 1.14 W.F. = 18.24 Subtotal

CONSTRUCTION FIRM CAPABILITY INDEX 120

Evaluated by: James Creager

David Bird

Date: May 1986

Work Planning and Project Control - Because of their inexperience in the use of scheduling techniques and project control methods, it is expected that Haddad will advance substantially in this area.

Relevant Company Experience - This project is the first Haddad has bid in the English language. Because of their small size, they tend to hire their project staff as needed for a particular project. Consequently, the company as a whole does not retain the knowledge and experience gained from past projects.

Past Performance - Haddad has a good reputation on past projects. They reported to have achieved completion of all their projects within both cost and time frames, with adequate project documentation. Their relationship with the client, construction managers, and subcontractors has been satisfactory.

Financial Indicators - The financial health of the firm is considered average. By maintaining a lean support staff, the total overhead for the firm is low which allows more net current assets to be devoted to the project.

Available In-House Resources - By maintaining a lean support staff, project monitoring from the home office is adversely affected in the short term and, as mentioned previously, knowledge and experience is not maintained for future company growth.

7.3.2 Madanat Contracting Co.

Key Personnel - The Project Manager is considered very strong, however, the Project Engineer is still an apprentice. This results in a lower-than-average rating but should not alarm management. Proper monitoring by the home office staff should prevail. The Project Manager is Osama Haddadin. His curriculum vitae is in Appendix H.

Work Planning and Project Control - Present work planning and project control methods are appropriate. Their U.S. subcontractor intends to spend a large part of his effort computerizing and otherwise developing systematic scheduling and profit/loss control management systems and reports. If the contractor is responsive, a significant improvement in this firm's overall capability is expected.

Relevant Company Experience - Madanat has above-average experience in constructing water and wastewater projects. They have retained staff knowledgeable of construction methods related to such projects and should be considered a leader in this industry.

Past Performance - From all indications, Madanat has a good reputation on their past projects. It was reported that all previous projects were constructed within budget, and only one project exceeded the allotted time

frame. Their relationship with other project management, the client, and subcontractors is considered adequate.

Financial Indicators - The financial health of the firm is considered excellent. The present plan to modernize scheduling and profit/loss control management should reveal excess financial resources that could be used to stimulate company growth.

Available In-House Resources - The support staff appears to be available to monitor project-related documentation and quality control items.

7.3.3 Sinimmar Engineering and Contracting

Key Personnel - The project management team provided for the Tafila treatment facility project is considered most stable and knowledgeable regarding the project to be constructed. It is anticipated that this project will be completed with the minimum amount of management problems due to the strong project management and quality control skills. The Project Manager is Abad Sahhar, an experienced design, operations, and construction engineer. His curriculum vitae is in Appendix H.

Work Planning and Project Control - Project documentation was found to be satisfactory. At the time of this evaluation, their work plan was being revised by their scheduling subcontractor. It is anticipated that technology will best be transferred in the area of scheduling and profit/loss control.

Relevant Company Experience - The project team has average experience in constructing water and wastewater system facilities. Because of the Project Manager's experience in the operations and maintenance of such systems, his special insight to the construction phase is considered most valuable.

Past Performance - Sinimmar has an excellent reputation as a contractor on water and wastewater construction projects. All of their projects were reported to have been constructed on time and within budgeted cost. Their relationship with the client, construction managers, and subcontractors is also considered satisfactory.

Financial Indicators - The financial health of this firm is considered their most diminutive attribute to the overall CFCI evaluation, although no significant problems were apparent to the evaluation team. Through increased use of scheduling and profit/loss control techniques, the firm's growth and current liquidity is expected to improve.

Available In-House Resources - Their support staff appears to be available to monitor project-related documentation and quality control items. Scheduling control is presently being provided by subcontract.

7.3.4 Trans Orient Engineering & Contracting Co. Ltd.

Key Personnel - Of all the construction firms' teams interviewed, TROCON's staff was considered to have the lowest overall level of experience and familiarity with water and wastewater system construction. However, because of TROCON's size and given proper support from the home office, no particular problems are anticipated. The Project Manager is Suheil Younis. His curriculum vitae is in Appendix H.

Work Planning and Project Control - At the time of this evaluation, the project schedule was being revised, with comments by the construction supervision team. Because of the centralized management abilities of the firm's home office, work planning and project control is considered their strongest attribute. However, individual project management members are expected to benefit from this construction experience. At the present time, the U.S. subcontractor is providing support and technology transfer only in the area of submittal review and procurement activities for U.S.-purchased equipment. Should TROCON need assistance during the commissioning and start-up phases, support will be made available.

Relevant Company Experience - The firm as a whole has constructed many kinds of projects and is considered above average in the contracting environment. They have the ability to maintain staffing that will utilize their experience on this project to benefit the firm on future projects of this kind.

Past Performance - TROCON has a good reputation as a contractor. They construct projects of all kinds and do not limit themselves to a specific area. It was reported that all of their projects have been completed on time and within budget. Their relationship with the client, construction management personnel, and subcontractors is considered satisfactory.

Financial Indicators - The financial health of the firm is considered average and should not have any impact on their ability to complete this project.

Available In-House Resources - TROCON appears to have the support personnel and resources to complement the project as the need arises. Project documentation and quality control monitoring should be provided by the home office support staff on a regular basis to supplement the project management staff.

SECTION 8

TECHNOLOGY TRANSFER FOR CONSTRUCTION FIRMS

8.1 INTRODUCTION

The primary objective of the technology transfer program, outlined in the WAJ tender documents for all the construction projects, is to increase the level of knowledge of the construction firm in the areas of bid preparation, project execution, project completion, and the commercial aspects of the construction industry. Because of the variety in size, financial status, and growth pattern of each construction firm, the strengths and improvement needs vary.

In this section, the deliverable items are discussed for each construction firm as well as the technology transfer techniques being used or scheduled to be used by their U.S. subcontractors.

8.2 APPROPRIATE DELIVERABLE ITEMS FOR EACH CONSTRUCTION FIRM

Each construction firm evolved from a different background and, consequently, each has different technology transfer needs to complement their overall capabilities. During interviews and visits to the job sites, all the construction firms exhibited an interest in learning new techniques specifically related to scheduling and monitoring costs. Other deliverables unique to each construction firm are discussed in the following paragraphs.

8.2.1 Haddad Engineering & Contracting Co.

Project K-3, a 330-meter long tunnel, has developed a major technical problem which will affect the overall project budget and schedule. The project management team does not have a great deal of experience in claims management. Technology transfer is needed in this area to advise Haddad on what project documentation of the and cost overruns must be completed and what project daily and monthly reports are needed to explain the problem in detail to justify their claims.

The two Project Managers for their second construction project (T-2), the installation of water distribution and sewage collection system, appear to be knowledgeable about their project and well-versed in project management skills and quality control. Both individuals are, however, new to the company and their performance is untested. Project documentation should be monitored closely by the construction supervision team.

8.2.2 Madanat Contracting Co.

The Project Manager for the K-2 project appears to have very strong overall management capabilities, and no problems are expected with the overall project schedule or budget. The Project Engineer, however, is inexperienced and must learn many management skills from both the Project Manager and the U.S. subcontractor to be effective. Providing project documentation and the modernization of their record keeping system will be major contributions to this construction firm.

8.2.3 Sinimmar Engineering and Contracting

The Project Team for the T-1 project has the most overall experience in construction, project management, and quality control. Design changes were made to the facilities including a slight relocation which will have an impact on the construction schedule. The Project Manager indicated that he felt the greatest need for technology transfer is in overseas equipment procurement and the submittal review process.

8.2.4 Trans Orient Engineering & Contracting Co. Ltd.

This construction firm is probably the most advanced technologically of the four evaluated; however, the Project Team as a whole does not have experience in the construction of wastewater facilities. They have provided a variety of expertise in the mechanical and construction management disciplines to supplement the skills of the Project Manager. This team also receives home office support for scheduling submittal review. The management has indicated that technology can best be transferred in the area of overseas procurement of equipment and in the start-up phase of construction.

8.3 TRANSFER TECHNIQUES

Following is a discussion of the various technology transfer methods available and proposed usage by the U.S. subcontractors.

8.3.1 Lectures

Formal lectures have been and are being used by the U.S. subcontractors to the Jordanian design and construction supervision firms. The timing and subject matter varies to complement the project needs. Several factors have been noted, by both the subcontractors and the personnel who attended the past lectures, that should be considered to attain maximum effectiveness from future lectures:

> The timing of lectures should coincide with the application of the subject matter to the project. This permits the recipient of the information the opportunity to apply the subject matter while it is fresh in his mind. All of the Jordanian construction firm Project

Team members indicated that direct application of the subject matter is important to the overall learning process.

Whenever possible, all students should be supplied with lecture outlines and notes. This provides them with reference materials and will help the participants recall and apply the information.

Emphasis should be placed on practical approaches to problem solving, including presenting and jointly solving example problems. All of the Project Team members affirmed that they retained more information when lectures were followed by solving example problems than when only lectures were given.

Lectures should be given by local people whenever possible. This reinforces the technical knowledge of the lecturer, demonstrates the technical capabilities of the local personnel to their associates, develops a level of professional rapport and respect, and should be more responsive to the needs of the attendees.

8.3.2 Reference Materials

As much reference material as possible should be provided to the local staff. This includes text and reference books, equipment and material catalogs, and other design tools available to assist the construction firms in accurate and efficient construction practice and project control. These items should remain after the U.S. subcontractors leave. They are tools that will be useful on future construction projects. Also, they improve familiarity with U.S. products and encourage the use of these products and construction monitoring methods.

8.3.3 Field Trips

Field trips to other similar construction projects are felt to be very beneficial, especially for plants and hydraulic structures. Good projects should be selected to demonstrate correct construction practices.

8.3.4 One-on-One Training

One-on-one training is considered the most effective means for transferring technology. It utilizes interactive communication, not possible with lectures, between the instructor and the student. However, it is time consuming and should be limited to the more technically complex subjects whenever possible. This type of training should also be encouranged between technically qualified local expertise and on-site trainees.

8.3.5 Methods Proposed by U.S. Subcontractors

Each of the three U.S. subcontractors has proposed and presently is implementing methods for transferring technology to the Jordanian construction firms.

8.3.5.1 Caddie Construction Company

Caddie Construction Company has provided Mr. Rhett C. Leary as their in-country representative to perform technology transfer to contractors Sinimmar Engineering and Contacting and Haddad Engineering and Contracting Co. on the T-1, T-2, and K-3 projects, respectively. In all cases, Caddie is emphasizing training efforts in the areas of CPM scheduling, safety, and contract administration. Other items are specific to the technical needs of each of the contracts. Although Mr. Leary is presently out of the country, he is scheduled to return to Jordan in June 1986 to work on the T-1 contract with Sinimmar. Because of the present unforeseen technical problems on the tunneling project (K-3) and the subcontractor arrangement with Haddad, Mr. Leary's participation on the T-2 and K-3 projects is subject to the request of Haddad.

It appears that Caddie has an appropriate plan to transfer technology using one-on-one training. During our interview with Mr. Caddie in Orlando, Florida, it was commented that because of the size of the audience, lectures would not be appropriate for most items to be transferred, although the contractors and subcontractor would participate in seminars that would involve group training in CPM scheduling.

Caddie has planned to maintain in-country participation for a period of 10 months, beginning March 1986, using the services of Mr. Leary. Supplemental participation will be provided as necessary by Mr. Caddie and other support personnel. No program arrangements have been provided for beyond January 1987.

8.3.5.2 ETI of North America from Overland Park, Kansas, is the subcontractor to Madanat Contracting Co. ETI's representative, Mr. John Duffy, is utilizing the services of Near East Computer Enterprises (N.E.C.E.) from Amman. Mr. Ramzy Kopty of N.E.C.E. is the Managing Director and will be conducting lectures and one-on-one training in the use of computers and applicable software related to scheduling and project cost control. ETI will support N.E.C.E. activities as necessary to supplement any additional technology transfer requirements requested by Madanat.

8.3.5.3 Carl P. Wallace International Inc. of Irving, Texas, has a subcontract with Trans Orient Engineering & Contracting Co. Ltd. to provide technology transfer.

Mr. Preston Wallace and Carl Wallace, Wallace International, indicated they will provide technology transfer in the areas of equipment procurement expediting. Mr. Bill Bailey will be provided as an in-country representative for 2 to 4 weeks as a minimum and will visit TROCON's home office and Korak job site personnel to determine other areas of technology that would benefit the contractor. Additional in-country teams will be provided at the request of TROCON and will be paid above and beyond the original contract amount.

Wallace International intends to provide a manual of construction-related control procedures upon completion of the project. These procedures will include profit/loss control and CPM scheduling methods.

8.4 EVIDENCE OF TECHNOLOGY TRANSFER

The ratings and assessments found in Section 7 of this report indicate a sound baseline for all evaluated construction firms. All personnel interviewed demonstrated some exposure to construction practices and management skills.

Each construction firm and members of the project management team must be responsive to the technology transfer program in order for personal benefit to be received. Exposure to the elements of the evaluation, increased usage of present skills, and responsiveness to the U.S. subcontractor's capabilities should determine measurable changes in technological attributes of both the construction firm and its personnel.

APPENDIX A

PERSONS CONTACTED

1. GOVERNMENT OF JORDAN

Ministry of Planning

Boulos Kefeya

Water Authority

Mohammed S. Kilani
Mahmoud Talhouni, Secretary General
Nadir Abu Arkub, Project Manager of Karak and Tafila
Ibrahim Abu Shams, Project Manager of Madaba
Ghazi Abdul - Qader, Project Manager - Northern Six Cities

2. USAID/AMMAN

Lewis P. Reade, Director
Bernard E. Donnelly, Chief Engineer
William A. Libby, Deputy Chief Engineer
Aied S. Sweis, Civil Engineering Advisor
Nancy Carmichael Hardy, Mission Evaluation Officer

3. CONSULTING ENGINEERS

Arabtech Consulting Engineers

Yousef N. Abdallah
Ali Adib Hattar, Project Manager
Ziad Nobani, Chief Engineer Construction Supervision Department
Salti Salim Hanna Qaqish
Abdul Latef Ali Hassein
Mohammed Othman Hussein Naddaf
Nabeeh Maroon
Akman Harrani

CH2M Hill International

Buryl Glasser, Project Engineer

Persons Contacted

Consulting Engineering Center

Aziz Abdo Sajdi, President
Lufti Hallak, Project Manager
Ziad Issa Twal, Resident Manager
Izzat Sajdi
Nader Yousef Kabboushi
Jamal Omeri
Mohammad Bahar

Black & Veatch International

Malcolm Ross Leitch, Project Engineer

Jouzy and Partners Consulting Engineering Bureau

Raji Jouzy, Partner
Najeab F. Tleel, Project Manager
Suleiman A. Smedi, Ph.D.

Engineering-Science, Inc.

Robert Keaten, Project Engineer
Thomas Mitchell, Resident Engineer

4. CONSTRUCTION FIRMS

Haddad Engineering & Contracting Co.

Ghassan Haddad, General Manager
George Billeh, Project Manager K-3
Bishara Ghawi, Project Manager T-2
Akram Sonna, Resident Site Engineer K-3
Mahmoud Abdella, Resident Site Engineer T-2

Madanat Contracting Co.

Fayez Madanat, General Manager
Osama Haddadin, Project Manager K-2
Naief Nawaieseh, Resident Site Engineer K-2

Sinimmar Engineering and Contracting

Nabil Haddadin, Technical Director
Naim Tu'mah, General Manager
Abad Sahhar, Project Manager T-1
Amad Auqlah, Resident Site Engineer T-1

111

Persons Contacted

Trans Orient Engineering & Contracting Co. Ltd.

Hani Haddadin, Head of Tenders and Estimating Department
Hassan Talhouni, Main Office Coordinator
Suhail Younis, Project Manager
Mohan Sharma, Resident Site Engineer

Caddie Construction Company Inc.

Caddie, President
Rhett C. Leary, Project Representative

ETI of North America

John R. Duffey, President
Ramzy Kopty, Project Representative

Carl P. Wallace International Inc.

Carl P. Wallace, President
Preston Wallace

Jordan Contractors Association

Radwan Hajjar, Past President

APPENDIX B

REFERENCES

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2. Arabtech Consulting Engineers - General Brochure, Undated.

3. Jouzy and Partners, C.E.B. - General Brochure, Undated.

4. Consulting Engineering Center - General Brochure.

5. Agency for International Development - Near East Bureau, Evaluation Guidelines, (NE/DP/Evaluation), August 1984.

6. Agency for International Development - Technology Transfer Evaluation Baseline Survey of Three Jordanian Firms' Capabilities, March 1984.

7. Agency for International Development - Technology Transfer First Interim Evaluation and Construction Supervision Baseline Survey of Three Jordanian Firms' Capabilities, March 1985.

8. Jouzy and Partners C.E.B. and Engineering-Science, Inc. - Six-Towns Project Monthly Progress Report, March 1986.

9. Consulting Engineering Center and Black & Veatch International - Karak 1, 2 and 3 Projects Monthly Progress Report, March 1986.

10. Arabtech Consulting Engineers and CH2M Hill International - Ma'an and Tafila Contracts MN1, MN2, T1 and T2 Monthly Progress Report, March 1986.

11. City of Karak - Municipal Water, Wastewater and Storm Water Systems Tender Documents and Specifications (Typical), 1985.

12. Marcel Bitoun - Engineering Services in Developing Countries, 1980.

13. Benjamin Caffy and Andre Dahamni - Construction and the Transfer of Technology to the Arab World, 1986.

APPENDIX C

QUESTIONNAIRES - CONSTRUCTION SUPERVISION

QUESTIONNAIRE - GOVERNMENT AGENCIES

CONSTRUCTION SUPERVISION - FIRST INTERIM EVALUATION

1. Name of government agency.

2. Do you feel the technology transfer programs benefited the Jordanian consulting engineering firms? If so, in what ways, or how, were they benefited?

3. Describe how each of the consulting firms improved their managerial and technical capabilities with regard to construction supervision during this project. (If they did improve in your opinion.)

4. What were the favorable and unfavorable aspects of the technology transfer programs employed by each of the U.S. subconsultants?

5. Do you feel these three Jordanian consulting firms are fully qualified to provide construction supervision on a similar project without foreign technical and managerial assistance?

6. Do you feel there was a significant improvement in the quality of the project as a result of using the services of these engineering firms and their construction supervision expertise?

Questionnaires - Construction Supervision

7. Do you feel the project schedules were affected as a result of using the consulting firms to perform the construction supervision. If so, how?

8. How do you feel the country of Jordan, WAJ, the consulting firms, and the individuals that participated on these projects will benefit from this technology transfer?

9. Do you feel each, or any, of the Jordanian consulting firms will utilize the managerial and technical skills learned during these projects?

10. What do you feel was (were) the most important skill(s) acquired as a result of these projects and the emphasis placed on technology transfer by USAID?

11. Do you know of any external factors that may have affected the technology transfer?

12. Indicate what you feel are the current strengths and weaknesses of each firm.

13. Suggest any changes or additions you think could improve the technology transfer process.

14. Any pertinent comments and/or observations you would like to make regarding this project and its implementation.

QUESTIONNAIRE - U.S. CONSULTING FIRMS

CONSTRUCTION SUPERVISION - FIRST INTERIM EVALUATION

1. Name of firm.

2. Identify and describe both tangible and intangible evidence of technology transfer obtained by the local firm as a result of this project.

3. Describe what training programs were provided to the local firm, both formal and informal.

4. What in your opinion are the training programs that worked and why; also what didn't work and why?

5. Identify any external influences that may have affected the technology transfer either positively or negatively on this project.

6. Suggest any improvements you would recommend to enhance the technology transfer process.

7. Provide any comments and/or observations you feel are pertinent to this evaluation.

QUESTIONNAIRE - JORDANIAN ENGINEERING FIRM

CONSTRUCTION SUPERVISION - FIRST INTERIM EVALUATION

1. Name of firm.

2. How many projects of any type and size were completed in the last three years?

3. How many of these were comparable in size and complexity to this project?

4. How many of these were sanitary projects?

5. Were these projects all designed by your firm, or by others?

6. Has the firm undertaken any construction supervision projects outside of Jordan? If so, where?

7. Who are your top three competitors for construction services?

8. What are the strengths and weaknesses of your firm relative to construction supervision?

9. What do you feel is the reputation of your firm? How would you rate your firm?

Prestige - Will only do a quality job regardless of cost.

Leader - Does quality work but controls budget carefully.

Me Too - Follows along on advancement of other consultants. Close control on budget.

Price Competitive - Low prices to get volume of work and rigorous control on budget.

10. Number of personnel with construction supervision experience and average number of years of experience.

11. Total number of employees by classification/discipline.

12. How many employees were hired for this project?

13. Does your firm carry professional liability insurance?

14. Ratio of current assets to liabilities.

15. Average percentage of fees for last three years for construction supervision.

16. Average annual percentage of increase (decrease) in the fees for last three years.

17. How were your past relationships with clients, contractors, and designers (if done by others)?

18. What test equipment is available in-house?

19. Did you do materials/soils testing in-house, or did you utilize an outside service?

20. What testing standards and material standards do you have in your library?

21. Do you have a company construction manual and/or a company standard procedures manual?

22. Do you have an established:

    Policy to handle correspondence?

    Documentation system?

    Policy for handling submissions?

    Policy for handling change orders?

    Procedure for preparing and reviewing progress payments?

    Testing plan and manual?

23. Do you perform minor materials and soils testing in the field (i.e., concrete slump, entrained air, compaction and moisture content)?

24. Did you and do you normally conduct preconstruction meetings and regular construction meetings? Are written minutes made of all meetings?

25. Do you normally initiate projects in a timely fashion and complete within budget?

26. Describe the technology transfer program provided by your U.S. subcontractor.

27. What do you feel you have gained from the U.S. subcontractor that improves your ability to better perform construction supervision contracts?

28. What elements of the technology transfer program do you feel were good?

29. What elements of the technology transfer program were not beneficial or could have been improved? How could they have been improved?

30. What procedures obtained through this technology transfer program will your firm continue to use on future construction supervision projects?

APPENDIX D

QUESTIONNAIRES - CONSTRUCTION FIRMS

QUESTIONNAIRE - JORDANIAN CONSTRUCTION FIRM

Date: _____

Company name:

Address:

Phone:

Person interviewed:

Title position:

U.S. subcontractor:

Address:

Phone:

Project name:

Location:

Project description:

Applicable Water/Wastewater System Years of Construction Experience

Own design _____

Design by others _____

Construction company age _____ Year formed _____

How many employees (Full time) _____ Technical _____ Administrative

Total assets _____ Total liabilities _____

What are your present current assets _____ Current liabilities _____

What is the present annual volume of work completed? _____

What was the annual volume of work completed in 1976? _____

Does your company have professional liability insurance? Yes/No

Does your company have computer capabilities? Yes/No

Was a master work plan developed for this project? Yes/No

Does your company have CPM/Network Analysis experience? Yes/No

Does your company utilize standard field record keeping? Yes/No

Does your company perform the following? Yes/No

Shop drawing review _____ Photographic record _____

As-built drawing control _____ Change order control _____

Manpower control _____ Materials inventory _____

Equipment control _____

Has your company had any claims? Please explain:

Does your company have the ability to supervise subcontractors? Yes/No

Does your company receive performance bond from subcontractors? Yes/No

Where can your company benefit the most from technology transfer?

Please explain:

Please explain where your company would benefit the least from technology transfer:

Does your company have knowledge of local codes? Yes/No

Does your company have knowledge of the following?

_____ Off-site work _____ On-site reconnaissance _____ Blasting

_____ Concrete work _____ Earth-moving work _____ Carpentry

_____ Utility piping _____ Paving work _____ Roofing

_____ Mechanical (HVAC) _____ Foundation work _____ Plumbing

_____ Form work _____ Masonry work _____ Electrical

_____ Structural steel _____ Lath and plaster _____ Painting

_____ Safety procedures _____ Plan and specification reading

_____ Materials testing _____ Equipment and tools _____ Q/C testing

Have you worked on projects in the following areas?

Amman _____, Jordan _____, Middle East _____, Worldwide _____.

Did the technology transfer program exist on other projects? Yes/No

Does your company perform materials procurement scheduling? Yes/No

Who has the ultimate project authority for the following activities?

	Project Office	Main Office
CPM scheduling		
Change order negotiating		
Selection of subcontractor		
Materials purchasing		
Progress payment billing		
Equipment rental		
Personnel selection		
Construction method selection		

QUESTIONNAIRE - U.S. CONSTRUCTION FIRM

CONSTRUCTION FIRM EVALUATION

Company: _____

Person Interviewed: _____ Title: _____

1) What is your plan to provide technology transfer to the construction firm?

   * Classroom
   * One-on-One
   * On the Job
   * Other _____

2) Identify "deliverable" items from your training program.

3) What "training aids" do you plan to leave with the construction firm?

4) Identify any external influences that may have an effect on the transfer of technology process.

5) Do you have an outline of final report to be provided at end of project?

6) What is the duration of the construction project?

7) What is the approximate value of the prime contract?

8) How many man-months of effort will you, the U.S. construction firm, provide to the Jordanian construction firm? How much will be provided in Jordan?

QUESTIONNAIRE - PREVIOUS CLIENTS - PAST PERFORMANCE

CONSTRUCTION FIRM EVALUATION

1) Name of firm:

2) What was constructed; the estimated value and duration of the contract?

3) What was the relationship with:

   * Client?
   * Construction Manager?
   * Subcontractors?

4) Was the project documentation satisfactory?

5) Was the job completed:

   * On time?
   * Within budget?

6) Were there any claims?

7) What are/is your general impression of the company?

QUESTIONNAIRE - GOVERNMENT AGENCIES

CONSTRUCTION FIRMS EVALUATION

Agency: _____ Person Interviewed: _____

1) What is the reputation of each of the construction firms with respect to the following?

   A) Firm in general

   B) Senior management

   C) Quality of line management

   D) Field supervision and quality of work

2) Have the contractors done work for the agency previously and were these projects completed on time and within budget?

3) What were the firm's strengths?

4) What were the firm's weaknesses?

5) Was the agency supplied with the appropriate project documentation and final records?

6) What, in your opinion, should each firm try to acquire through the transfer of technology from the U.S. construction firm?

SCORING METHODOLOGY/PROCEDURES

CONSTRUCTION FIRM CAPABILITY INDEX

With the exception of Category I, Key Personnel, no explanation is required in addition to Table 8-1 to complete the rating form. The following is a description of the procedures to complete Category 1, Key Personnel of the Construction Firm Capability Index (CFCI).

Step 1 - Complete the two Questionnaires - Construction Firm, Key Personnel Background and Related Experience.

Step 2 - Complete Elements I.A.1 and I.B.1 (Education and Registration) and Elements I.A.2 and I.B.2 (Experience) of the Construction Firm Capability Index Form for both the Project Manager and the Project Site Engineer for each construction company, using the following guidelines.

Education and Registration

College or University work	6 points		
Bachelors Degree	7 points		
Masters Degree	1 point	Total = 8	
Doctors Degree	1 point	Total = 9	
Professional Registration	1 point	Total = 8, 9 or 10	
	Total maximum		10

Experience

Total years of experience after graduation 1/2 point per year up to 10 years	Maximum	5
Years of experience water and wastewater facilities 1 point per year up to 15 years	Maximum	15
Years with present firm 1 point per year up to 10 years	Maximum	10
	Total maximum	30

Step 3 - Complete the Key Personnel - Individual Assessment Rating Form. The information needed to complete this form is contained in the Questionnaire of the Key Personnel, Related Experience, together with the following guidelines.

Individual Assessment

Education: Yes = 1 point, No = 0 point
Experience: 1 point per year up to 4 years. Maximum of 4 points.
Point Average is the total number of points for education and experience divided by 2. The maximum point average is 2.5.

Element Score is the point average multiplied by the weighing factor.

Category Score: The sum of the element scores. This score should then be compared to the corresponding rating of Table 7-1, and transferred to the appropriate places in Category I, Key Personnel of the Construction Firm Capacity Index. The maximum points for each of the three subelements of Project Related experience in Category I, Key Personnel are:

Engineering	12.5 points
Project Management	37.5 points
Quality Control	55.0 points

QUESTIONNAIRE - CONSTRUCTION FIRM
KEY PERSONNEL - BACKGROUND

Name: _____

Company: _____

Position: _____

Education level (Circle): B.S. M.S. Ph.D.

Registration:

Technical specialty:

Years of construction experience:

Years of construction experience water/wastewater systems:

How long have you been with this company?

What do you feel are your strengths with regard to your job?

What do you feel are your weaknesses with regard to your job?

Have you used CPM network scheduling?

Explain:

Have you been involved in any claim issues?

Explain:

Interview comments:

Please give last project reference:

Name: Address: Phone:

Attach biodata to form.

QUESTIONNAIRE - CONSTRUCTION FIRM
KEY PERSONNEL - RELATED EXPERIENCE

Name: _____

Company: _____

Position: _____

	Education Yes/No	(Years) Experience
I. Engineering		
Civil Design		
Mechanical Design		
Electrical/Instrumentation Design		
Construction Management		
Contract Administration		
Surveying		
Cost Estimating		
II. Project Management		
General Project Management		
Schedule Control		
Cost Control		
Change Order Proposal Development		
Material Inventory Control		
Manpower Utilization Control		
Shop Drawing/Submittal Control		
Daily Project Report		
Daily Diary		
As-Built Drawings		
III. Quality Control		
Water/Wastewater Construction		
Pipeline Construction		
Concrete Strength Testing		
Formwork Construction and Reinforcement Placement		
Soils Compaction Control		
Water Stop Placement		
Equipment Operation		
Mechanical Installation		
Electrical Installation		
Instrumentation Installation		
Operation and Maintenance		

CONSTRUCTION FIRM
KEY PERSONNEL - INDIVIDUAL ASSESSMENT RATING FORM

Name: _____

Company: _____

Position: _____

	Yes/No Education	0-4 (Years) Experience	Point Ave.	Factor	Score
I. Engineering					
Civil Design				0.5	
Mechanical Design				0.5	
Electrical/Instrumentation Design				0.5	
Construction Management				1.0	
Contract Administration				1.0	
Surveying				0.5	
Cost Estimating				1.0	
				Total	
II. Project Management					
General Project Management				1.5	
Schedule Control				1.5	
Cost Control				1.5	
Change Order Proposal Development				1.5	
Material Inventory Control				1.5	
Manpower Utilization Control				1.5	
Shop Drawing/Submittal Control				1.5	
Daily Project Report				1.5	
Daily Diary				1.5	
As-Built Drawings				1.5	
				Total	
III. Quality Control					
Water/Wastewater Construction				2.0	
Pipeline Construction				2.0	
Concrete Strength Testing				2.0	
Formwork Construction and Reinforcement Placement				2.0	
Soils Compaction Control				2.0	
Water Stop Placement				2.0	
Equipment Operation				2.0	
Mechanical Installation				2.0	
Electrical Installation				2.0	
Instrumentation Installation				2.0	
Operation and Maintenance				2.0	
				Total	

APPENDIX E

GENERAL CONTRACT REQUIREMENTS FOR TECHNOLOGY TRANSFER TO CONSTRUCTION FIRMS FROM U.S. SUBCONTRACTORS

General Contract Requirements For
Technology Transfer to Construction Firms
From U.S. Subcontractors

SECTION 00120

TRANSFER OF TECHNOLOGY

PART 1 - GENERAL

1.01 Description

This section covers the requirement for a United States construction firm in the role of a subcontractor to assist the prime Jordanian Contractor through training and technology transfer. This will include the preparation for the project execution, the completion of the project and the organizational and commercial aspects of the construction industry.

1.02 Objective

The objective of technology transfer is to upgrade the capabilities of the prime Jordanian Contractor to successfully undertake and complete construction activities.

1.03 Methodology

The suggested method of technology transfer is through formal (classroom type) training, on-the-job training (OJT) and one-on-one training as opportunities present themselves.

PART 2 - PRODUCTS

2.01 General

The products of this Division shall be within but not necessarily limited to the following items and shall be used to determine compliance with contract requirements:

2.02 Bid Preparation

a. Analysis of Contract

b. Analysis of Specifications

c. Analysis of Plans

d. Quantity Take-Offs

General Contract Requirements For
Technology Transfer to Construction Firms
From U.S. Subcontractors

e. Construction Methods

f. Selection of Equipment

g. Selection of Staff

h. Project Schedule

i. Any Other Items (Guarantees - Bond - Permits - Taxes - Insurance - Letters of Credit - Etc.)

j. Subcontracting Arrangements and Contracts

k. Offshore Materials Procurement

l. Cost Estimate

m. Financing Plan

n. Cash Flow

o. Bidding Strategies, Preparations and Procedures.

2.03 Project Execution

a. Planning and Scheduling

(1) Work Elements

(2) Personnel

(3) Materials, Local and Offshore

(4) Equipment

(5) Subcontractors

b. Initial Submittals on Bonding, Insurance Coverage, Etc.

c. Shop Drawings

d. Certified Shop Tests

e. Materials Testing

f. Material and Equipment Shipping

g. Progress Reports

h. Other Required Reports

i. Voucher Preparation and Submittals

j. Payroll

k. Cash Flow

l. Administrative Concerns (Customs-Labor)

m. Project Claims

n. Project Records

o. Occupational Safety

p. Quality Assurance

q. Equipment Installation - Factory Rep and Inspection.

2.04 Project Completion

a. As Built Drawings and Records

b. Equipment Manuals and Data

c. Operating and Maintenance Manuals

d. Spare Parts

e. Project Acceptance Procedures/Policies

f. Start-Up Period

g. Maintenance Period

h. Site Cleanup

i. Disposition of

(1) Personnel

(2) Equipment

(3) Resources

j. Claims

k. Final Payments

l. Records Completion and File

2.05 **Commercial Aspect - Construction Industry**

a. Occupational Safety

b. Overhead

c. Advertising

d. Company Planning

e. Public Relations

f. Product Improvement

g. Marketing

h. Client Contact and Relations

i. Organization Structures and Alternatives

j. Financial Records (Bookkeeping)

k. Skills Enhancement/Training

l. General Organizational Improvements

m. Certification/Licensing

n. Role of the Construction Industry

PART 3 - EXECUTION

3.01 Location of Work

The project itself, both in the office and in the field, shall be the principal location of the technology transfer. It is anticipated that virtually all the technology transfer will take place in Jordan.

3.02 Training Aids

The use of normal training aids such as text books, charts, films, chalk boards and seminar are encouraged for the more formal training programs. The Training Aids/Reference Materials shall remain with the prime Jordanian Contractor.

3.03 Training Plan

The subcontractor shall submit to the prime Jordanian Contractor a training plan which will define how and when the items listed under Part II will be provided. The training plan is due two weeks before submittal of bid.

3.04 Completion Report

At the end of the project, and not later than two weeks before substantial completion of the construction works, the subcontractor shall submit to the prime Jordanian Contractor a report including the technical material courses, lecture notes, standard forms, data, lists of suggested reference books and other material used in achieving the transfer of technology and training objectives.

PART 4 - PAYMENT

No separate payment will be made for this item.

The entire cost of the training and transfer of technology will be included in the costs of other items. This item will not be considered as an extra work item.

APPENDIX F

CURRICULUM VITAE - CONSTRUCTION SUPERVISION
PROJECT MANAGERS
AND
KEY PERSONNEL

CURRICULUM VITAE

OF

PROJECT MANAGERS

AND

RESIDENT ENGINEERS

ARABTECH CONSULTING ENGINEERS

CH2M HILL INTERNATIONAL

CONSULTING ENGINEERS

AMMAN – JORDAN
P. O. BOX 732

Ref : 501/85/6413

Date 14/9/1985

H.E. The President
Water Authority

Subject : TAFILA & MA'AN PROJECT
SUPERVISION STAFF

Dear Sir,

Reference is made to your letter of intent Ref. WA/7/2/19693 Dated 11/9/85 and in accordance with the supervision Agreement signed on Sept. 14th, 1985.

We enclose herewith the C.V. of Mr. Yousef Naji Said Abdullah who will be our Project Manager .

Mr. Abdullah will start his duties as soon as we have your approval.

Yours faithfully
ARABTECH CONSULTING ENGINEERS

I.A. Abu Ayyash

I.A. ABU AYYASH

encls:

BEST AVAILABLE DOCUMENT

146

Office Shaker Ben Zeid Street Shmaisani Tel 65297 64420 Telex 21705 Rabtec Jo Cable Address : ARBTECH - AMMAN

YOUSEF NAJI SAID ABDULLAH

POSITION	Civil Engineer - Project Manager.
DATE OF BIRTH	1940
EDUCATION	B.Sc. Civil Engineering 1969 - Cairo University.
SOCIETIES & HONORS	Member of Jordan Society of Engineers. Member of Kuwaiti Society of Engineers.

PROFESSIONAL EXPERIENCE:

May 1980-July 1985	International Contractors Group (ICG) Civil Engineer as follows: - Halab Souare to Nissour Square Road Project Baghdad - Iraq, in the capacity of Deputy Area Manager. - Baghdad Sewage Contract 1 Project, Baghdad Iraq, in the capacity of Deputy Area Manager. - Assafar Motorway Extension Project Kuwait in the capacity of Contractor Agent Representative. - Stadium and Horse Arena at King Abdulaziz Military Academy (KAMA) Project. Riyadh Saudi Arabia in the capacity of Authorized Area Manager.
October 1978-May 1980	Mohammad A. Mohsin Al-Kharafi Co. - Civil Engineer, Project Manager.
February 78-October 78	Marwa Trading and Contracting Co. - Civil Engineer in Bayan Houses Project (Buildings and Civil Works for 327 Houses).
Dec. 1976-Feb. 1978	Kuwait Foreign Trading Contracting & Investment Co. (KFTCIC), Project Engineer /Manager, Workers town project for 5000 workers. The works include about 100 residential buildings, Mosque, Power Stations, SuperMarket, all services and civil works.

BEST AVAILABLE DOCUMENT

Cont'd Yousef Abdulla .....

July 1972- Dec.1976: Ministry of Public Works Kuwait, Project Engineer/ Manager as follows:-

- Construction of Roads, stormwater, sanitary sewerage, water supply net, telephone routes and electrical ducts at Doha.
- Construction of Roads, stormwater, sanitary sewers, water supply net, telephone routes and electrical ducts at Rai Area.

Nov. 1969-July 1972 Burhan Kuwaiti Contracting Co., Site Engineer as follows:-

- Farwaniya Neighbourhood Centre Project, Clinic, Police Station, Administration, Library, SuperMarket, Cafe' ...etc.. with all civil works and services.
- Nuzha Storm Water Culverts Project. Two vents box culvert 4000 m.r. of about 25000 cum. Reinforced Concrete.
- Coastal Road Project - Fahaheel and Fintas.
- House Connections for Shamiya area and low income houses.
- Safarat (Embassies) Area Road Project. Roads S/W, S/S and other services.

BEST AVAILABLE DOCUMENT

SALTI SALIM HANNA QAQISH

POSITION	Civil Engineer
DATE OF BIRTH	1948
EDUCATION	B.SC Civil Engineering /Ain Shams University Cairo, 1974.
PROFESSIONAL TRAINING:	Training course about sewage refineries in Hangari - Budabest.
SOCIETIES & HONORS:	Menmber of Jordan Engineers Association.
PROFESSIONAL EXPERIENCE:	May 1984 - uptodate - Executive project Manager of 27floor building (in Sheick Mohammad Baqer Company). Thes building is being built in Amman near Tabarbor City.

June. 1983 - May 1984 - Project Manager of Northern and Southern Cities Projects in W.S.C and then in W.A. These projects composed of 1.Water net works
2.Sewage net works
3.W.Tanks.
4.Sewage Treatment plant.

Feb 1982 - June. 1983 Supervising Engineer and designer in his own Office.

Jan .1981 - Feb. 1982 Supervising Engineer and designer in many Offices; Osama Abu Jebara Office, Basem El'aqa office, and Abu Jebara Company office.

Mar.1980 - Jan.1981 - Manager of one part of the nine parts of Amman. (in Municipality of Amman).

Apr 1975 - Mar.1980 Executive Engineer in water supply corporation.
Project in W.S.C. -1- Water net works of cities: Salt-Eera, Yarqa, Saroot, Alook, Hashemeia, Yajooz, Omel Basatin, Qastal, Hossaineiah, Aqaba, Dissi, Homaima, Abu Hammor, Theban, Carandal, Ma'an, Orq Ellolo, Balama, Ain El'deek, Ajloon, Ain El'[illegible]s, Eldlail, Azrak, H4, Elaqeb, Zatany, Zay, Yazeede'eh, Samad Ras Munif, And Beqaa.
-2- Water tanks - Elevated and ground tanks of all the cities mentioned before.
-3- Water pump stations of all the cities mentioned before.

Feb.1975 - Apr. 1975 Engineer under Training in Ministry of public works. Supervising buildings.

HF

BURYL T. GLASSER

EDUCATION

B.S. Civil Engineering, University of Wyoming
Graduate studies soil mechanics, Harvard University

SPECIALTIES

Construction Management--Construction Supervision * Water and Wastewater Treatment * Water Distribution * Sewage Collection * Pump Stations * Storm Drainage * Spillways and Outlet Works * Earthfill Dams and Dikes * Irrigation Canals * Bridges * Commercial Buildings * Contract Administration * Cost Estimates * Scheduling

EXPERIENCE: International

Construction Engineer Consultant, PRC/Engineering Consultants International, Englewood, Colorado (September 1982 to December 1984). Assigned as consultant to the Government of SRI Lanka. Advised and assisted the construction personnel in the rehabilitation of a large irrigation system involving layout, function, scheduling, costing, equipment selection, and completion of construction.

Provided U.S.A.I.D. with assurance of completion and certification of the construction.

Experience: Domestic

Resident Engineer, PRC/Engineering Consultants, Inc., Englewood, Colorado (1981 to September 1982). Monitored construction of water resource projects including dams, appurtenant structures, flood control channels, and other civil works. In charge of ensuring quality control through field testing and inspection.

Consulting Engineer-Construction Management, MSM Consultants Inc., Denver, Colorado (1977-1981). Projects included sewage collection systems, water distribution systems, storm drain pipe installation, (pipelines from 6-inch to 90-inch diameter), concrete and steel water storage tanks, water and wastewater treatment plants, (three wastewater treatment plants of 1,892.5 cubic meter/day each), as well as bridges, canals, siphons, and industrial buildings. Duties included, working with architects and engineers during design; conducting design reviews for construction feasibility; setting up schedules; reviewing estimates, and subcontracts. Mr. Glasser also supervised project engineers; consulted with architects, engineers, and project engineers in problem solving, contract administration, and contract negotiations

150

during construction phase. Consulted with clients and maintained high client relationships. Supervised final acceptance of all projects.

Resident Engineer, U.S. Army Corps of Engineers, Denver, Colorado (1967-1977). Supervised the construction of two major earthfilled dams with concrete spillways and outlet works. The dams are located within a large metropolitan area and required close coordination with state and local entities during relocations of water and wastewater facilities, highways, irrigation canals, railroads, and residential areas. Supervised a $1.9 million debris removal operation in conjunction with the Big Thompson River flood between Estes Park and Loveland, Colorado.

Assistant Resident Engineer and Construction Engineer, U.S. Army Corps of Engineers (1961-1967). In charge of monitoring quality of construction for a 800-megawatt powerhouse and for a multipurpose dam spillway. Administered the contract on the spillway earthwork and relocations of a major multi-purpose dam. Also in charge of monitoring construction of highways, irrigation canals, and pump stations, and for the construction of two new townsites which included a 378.5 cubic meter/day wastewater treatment plant as well as other water and wastewater facilities.

Resident Construction Engineer, U.S. Army Corps of Engineers (1958-1961). In charge of building a military base. Responsible for monitoring quality of construction for major buildings, site work, and utilities.

Design Engineer, U.S. Army Corps of Engineers (1954-1958). Involved in various engineering assignments including design of dam project structures, and site-related support facilities.

* * * * *

Professional Registration:

Civil Engineer: Iowa

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DEC 19 85 0331 +
=21705 RABTEC JO

CH2M COVS
DEC. 17, 1985
A210.A4
TO: RABTEC/JORDAN
FROM: IRVING, BILLMAN, LASRAMI
COPY: PAULA RYAN/FDA

YESTERDAY'S TELEX CONCERNING DURYL GLASSER FAILED TO INCLUDE HIS WATER AND WASTEWATER EXPERIENCE. THE CERTIFIED EXPERIENCE RECORD AMENDED AS FOLLOWS, INCLUDES THIS ADDITIONAL INFORMATION.

DATE	PLACE	JOB TITLE	FIRM
6-54 TO 6-55	VICKSBURG, MISSISSIPPI	HYDRAULIC RESEARCH ENGINEER	U.S. ARMY CORPS OF ENGINEERS
6-55 TO 3-58	OMAHA, NEBRASKA	STRUCTURAL DESIGN ENGINEER	U.S. ARMY CORPS OF ENGINEERS
3-58 TO 8-61	CHEYENNE, WYOMING	RESIDENT CONSTRUCTION ENGINEER, MISSILE WORK	U.S. ARMY CORPS OF ENGINEERS
8-61 TO 8-67	CHAMBERLAIN, S. DAKOTA	ASSISTANT RESIDENT ENGINEER- MAJOR MULTIPURPOSE DAM, WASTEWATER PLANT, WATER SYSTEM RELOCATION WORK.	U.S. ARMY CORPS OF ENGINERS
8-67 TO	DENVER, COLORADO	RESIDENT CONSTRUCTION ENGINEER DAMS AND WATER AND WASTEWATER FACILITY RELOCATIONS.	U.S. ARMY CORPS OF ENGINEERS
2-77 TO 4-81	DENVER, COLORADO	CONSTRUCTION MANAGEMENT ENGINEER, LAND DEVELOPMENT PROJECTS INCLUDING WASTEWATER TREATMENT, STORM COLLECTION AND DRAINAGE.	PRIVATE CONSULTING FIRM--MSM CONSULTANTS INC.
4-81 TO 12-81	DENVER, COLORADO	PRIVATE CONSULTANT BUILDING CONSTRUCTION	SELF-EMPLOYED
12-81 TO 9-82	PARACHUTE, COLORADO	RESIDENT ENGINEER DAMS AND WATER CONTROL FACILITIES.	PRIVATE CONSULTING FIRM--PRC ENGINEERING INTERNATIONAL
9-82 TO 12-84	SRI LANKA	CONSTRUCTION ENGINEER CONSULTANT FOR THE THE GOVERNMENT OF SRI LANKA, IRRIGATION DEPARTMENT- PIPELINES, DAMS, AND WATER CONTROL STRUCTURES.	PRIVATE CONSULTING FIRM--PRC ENGINEERING INTERNATIONAL
1-85 TO PRESENT	DENVER, COLORADO	CONSTRUCTION ENGINEER-- LEVEL OF ASSISTANT AWAITING NEW ASSIGNMENT	PRC ENGINEERING INTERNATIONAL

HE HAS ALSO CERTIFIED THAT THE FOLLOWING INFORMATION IS TRUE.

DATE OF BIRTH: MARCH 31, 1935
PLACE OF BIRTH: LITTLE SIOUX, IOWA
DATE OF COLLEGE GRADUATION: JUNE 7, 1954
SCHOOL GRADUATED FROM: UNIVERSITY OF WYOMING

WE REALIZE THAT YOU HAVE REQUESTED CERTIFICATES WHICH WILL FOLLOW, HOWEVER IT WILL TAKE TIME TO GET THEM FROM THE APPROPRIATE SOURCES AND HAVE THEM NOTORIZED. IN THE MEANTIME, WE THOUGHT THIS TELEX MAY BE HELPFUL. WE WILL SEND THE NOTORIZED CERTIFICATES AS SOON AS WE RECEIVE THEM IN OUR OFFICE.

+
=21705 RABTEC JO.....
ABOVE VIA ITT DEC 17 1985 2030
PLEASE REPLY TO CH2M COVS VIA ITT USA ACCESS CODE 0230

152

CURRICULUM VITAE

OF

PROJECT MANAGERS

AND

RESIDENT ENGINEERS

CONSULTING ENGINEERING CENTER

BLACK AND VEATCH INTERNATIONAL

153

C.E.C.

Consulting Engineering Center

مركز الإستشارات الهندسية

Projects Manager
Projects Dept.
Water Authority
Amman - Jordan

Ref.: 25/14 18.9.1985

Subject: Madaba & Karak Water & Wastewater Projects Supervision Project Manager

Dear Sir,

Enclosed are the CV's for four engineers nominated for the rank of Project Manager for the above mentioned projects. The four engineers are:

1. Moein Sha'er - 16 years
2. Lutfi Hallaq - 13 years
3. Ali Hatamleh - 11 years
4. Samih Abu Sheikha - 13 years

You are kindly requested to nominate one of the above mentioned engineers as a Project Manager as soon as possible so that we can continue our supervision work.

Yours sincerely,

A. Sajdi

Aziz Abdo Sajdi
President
CEC.

154

مكتب الاستشارات الهندسية
عمان
ص.ب ٨١٨٠١
تلفون ٦٦١٢٥١
CONSULTING ENGINEER

B I O D A T A

NAME : LUTFI BAKER YOUSEF HALLAK

DEGREE : M.Sc. IN TRAFFIC HIGHWAY ENGINEERING
UNIVERSITY OF STRATHCLYDE -U.K. (1974)
B.Sc. Mousel University-Iraq (1972)

DATE : JULY 1974 - AUGUST 1975

EMPLOYER : W.S. ATKINS PARTNERS - ENGLAND

TITLE : DESIGN ENGINEER

WORK : During this period I worked as a design engineer at the Highways & Bridges Division of the above British Firm , during which I worked in the design of contract No. 4 of M11 (London - Cambridge Highway) including roadworks, bridges , storm water drainage.

DATE : SEPT. 1975 - OCT. 1977

EMPLOYER : AL-JAZIRAH AL-ARABIA EST.
SAUDI ARABIA

TITLE : PROJECT MANAGER

WORK : During this period I worked as a project manager of Al-Hafair Road of 3.5 Km. long, 35m. wide in Macca . Later on I worked as a project manager of the saintary drainage of Muna area in Macca using 20 cm.,30cm P.V.C pipes with 7 Km. length which ends at the sewage treatment plant .After which I worked as a site engineer of Al-Biah Mosque water reservoirs . which consist of two R.C. reservoirs , each of a capacity of 12000 m^3 of water with a pumping station to pump the water from the lower reservoir to the upper reservoir.

DATE : OCT. 1977 - NOV. 1978

EMPLOYER : CONSOLIDATED CONTRACTOR COMPANY (C.C.C.)
SAUDI ARABIA - JEDDAH

TITLE : SITE ENGINEER

WORK : During this period IO worked as a site engineer in Jeddah 3 Desalination and Power Plant project which is an industrial project with a cost of more than 2000 million of S.R. In this project I was in charge of constructing the Control Room Buildings as well as the 380 Kv. switching station of this project beside the necessary network of storm water drainage, sewarage network , fire resistance network.

DATE : NOV. 1978 - MARCH 1983

EMPLOYER : ENGINEERING PROJECTS ESTABLISHMENT (E.P.E.)

TITLE : SITE ENGINEER

WORK : During this period I worked in East Jeddah Airport Road (Interchanges 8 & 10 A) with a cost ofmore than 350 million of S.R. including roadworks , bridges , stormwater drainage , electrical lighting . After which I worked for the last three years in Sharafia and Al-Sitten viaduct which is a 5 Km. dual carriageway bridge in addition to the necessary ramps , stormwater drainage , sewarage network , electrical lighing and landscaping . This project has a cost of more than 600 million of S.R.

DATE : MAY 1984 - F.B. 1984

EMPLOYER : HETTIN GENERAL CONTRACTING COMPANY - JORDAN

TITLE : PROJECT MANAGER

WORK : During this period I worked with the above mentioned company at ajouz - Sweileh road with 40 m. width , 3Km. long with estimated cost of 4[illegible] thousand Jordan Dinars.

DATE : APRIL 1984 - PRESEN

EMPLOYER : CONSULTING ENGINEERING CENTER (C.E.C)-JORDAN

TITLE : PROJECT MANAGER

WORK : Supervising the Construction of Sweileh Interchange which consists of a bridge , tunnel and the necessary ramps. service roads , storm water drainage , with an estimated cost of 3 million Jordan Dinars .

156

MALCOLM ROSS LEITCH
CONSTRUCTION PROJECT MANAGER

EDUCATION: Berwickshire High School, Scotland, Science Courses, 1937-1943
B.S., Civil Engineering, St. Andrews University, Scotland, 1946

PROFESSIONAL QUALIFICATIONS: Registered Professional Engineer: Province of British Columbia, Canada

LANGUAGE(S): English, French

CITIZENSHIP: Canadian

PROFESSIONAL EXPERIENCE:

1985 Senior Resident Engineer - Black & Veatch International

Principal representative of the Project Director in charge of supervision of construction of new and rehabilitation of old wastewater pumping stations, force mains, gravity sewers, culverts, and treatment works for Greater Cairo, Egypt. Rehabilitation works approximate $50,000,000 and new works approximate $80,000,000.

1985 Project Engineer - Parsons-Daniel Joint Venture, King Abdulaziz International Airport (KAIA), Jeddah, Saudi Arabia

Construction Manager's field representative on major rehabilitation works at King Abdulaziz International Airport, such as those on the Haj Terminal pylon basis, on the Control Tower Base Building, and on the South Terminal Building.

1983-1985 General Manager of Construction - Parsons-Daniel Joint Venture, King Abdulaziz International Airport (KAIA), Jeddah, Saudi Arabia

Principal representative of the Project Director with prime contractors, designers, government contractors, and suppliers involved with the project and with the airport operating authority. Responsible for overall project coordination between the client, the designers, and the construction contractors by initiating and following up on the action required to ensure smooth development of the project from conception to completion Coordinated necessary support for construction from the operations support departments of the construction management organization. Managed Construction Department staff of 37 expatriates and 12 TCN's. Ongoing project value at time of appointment as General Manager of Construction +/- US $150,000,000.

1980-1983 Project Manager - Black & Veatch International

In charge of supervision of construction of a grain handling facility in the Port of Alexandria, Egypt; also of a tallows, oils, and fats terminal in the same area, both projects being USAID-funded, and constructed to US standards.

The grain handling facility involved concrete foundation work, the erection of 50 bolted steel storage tanks and bagging bins, screw and drag conveyors, and related steel erection. Construction by Egyptian contractor.

The tallows, oils, and fats terminal project, built by a US construction company, involved soils densification by the drop weight method, tank erection, and pipelines installation together with building construction. Project value is approximately $30,000,000.

1977-1980 Construction Manager - Tippetts-Abbett-McCarthy-Stratton, New York, USA

Advisor to the Resident Engineer and site inspection staff of the Ministry of Development and New Communities on all phases of civil construction of the Ahmed Hamdy Tunnel Project, Suez, Egypt.

This work involved tunnel driving (by shield), surface building construction for ventilation buildings, and other associated structures, together with a considerable amount of precast concrete construction.

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B23A31

PROFESSIONAL
EXPERIENCE (Continued)

1975-1976 Chief of Marine Operations - Ralph M. Parsons Company, Pasadena, USA

Resident supervisor on construction of a new port at Bethioua, Algeria, involving dredging, piling, precast concrete construction and installation, and insitu concrete construction.

1974-1975 Resident Engineer - Tippetts-Abbett-McCarthy-Stratton, New York, USA

Supervised field studies concerning preparation of Master Plan and design of industrial and commercial port complex east of Algiers, Algeria, consisting of 6 km long breakwater, berthing facilities for large tankers, LNG carriers, container ships, general, and bulk cargo vessels. Carried out liaison work between field, head office, and the client.

1973-1974 Powerhouse Engineer/Assistant Project Manager, International Power & Engineering Company, Canada

Supervised inspection staff on construction of powerhouse, penstocks, and ancillary works for Kootenay Canal Project, British Columbia, Canada.

1969-1972 Assistant Construction Manager - Wright Engineers, Ltd., Vancouver, Canada

In charge of coordination of construction inspection for earthwork, concrete construction, structural steel erection, and equipment installation for iron ore concentrator and pelletising plant in Morocco.

1968-1969 Resident Engineer - Tippetts-Abbett-McCarthy-Stratton, New York, USA

In charge of quality control and supervision of construction of Grou Provisoire Dam, Morocco, involving 500,000 cm^3 earthwork, concrete spillway and low level outlet construction, together with steel framed pumphouse erection.

1966-1967 Resident Office Engineer - Engineering Consultants, Inc., Denver, USA

Worked on review and analysis of contractor's claims, construction scheduling, and contract administration for construction of Kremasta Hydroelectric Project in Greece.

1965-1966 Field Construction Supervisor - Engineering Consultants, Inc., Denver, USA

Employed on contract administration and job supervision of construction of concrete lined irrigation and drainage canals, box culverts, shutes, drops, and other ancillary structures in Adana, Turkey.

1964 Estimator - Mannix Co., Ltd., Calgary, Canada

Employed as concrete estimator in heavy construction division, involving bidding for dams, power developments, navigation locks, and related structures totaling some $200 million.

1960-1964 Field Office Engineer - C. E. Crippen & Associates, Ltd., Vancouver, Canada

In charge of office engineering on construction of earthfill dam, power canal, intake structure, and powerhouse for Squaw Rapids Hydroelectric Project, Saskatchewan, Canada.

In charge of preparation of progress certificates, review of contractor's claims, estimating, materials requisitioning, preparing of progress reports, "as-built" drawings, and all project correspondence.

PROFESSIONAL
EXPERIENCE (Continued)

1959	Resident Engineer - Wright Engineers, Ltd., Vancouver, Canada
	Assisted in preparation of specifications for, and later served as Resident Engineer on project involving earthwork, pile driving, road and bridge construction, and drainage installations.
1954-1958	Field Engineer and Resident Engineer - B. D. Bohna & Company, Ltd., Vancouver, Canada
	Resident Engineer on construction of steel pipe manufacturing plant. Field Engineer in charge of civil work on construction of small oil refinery, oil pipeline, and water supply projects.
1951-1954	Site Engineer - Morrison-Knudsen Company of Canada Ltd., Canada
	Employed on construction of underground powerhouse and 16 km tunnel for Alcan Project; layout and inspection on behalf of Contractor.
1948-1953	Site Engineer - Messrs. Holloway Bros. (London) Ltd., London, England
	Employed on construction of dry dock, sewage disposal installation, deepwater quay construction in the United Kingdom, and on building construction on Bahrain Island.
1946-1948	Second Lieutenant, Corps of Royal Engineers, British Army
	General duties in Great Britain and construction supervision in Egypt and Kenya.

CURRICULUM VITAE

OF

PROJECT MANAGERS

AND

RESIDENT ENGINEERS

JOUZY AND PARTNERS CONSULTING ENGINEERING BUREAU

ENGINEERING-SCIENCE, INC.

APPENDIX G

ORGANIZATION CHARTS - CONSTRUCTION FIRMS

ORGANIZATION STAFF

HADDAD ENGINEERING & CONTRACTING CO.

TAFILA WATER DISTRIBUTION AND WASTEWATER SYSTEM (T-2)

Engineer Ghassan Haddad	Owner
Engineer George Billeh	General Manager
Engineer Bishara Ghawi	Project Manager
Engineer Mahmoud Abdella	Resident Site Engineer
Engineer Akram Sonna	Resident Site Engineer

ORGANIZATION STAFF

HADDAD ENGINEERING & CONTRACTING CO.

KARAK TUNNEL CONTRACT (K-3)

Engineer Ghassan Haddad	Project Director and Owner
Engineer George Billeh	Project Manager
Engineer Rhett Leary	Project Advisor
Engineer Akram Sonna'	Site Engineer
Mr. Fawzi Jambely	Surveyor
Mr. Ahmad Mansour	General Foreman
Mr. Ibrahim Shenair	Safety Engineer

ORGANIZATION STAFF

MADANAT CONTRACTING CO.

KARAK WASTEWATER SYSTEM (K-2)

Engineer Fayez Madanat	Project Director
Engineer Usama Haddadin	Project Manager
Engineer Jasem Abu Ellil	Site Engineer
Engineer Nayef Nawaiseh	Senior Site Engineer
Mr. Ismael Assaf	Laboratory Technician
Mr. Ibrahim Al-Machini	Surveyor
Mr. Azzam Mahmoud	Surveyor
Mr. Yousef Hussein	Surveyor
Mr. Ayyoub Suleiman	General Foreman
Mr. Ahmad Rashid	Foreman
Mr. Samih Bayyoud	Foreman
Mr. R. Sing	Mechanic
Mr. Abdul Hadi Alrajabi	Mechanic

ORGANIZATION STAFF

TRANS ORIENT ENGINEERING & CONTRACTING CO. LTD.

KARAK WASTEWATER TREATMENT PLANT (K-1)

Engineer Hassan Talhoni	Main Office Coordinator
Engineer Suhail Younis	Project Manager
Mr. Mohan Lal Sharma	Superintendent
Engineer Deia' Mobaydeen	Construction Manager
Engineer Mohammad Nabahani	Quality Control Engineer
Mr. Abed El-Majeed Tarawneh	Administration Manager
Mr. Moh'd Badar Moh'd	General Foreman
Mr. Abed El-Hadi Tarawneh	Surveyor
Mr. Nayel Haddaden	Laboratory Technician

ORGANIZATION STAFF

SINIMMAR ENGINEERING AND CONTRACTING

TAFILA WASTEWATER TREATMENT PLANT (T-1)

Engineer Nabil I. Haddadin	Partner
Engineer Na'im Y. Tu'Mah	General Manager
Engineer Abad N. Sahhar	Project Manager
Engineer Amad Auqlah	Resident Site Engineer

APPENDIX H

CURRICULUM VITAE - CONSTRUCTION FIRM PROJECT MANAGERS

TROCON-TRANS ORIENT ENGINEERING & CONTRACTING CO. LTD.

P O Box 2079 Amman-Jordan
Tel 672392 672311 672188
Telex 21893

K-1

Our Ref: M42/194/86

20th February, 1986

Messrs.
Consulting Engineering Center
P.O.Box 9180
Amman - Jordan

22 FEB 1986

Subject: KARAK WASTEWATER TREATMENT PLANT CONTRACT 1
PROJECT MANAGER

Dear Sirs,

Please find attached for your kind approval, a copy of Mr. Suheil Younis' Resumé, our nomination for the post of Project Manager for the above mentioned project.

Yours faithfully,

HASSAN TAHOUNI

Encls.

168

C.V.

K-1

Name : Suhail A.Q. YOUNIS

Status : Married with one child

Education :

1971	Tawjeehi Sientific, Yamamah Secondary School Riyadh, SAUDI ARABIA				
1972	G.C.E. "O" Level Add. Maths. Weston-S-Mare Tech. College U.K.				
1972	=	"A"	=	Pure&Applied Maths.	= =
1973	=	=	=	Applied Maths.	= =
1973	=	=	=	Pure Maths.	= =
1973	=	=	=	Physics	= =
1973	O.N.C.	02		Engineering	= =
1977	B.Sc.			Civil Engineering University College of SWANSEA, U.K.	

Hobies:

Travelling around the world,&observing at first hand different cultures.

Sports, squash & swimming.

Experience:

1977-1979

Company : Modern Arab Construction Co. Ltd. (M A C).

Project : Riyadh, 450 M.W. Substation, Saudi Arabia.

Value : 30 M.Saudi Riyals, for civil works.

Owner : Riyadh Electric Company & Suburbs (R E C S).

Contractor: Mitsubishi Electric Co. (MELCO).

Sub-Cont. : MAC for civil works.

Duties : Site Eng. in charge of 3 substation.This project isfor different sizes of Sub-stations atdifferent locations around Riyadh City.

Each S/S consists of housing rooms for 450 MW transformers, switch gears& control rooms, acompositesteel, conc., conc. blockwork structure.
Site supervision on formwork, rebar. bending and installation, and steel structure errection.

1979-1980

Company : MAC in London office, U.K.

Project : AL-Khobar II Power Desalination Plant, Saudi Arabia.

Value : One Billion $, turn key contract.

Owner : Saline Water Conversion Corporation, Saudi Arabia.

Consultant: Fichtner Consulting Eng., West Germany.

Contractor: Multi National Consortium, where MAC & Hayundi a joint venture member for civil works.
MAC portion, the Non Tech. Area (NTA), is a combination of structures, that is part of the plant, they varried in function & design consept.
The structures are, Administration two storey bldg., Restaurant, Mosque, Training Simulator, Workshop & maintenance, Social, Coverd Parking Areas, and Road Works.

Duties : Preparation of preliminary design, drawings, and bid backages for different materials, equipment suppliers.
Co-ordination for NTA between Consortium members, The Engineer & MAC.
Preparation for site mobilisation and required resources.

1980-1983

Company : MAC AL-Khobar site office, Saudi Arabia.

Project : Same A/M Project.

Duties : In charge of site mobilisation, setting out of different stuctures, and supervision of Vibro-floatation work for soil stabilasation under each structure.
Project Eng, in charge of general co-ordination for elect.-mech., with civil works, between MAC & Consortium members, and obtaining approvals from the Client.

1983

Company : MAC
Project : Saffaniyah Gas Gathering Plant, Saudi Arabia.
Owner : ARAMCO , Saudi Arabia.
Consultant: Flour Arabia, Saudi Arabia.
Contractor: MAC for civil & mechanical errection.
Duties : Project Eng. in charge of concrete pavements, in co-ordination with burried elect.& mech. works, prior to start of execution in the form of backfill, excavation, formwork, and casting concrete as well as quality controls in line with the construction schedule.

1984-1985

Company : Mubarak & Tukan Eng. Cont. Co.(MTCO), Jordan.
Project : Irbid Waste Water Treatment Facility I.
Owner : Water Authority, Jordan.
Consultant: Weston Consulting Engineers, U.S.A.
Contractor: Sam P. Wallace, U.S.A.
Value : 2.5 M. Jordan Dinars, for civil works.
Subcont. : MTCO for civil works.
Duties : In charge of shop drawings for 5 months, in preparation of construction details, bar bending schedules, design & ordering formwork system, and preparation for site mobilisation.

Project Eng.in charge of site mobilisation, then execution of structures,from setting out, excavation,tremming. formwork, rebar fixing, and concreting.Special care was required for co-ordination of mech. embeds cast in place, with strict quality controle on final finished product,to facilitate smooth mech. installation, particuraley in circular tanks.

1985

Company : MTCO

Project : Jordan Valley Irrigation Project Stage II, a 14.5 Km.canal extention,with irrigation network.

Owner : Jordan Valley Authority, Jordan.

Consultant: Dar AL-Handessah, Lebanon.

Contractor: Joseph Reiple, West Germany.

Sub-Cont. : MTCO

Value : 9 M Jordan Dinar.

Duties : Section Eng. in charge of civil structures along the main canal,like pumping stations, check struct.,syphon spillway, boxculverts, and road crossings.

Adress; C/O AL-Jawhari Co.
P.O.Box 9690
AMMAN
JORDAN.
Tel;Amman { 818358. / 816207 }

K2

CONTRACTING CO.
818901 / 2 P. O. Box 902
Jabal Amman 7 Circle
AMMAN — JORDAN

شركة مدانات للتعهدات
٨١٨٩٠١ / ٢ ☎ ٩٠٢ ✉
جبل عمان / الدوار السابع
عمان - الاردن

التاريخ 12 / 11 / 1985

REF : 6 / K2 / 85

MESSRS : CONSULTING ENG. CENTERE ,

AMMAN ,

SUBJECT: KARAK CONTRACT KA 2

Dear Sir,

We would like to recommend most strongly , Eng. USAMAH HADADIN as our project manager for contract KA2 , eventhough he only has six years experience,and thats for the following reasons :

1- All his years of experience are in the field of sewers, two years with the water Authority and four years with our company .

2- He managed some of the most sensible projects very successfully, like for example Marj Al Hamam Storm Water .

3- He was the project manager for Karak water network (under finishing) for which he is familiar with every aspect of work in the city of Karak .

4- Because of our high confidence in Eng. USAMAH , HE will be fully authorized for all and any matter concerning the project .

Sincerely Yours,

FAYEZ MADANAT

F. Madanat

MADANAT CONTRACTING CO.
TEL 818901 / 2 . P.O. BOX 902
JABAL AMMAN 7 CIRCLE
AMMAN / JORDAN

Book No. 13 Serial No. XD 646

K-2

University of Engineering and Technology

Lahore

FACULTY OF ENGINEERING

PROVISIONAL CERTIFICATE

This is to certify that Mr. OSAMA MOUSA KHALAF HADDADIN

son of Mr. MOUSA KHALAF HADDADIN *Registered No.* 75-Civil-190

has passed the B. Sc. Examination in CIVIL

Engineering under the Semester System during the Session 1975-79

in the FIRST. *Division.*

While at this University his Conduct was good.

Lahore

Dated 12-7- 1980.

Dean 3/9/80
Faculty of Engineering,
University of Engineering and Technology,
LAHORE

A transcript of complete Academic Record is issued separately.

(NOTE : THIS PROVISIONAL CERTIFICATE IS ISSUED ERRORS AND OMISSIONS EXCEPTED AND DOES NOT BY ITSELF CONFER ANY RIGHT OR PRIVILEGE FOR ADMISSION TO THE DEGREE)

174

K-2

بسم الله الرحمن الرحيم

سلطة المياه

WATER AUTHORITY

المملكة الاردنية الهاشمية

The Hashemite Kingdom of Jordan

٢٦١٥٢

Ref. | Date التاريخ ١٤٠٦/٣/ ١٩٨٥/١١/ | الرقم ب/ ٧٣٠ /

لمن يهمه الامر

تشهد سلطة المياه أن السيد/ اسامه موسى خليل حدادين قد عمل لديها بوظيفة مهندس مدني اعتباراً من تاريخ ١٧/٨/١٩٨٠ ، ثم نقل ليعمل مشرفاً على قسم مجاري مياه الامطار بتاريخ ١١/٢/١٩٨٢ ولغاية ٢٩/٨/١٩٨٢ حيث استقال من العمل .

وبناء على طلبه اعطيت له هذه الشهادة

واقبلوا الاحترام

الامين العام

المهندس محمود التلهوني

م ح / ١٧

Tel. 666111 - 666117
P. O. Box 2412 - 5012
TLX. 22439 WAJ - JO
العنوان البرقي – المياه
Cable / WATER JO
Amman
هاتف ٦٦٦١١١ – ٦٦٦١١٧
ص.ب ٢٤١٢ – ٥٠١٢ – عمان

175

شركة خداد للهندسة والتعهدات

HADDAD ENGINEERING & CONTRACTING CO.

P.O. Box 9909
Cable : HADDAD
Tel 662040
Telex : 21970 Fcodco Jo
Amman - Jordan

ص.ب ٩٩٠٩
برقياً : حداد
تلفون ٦٦٢٠٤٠
تلكس ٢١٩٧٠ فودكو
عمان - الاردن

Date 4/2/1986

No HD/21/86

التاريخ

الرقم

Consulting Engineering Center
P.O. Box 8180
Amman - Jordan

Reference : Karak Tunnel. (Contract KA3)
Subject : Project Manager.

Dear Sirs,

We Kindly inform you that Eng. George Billeh will be our project manager for the above said project.

We enclose for your approval his experience certificate.

We remain .

Sincerely Yours

HADDAD ENGINEERING & CONTRACTING CO.

عمان - الاردن
HADDAD ENG & CONT CO

GEORGE BILLEH
K-3

بسم الله الرحمن الرحيم

شركة مناجم الفوسفات الأردنية المساهمة المحدودة

عمان - الأردن

شهادة خدمة

إلى من يهمه الأمر

تشهد شركة مناجم الفوسفات الأردنية المساهمة المحدودة

بأن السيد جورج يعقوب بلـــــه

قد التحق بخدمتها بتاريخ ١/ ٨/ ١٩٦٤ واشغل الوظائف التالية :

١ ـ مهندس تعدين اعتبارا من ١/ ٨/ ١٩٦٤ (٢) رئيس شعبة التعدين اعتبارا من ٢٤/ ٩/ ٦٨
٣ ـ رئيس قسم دراسات التعدين اعتبارا من ٢/ ٢/ ١٩٧٦ (٤) مدير مشروع منجم الوادي الابيض
اعتبارا من ١٠/ ٨/ ١٩٧٦ (٥) مدير مشاريع بالوكاله بالاضافه لعمله مدير مشروع الوادي الابيض
اعتبارا من ١٧/ ٧/ ١٩٧٧ (٦) مدير المشاريع للشركه اعتبارا من ١/ ٧/ ١٩٨١ .

وقد انتهت خدماته في الشركة بتاريخ ١/ ٨/ ١٩٨٢ للأسباب التالية :

لاستقالته بناء على طلبـــــه .

PHOSPHATE

عن شركة مناجم الفوسفات الأردنية المساهمة المحدودة

T-1

arabtech
CONSULTING ENGINEERS

AMMAN – JORDAN
P. O. BOX 7323

Ref :501H/T1/85/7092. ...

Date 27/3/1986

المملكة الاردنية الهاشمية
سلطة المياه - دائرة المشاريع
الديوان
٢٧ آذار ١٩٨٦
الرقم المتسلسل
رقم الملف

Director of Projects Department
Water Authority of Jordan
Amman - Jordan

Subject: TAFILA WASTEWATER TREATMENT PLANT
CONTRACT T1- ASSIGNMENT OF PROJECT
MANAGER

Dear sir,

Please find enclosed the CV of Mr. Abed N. Sahhar submitted by the Contractor for your approval to be assigned as the Contractor's P.M. We recommend to accept him as Project Manager for the above mentioned Contract .

Yours faithfully,
ARABTECH CONSULTING ENGINEERS

Yousef N. Abdalla

cc: Resident Eng. (Tafila)
Arabtech H/O
File

Encls:-

Office : Shalan Bin Zaid Street Shmeisani Tel 65207/8/9 Telex : 21705 Wahaba Jo Cable Address : ARBTECH - AMMAN

ABED N. SAHHAR

Mechanical Engineer.

EXPERIENCE.

Present :- ASIA CONTRACTING COMPANY.

Projects Manager Sewage Networks for Zarka, Wastewater Treatment Plants for cities of Ma'an and Madaba.

1984-1985 JOUZY AND PARTNERS CONSULTING ENGINEERING BUREAU.

Mechanical Engineer in charge of all Mechanical Projects of the firm.

1983-1984 ARABTECH CONSULTING ENGINEER AMMAN, JORDAN IN ASSOCIATION WITH CH2 MCHILL CONSULTING ENGINEERS NEWPORT OREGON U.S.A.

Sewage Treatment process and mechanical design of different components of plants and controls of various operations.

1982-1983 ASIA CONTRACTING COMPANY

Site Engineer responsible for sewage projects of the Company.

1969-1981 AMMAN WATER SEWAGE AUTHORITY

Manager of Amman Sewage Treatment Plant

1964-1969 MUNICIPALITY OF AMMAN

Mechanical Engineering in General Municipality Equipment, Water Projects, Sewage treatment plant, Head of the Mechanical Department.

1963-1964 UNITED NATIONS RELIEF WORLD AGENCY

Mechanical Engineer responsible for all mechanical projects of the Agency.

1960-1963 LYNCH CORPORATION INDIANA, U.S.A.

Project Engineer in design, research and development of automatic machines for packaging.

ABED N. SAHHAR

1959-1960

ALLIED CHEMICAL CORPORATION
NEW YORK. U.S.A.

Mechanical Engineer for the design and orperation of different equipments used in chemical plants and automatic controls of plant operations.

EDUCATION.

London University - General Certificate of Education 1952 Purdue University B.S. Mechanical 1959 West Lafayette Indiana U.S.A.

Special training in tratment plants operation and managment 1966 - 1967 in Sweden.

SOCIETIES.

Pi Tau Sigma Mechnical Honorary Jordan Engineering Society.

ADDRESS.

P.O. BOX (950263) AMMAN.

PHONE. (813709).

T-2

شركة حداد للهندسة والتعهدات

HADDAD ENGINEERING & CONTRACTING CO.

P. O. Box 9909
Cable : HADDAD
Tel. 662040
Telex : 21970 Fcodco Jo
Amman - Jordan

ص.ب ٩٩٠٩
برقياً : حداد
تلفون ٦٦٢٠٤٠
تلكس ٢١٩٧٠ فودكو
عمان - الاردن

٢٢٦
١٣/٤/٨٦

Date APRIL 13th, 1986 التاريخ

No HD/69/86 الرقم

PROJECT DIRECTOR,
ARABTECH CONSULTING ENGINEERS,
P.O.BOX 7323,
AMMAN JORDAN

REF: TAFILA WATER DIST. & SEWAGE COLL. SYSTEM

SUB: Project Manager And Surveyor C.V.s.

Dear Sirs,

Due to the resignation of our project manager Mr. H. Ojeilat from 14/4/1986. We have appointed Mr. Bishara Ghawi as project manager.

Also we have appointed Mr. Yahya Mohammad Okasheh as the chief surveyor.

We enclose herewith their C.V.s. for your approval.

We remain.

SINCERELY YOURS,
HADDAD ENG. & CONT. CO.

(١) [illegible]
(٢) [illegible]

BIO - DATA

ENGINEER BISHARA NIMER HABIB GHAWI

SAUDI ARABIA

T-2

From: 18/1/1979
to : 14/1/1983

I joined Mohamed Abdulmohsin Al Kherafi Establishment Riyadh, Saudi Arabia, in the capacity of Project Engineer for the Project of Minor Sewers and House Connections of the City of Riyadh, Contract No. 603-01-C7 and the two projects of Storm Drainage System of the City of Riyadh, Contracts 602-1-C4 and 602-2-C3.

The first Project included installation of about 117 kilometers main and subline of Vitrified Clay pipes upto 800mm diameter and 900 mm dia of Fiberglass reinforced pipes, House Connections of UPVC Pipes 150/200 mm dia, demolishing and backfilling, restoration, asphalting, installation of Manholes and Cleanouts, Concrete works etc.

The other two Storm Projects C3/C4 included about 9 kilometers normal and closed Box channel Sections sizes of 100 x 100 cms upto 195 x 325 cms, installation of about 36 kilometers of Abesto-Cement Pipes diameters 300 upto 800 mm, demolishing and backfilling, restoration, asphalting, installation of manholes, and catch basins and Concrete works.

Total value of the forementioned 3 projects was over 328 million Saudi Riyals.

From: 15/1/1983
To : 30/6/1984 (Date of my resignation)

I was appointed in the capacity of Project Manager for the Project of Improvement and Beautification of the City of Tabuk(Second Phase) which included the works of Rock and Earth Excavation, levelling, compacting, asphalting, fixing curbstone and tiles for pavements, construction of sheds covered with marble and Granite, Parks for Garden Areas, Flower basins and Water Fountains, Electrical and Mechanical Works for lighting and Traffic Signals and Signs and other works of Road and Town beautification nature. The total value of the Project was about 120 million Saudi Riyals.

..../2

JORDAN AND THE UNITED KINGDOM

1977 - 1979

I was appointed in the capacity of Director of Buildings Department at the Ministry of Health and incharge of Planning for preparing the requirements of Buildings for the Ministry, the structural requirements of the new buildings, studying and approving the designs, acting as the liason Officer between the Ministry of Health and the Ministry of Public Works, followup the Five Years Plan of the Ministry of Health, supervising the construction of new buildings, preparing the specifications for maintenance tenders etc.

1974 - 1977

Proceeded with the duties at the Ministry of Health after having completed a Postgraduate course in Health Facility Planning at the Polytechnic of North London and been awarded the Diploma of the Council for National Academic Awards in July, 1973.

1972 - 1974

I was delegated to the United Kingdom on a mission to complete a Postgraduate Course in Health Facility Planning. During my stay in U.K., after being awarded the Council's Diploma, I joined Messrs Donald A. Goldfinch Associates and worked in the Hospital Consultant Practice for the months of August and September 1973 and was engaged upon the preparation of designs for General Hospitals in Kuwait.

1968 - 1972

I joined the Ministry of Health in the capacity of Maintenance Engineer, incharge of the Buildings of the Ministry of Health in the Kingdom of Jordan and responsible for the maintenance extension and organizing the Ashrafia Hospital.

Education & Professional Qualifications.

- Awarded the Diploma in Architecture and Town Planning from the Sarajevo University Yugoslavia (Faculty of Architecture and Town Planning) and graduated as Diploma Engineer of Architecture on December 20th, 1967.
- Awarded the Diploma of the Polytechnic of North London in Health Facility Planning on 19th July, 1973.
- Member of the Association of Architecture Engineers in the Kingdom of Jordan.

NEAR EAST EVALUATION ABSTRACT

FILE

PROJECT TITLE(S) AND NUMBER(S)	MISSION/AID/W OFFICE
Water Systems and Services Management (278-0259)	USAID/Jordan

PROJECT DESCRIPTION To develop and improve the institutional capability of Jordanian private and public organizations in the water sector to conserve and manage water resources; and as part of that effort, extend and improve certain municipal water distribution and wastewater collection facilities.

AUTHORIZATION DATE AND U.S. LOP FUNDING AMOUNT	PES NUMBER	PES DATE	PES TYPE
8/83. $21.0 Million	85-7	2/19/86	1st interim Eva XXX Regular ☐ Other (Specify)

ABSTRACT PREPARED BY, DATE	ABSTRACT CLEARED BY, DATE	
Tancy C. Hardy Evaluation Officer	ENG:AAhmad ENG:LDonnell DD:RJohnson PRM:RBrown DIR:GGower	☐ Special ☐ Terminal

The First Interim Evaluation was conducted in March 1985 to determine the progress of Jordanian firms in developing improved capabilities to complete sanitary engineering design projects. The Water Systems and Services Management (WSSM) project places special emphasis on technology transfer by requiring that Jordanian firms be prime consultants and contractors with U.S. firms acting in the roles of subconsultants and subcontractors in the design and construction phases of the project. This evaluation was conducted near the end of the design phase to assess technology transfer from three U.S. subconsultant firms to three Jordanian consulting firms, drawing from a baseline survey conducted in February-March 1984. The evaluation team also developed baseline data for technology transfer in construction supervision, as the same three Jordanian design consultants had submitted cost proposals, negotiating discussions were underway, and these consulting firms were likely to be awarded the construction supervision contracts.

When this evaluation was undertaken, the project's design phase was nearly complete. Two of the Jordanian firms (with their two respective U.S. subconsultants) were finishing design of: water distribution systems, sewage collection and wastewater treatment facilities, and stormwater drainage systems for four cities in southern Jordan. The other Jordanian firm --- the largest of the local consulting firms --- was completing design of similar systems and facilities for six cities in northern Jordan. The U.S. personnel associated with the three American subconsultants had returned to the U.S. in early 1985.

On the basis of changes in the Overall Capability Index developed in the baseline survey for each of the three Jordanian firms, the evaluation revealed that all three firms increased their capabilities, indicating evidence of technology transfer. All had:

1. Developed or expanded their reference material libraries.

2. Acquired, or added to existing, general and technical specifications for sanitary work.

3. Acquired, or added to existing, standard details for sanitary design work.

4. Gained experience and confidence in the design of sewage treatment plants.

5. Gained greater appreciation of the needs of projects financed by international lending agencies.

184

Virtually everything that was tried to effect technology transfer was successful in varying degrees. The least effective approach was reading or studying outside the normal work environment. The most effective means was via one-on-one working opportunities.

An important conclusion of the WSSM project evaluation is that although short term gains in increased capabilities are real and identifiable, how well technology will be retained and applied will depend on the firms' ability to obtain additional sanitary design work.

Lessons learned from this evaluation which are relevant to design of future technology transfer oriented projects are:

1. Scopes of work for technology transfer activities should be defined showing planned approaches with scheduled milestones and deliverable items.

2. The use of tools such as participatory workshops and seminars, and lectures linked to ongoing project work activities followed by practical application in problem solving should be encouraged.

3. Major technology transfer efforts, especially in non-technical areas should continue to be grant-funded.

App. 5N, Ch 5, HB 3
(TM 3:26) 8-3-78

CLASSIFICATION

PROJECT EVALUATION SUMMARY (PES) — PART I

Report Symbol U-44

1. PROJECT TITLE	2. PROJECT NUMBER	3. MISSION/AID/W OFFICE
Water Systems and Services Management	278-0259	USAID/Jordan

4. EVALUATION NUMBER (Enter the number maintained by the reporting unit e.g., Country or AID/W Administrative Code, Fiscal Year, Serial No. beginning with No. 1 each FY) 85-7

XXX ☐ REGULAR EVALUATION ☐ SPECIAL EVALUATION

5. KEY PROJECT IMPLEMENTATION DATES	6. ESTIMATED PROJECT FUNDING	7. PERIOD COVERED BY EVALUATION
A. First PRO-AG or Equivalent FY 83	A. Total $ 28.5 million	From (month/yr.) 8/83
B. Final Obligation Expected FY 84	B. U.S. $ 21.0 "	To (month/yr.) 3/85
C. Final Input Delivery FY 88		Date of Evaluation Review 6/85

8. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

A. List decisions and/or unresolved issues; cite those items needing further study. (NOTE: Mission decisions which anticipate AID/W or regional office action should specify type of document, e.g., airgram, SPAR, PIO, which will present detailed request.)	B. NAME OF OFFICER RESPONSIBLE FOR ACTION	C. DATE ACTION TO BE COMPLETED
1. Disseminate evaluation findings to other interested USAIDs and other donors	AID/W	On-going
2. Begin evaluation process for the construction phase of project	USAID/J ENG office	March-April 1986

9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS

- ☐ Project Paper
- ☐ Financial Plan
- ☐ Logical Framework
- ☐ Project Agreement
- ☐ Implementation Plan e.g., CPI Network
- ☐ PIO/T
- ☐ PIO/C
- ☐ PIO/P
- ☐ Other (Specify) _____
- ☐ Other (Specify) _____

10. ALTERNATIVE DECISIONS ON FUTUR OF PROJECT

- A. ☒ Continue Project Without Change
- B. ☐ Change Project Design and/or ☐ Change Implementation Plan
- C. ☐ Discontinue Project

11. PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Names and Titles)

Abdullah Ahmad, Engineer, USAID/Jordan

12. Mission/AID/W Office Director Approval

Signature: Gerald F Gower

Typed Name: Gerald F. Gower

Date: 20 February 1986

AID 1330-18 (3-78)

186

PROJECT EVALUATION SUMMARY
WATER SYSTEMS AND SERVICES MANAGEMENT (278-0259)
FIRST INTERIM EVALUATION

INTRODUCTION AND BACKGROUND:

The Water Systems and Services Management (WSSM) project began in August, 1983. The project purpose is to develop and improve the institutional capability of public and private organizations in Jordan's water sector to conserve and manage water resources and as part of that effort, to extend and improve certain municipal water distribution and wastewater collection facilities. U.S. life of project funding consists of $17 million in loan funds and $4 million in grant funds. The Jordanian implementing agencies are the Water Authority of Jordan (WAJ) and the Ministry of Planning. U.S. project inputs consist of: 1) provision of technical advisory services for water quality monitoring, WAJ training, and public sector managerial skills upgrading; 2) financing the design of water and wastewater systems and construction supervision for ten cities in Jordan; and 3) financing the construction of water and wastewater facilities in Karak and Tafila, two cities in souther Jordan. WSSM places special emphasis on private sector technology transfer. In the design phase of the project, the three Jordanian firms which were contracted for facility and system design for the ten cities were required to form sub contractual relationships with U.S. sanitary engineering design consulting firms. The design of water distribution, sewerage collection and treatment and storm drainage for the ten cities were divided between three associations: Arabtech Consulting Engineers and CH_2M Hill International; Consulting Engineering Center and Black and Veatch International; and Jouzy and Partners Consulting Engineering Bureau and Engineering Science Inc. The design phase of the project ended in mid-1985; the First Interim Evaluation was conducted in February-March 1985, and the evaluation contractor's final report was received by USAID/Jordan in June 1985.

OBJECTIVE:

The objective of the First Interim Evaluation was to determine the progress of the three Jordanian firms in developing improved capabilities to complete sanitary engineering design projects. Secondary objectives were to identify, or indicate, the technology transfer; define and evaluate the mechanisms used in the transfer; and to recommend means of improving the mechanisms for the technology transfer.

Data was obtained through the review of available references. Numerous discussions were held with the Project Managers and project related personnel from the Jordanian firms, the Project Coordinators of the Water Authority of Jordan, the Ministry of Planning, and USAID/Jordan. In addition, there were discussions and/or correspondence with the Project Managers and project related staff from the US firms, after these personnel had returned to the United States.

187

The evaluation system utilized in the First Interim Evaluation was the system developed and used in the Baseline Survey Evaluation. This was consistent with project design and produced results which were themselves consistent and comparable. The differences in the two evaluations measured improved capabilities and also were indicative of technology transfer during the design phase.

MEANS AND METHODS:

All three of the associations used virtually the same means for the transfer of technology during the design phase of this project. The differences came about more in the degree of application of the methods, the time exposures for transfer and the areas of technology transfer. The transfer for purely technical matters included the use of lectures (in varying degrees of intensity and topics), special seminars by long term and short term US personnel, provision of reference materials, and one-on-one training as the opportunities arose during the design process.

In addition to transfer on purely technical matters, two of the associations undertook the transfer of management technology and techniques. The third association made a conscious decision not to include this area, based on the desires of the Jordanian firm. In the instances where project management issues was addressed, the general approach was strikingly similar for both associations. The U.S. subconsultant was instrumental as the lead in defining and instituting project management organization and philosophy. The lead responsibilities were then shifted to the Jordanian firm. In one case this was done with an informal approach with the US counterpart playing a low key but highly supportive role as needed. In the other case a rigidly defined chain of command was established and scrupulously adhered to in conducting project activities. Both of the Jordanian firms felt comfortable with these two differing approaches. They felt they had learned valuable lessons from these two approaches even though they were different in application.

Each of the associations did something a little different in the technology transfer process. Examples of individual activities which were utilized include: field trips within Jordan to visit existing systems for a better understanding and appreciation of the application of theoretical knowledge, an extensive participatory workshop using a case study and group problem solving approach, lectures and seminars by outside experts, and a combination project review and training trip to the office of the US consultant.

EVIDENCE OF TECHNOLOGY TRANSFER:

All three of the Jordanian firms showed evidence of technology transfer and increased capabilities in the following common elements:

- All developed, or expanded, their library of reference materials such as textbooks, technical publications, periodicals and catalogs.

- All acquired, or added to, existing, general and technical specifications for sanitary work.
- All acquired, or added to, existing, standard details for sanitary design work.
- All gained experience and confidence in the design of sewerage treatment plants.
- All gained a greater appreciation of the needs of project financed by international lending agencies..

INFLUENCES-EFFECTIVITY OF TECHNOLOGY TRANSFER:

The influences can be divided internal and external as follows:

Internal Influences:

Individual desires of the Jordanian project personnel to gain new technology, the commitment levels of the firms and their willingness to provide corporate support for technology transfer, the individual personalities of the Jordanian and US project-related staffs can all be classified as internal influences on technology transfer.

External Influences:

This phase was the change from the Water Supply Corporation (WSC) to the Water Authority of Jordan (WAJ) and the multiplicity of WAJ Project Coordinators. This no doubt actually enhanced technology transfer even though it may have had adverse impacts on scheduling and costs.

Virtually everything that was tried to effect technology transfer was successful, in varying degrees. The field trips, and the participatory workshops and seminars were very effective methods for transferring technology. As might be expected, the most effective means of technology transfer was the one-on-one working opportunities. The least effective approach was reading, or studying, outside the normal work environment. The next least effective method was the lecture approach unless closely tied to the design aspect and immediately followed by hands-on applications.

RECOMMENDATIONS AND COMMENTS:

1. Major technology transfer efforts, especially in non-technical areas, should be continued to be grant funded. It is difficult for a newly developing country to hold to the long view and commit scarce financial resources to training. This may appear to benefit a few in lieu of meeting immediate critical needs of the masses for such essential items as potable water supplies.

2. AID should try to obtain agreement from the host country to add the needed funding and manpower to any planned project. This will allow for the technology transfer in addition to the completion of the other project elements. It is possible for a critically tight project schedule to cause advers effects on the technology transfer activities if they are only an adjunct to the main project activities.

3. Define the Scope of Work for the technology transfer activities and require a planned approach with scheduled milestones and deliverable items.

4. Encourage the use of participatory workshops and seminars as training tools.

5. Continue the requirement for the provision of all lecture, seminar and workshop notes for future reference of the host country personnel. This should be matched with a continued, or increased level of supplies of reference materials and equipment under the contracts. These items will remain and be useful long after the US consultants have departed.

6. Attempt to schedule lectures linked to ongoing project work activities and to be followed by practical application in problem solving.

7. Increased use of field trips on a selective basis within Jordan, the region or to the US. These should be working trips, for qualified personnel, to observe and understand the design and operational concepts as they are applied and practiced. Such training will provide a better appreciation of the relationships between the theory and the practical.

8. The short range gains under this project have been real and identifiable. How well the newly gained technology will be retained and applied by the firms and individuals involved in this project will depend on the ability of the firms to obtain additional sanitary design projects. If additional opportunities are not provided to utilize, reinforce and adapt this new technology, it may be lost. If new sanitary projects are obtained, this new technology will improve and reinforce the capabilities of these Jordanian firms for sanitary design.

CONSTRUCTION SUPERVISION BASELINE:

The project paper envisioned a baseline survey of the construction supervision capabilities of Jordanian firms to be used as the point of reference to identify the increased capabilities and indicate the technology transfer during the construction phase.

The construction supervision contracts had not been finalized at the time the evaluation was prepared, but all three of the

above-mentioned Jordanian consulting firms submitted cost proposals and negotiating discussions were underway. Although the project people had not been selected and the agreements with the US subcontractors had not been finalized, it wad decided that it would be cost effective to begin the construction supervision evaluation. The objective evaluation was undertaken as part of this study. The subjective evaluations will take place at the time of the baseline evaluation of the Jordanian contractors when all agreements have been signed and the project people are in place.

The objective evaluation is based on a system developed along the same lines as the evaluation format for sanitary design capabilities. The Construction Supervision Development Index (CSDI) also reduces to a single pure number that is a useful indicator of the variance in the capability of a firm in construction supervision over time.