PD - AAQ - 533 37203

CLASSIFICATION

PROJECT EVALUATION SUMMARY (PES) -- PART I

Report Control Symbol U-447

1. PROJECT TITLE	2. PROJECT NUMBER	3. MISSION/AID/W OFFICE
Irrigation Management Systems Structural Replacement Component 000023	263 0132	USAID/Cairo

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)

☒ 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____ B. Final Obligation Expected FY____ C. Final Input Delivery FY____	A. Total $_____ B. U.S. $93million	From (month/yr.) 6/83 To (month/yr.) 12/84 Date of Evaluation Review January 1985

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. District engineers should complete course in construction management and quality control in conjunction with implementing a new structures program.	MOI	January 1986
2. Improve quality of structures by accelerating recruitment and training personnel, considering ministry incentive pay options, distributing construction manuals widely, and providing testing equipment.	MOI	September 1985
3. Initiate preconstruction conferences with contractors to promote quality control.	MOI	May 1985
4. Upgrade Specifications and design of structures (cover of reinforcing bars and transportation techniques).	MOI	September 1985
5. Establish data system to provide baseline information.	MOI	September 1985
6. Encourage more efficient use of water through Ministry of Agriculture extension system.	MOI MOA USAID	September 1985
7. Intensify monitoring activities by recruiting additional staff for monitoring and field inspection.	MOI Contractor USAID	May 1985

9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS

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

10. ALTERNATIVE DECISIONS ON FUTURE PROJECT

A. [X] 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 MEMBERS AS APPROPRIATE (Names and Titles)

WCarmack, AGR/ILD
EStains, AGR/ILD
DSchaer, AD/AGR
GLaudato, AD/DPPE
AHandly, DD

12. Mission/AID/W Office Director Approval

Signature

Typed Name: Frank B. Kimball, Director

Date

AID 1330-15 (3-78)

NEAR EAST EVALUATION ABSTRACT

PROJECT TITLE(S) AND NUMBER(S)	MISSION/AID/W OFFICE
Irrigation Management Systems Project (263-0132) Structural Replacement Component	USAID/Cairo

PROJECT DESCRIPTION

The structural replacement component of this project is designed to improve the operation of the irrigation system through the rehabilitation of minor structure, thus improving water control and water use efficiency.

AUTHORIZATION DATE AND U.S. LOP FUNDING AMOUNT	PES NUMBER	PES DATE	PES TYPE
9/22/81 $ 93 million	85-10	January 1985	[X] Regular [ ] Other (Specify) [ ] Special [ ] Terminal

ABSTRACT PREPARED BY, DATE	ABSTRACT CLEARED BY, DATE
NShafik, DPPE/PAAD January 1985	EStains, AGR/ILD January 1985

The evaluation was carried out by an irrigation structural consultant, an irrigation engineer, a senior Ministry of Irrigation (MOI) engineer, and an agricultural economist previously with the Ministry of Agriculture. The team reviewed progress on the implementation of recommendations from the June 1983 report on structural replacement. This report serves as both the second annual report and the evaluation of the structural replacement (SR) component of the Irrigation Management Systems Project.

The program work in the five directorates is essentially complete. A total of 3078 structures valued at approximately $ 20 million have been completed or are under construction in the Phase I irrigation directorates of East Dakahlia, West Dakahlia, Sharkia, Ismailia, and Beheira. These structures include intakes and head regulators, steel gates bridges, tailescapes, siphons, aqueducts, and weirs. Training sessions have been held for MOI personnel to improve structure design, construction management, and water management. The team found that the quality of the manuals used in the management and structural replacement seminars is high.

In the areas where all training activities were completed, construction targets were exceeded. The implementation of recommendations from the 1983 SR report on training, the use of portable test hammers mechanical mixers and vibrators have contributed to the improved quality of structures. Structure design has not been updated because the quality of construction is not yet sufficiently high. The MOI continues to have problems recruiting engineers. The 45 percent vacancy rate reflects the MOI's inability to lure engineers from other more lucrative jobs. The team concluded that the project purpose of improved operating efficiency of the irrigation system is being achieved. Water savings since 1981 in the project area have been estimated at 7 to 11 percent. MOI personnel have benefited from project training. Farmers have benefited from improved water distribution, fewer systems leaks, and easier access to their farms. While agricultural productivity increased in the project areas, it is difficult to attribute it to the project given the number of possible variables.

The report makes numerous recommendations to enhance the effectiveness of the project. The new structures program should coincide with the district engineers completion of training in construction management and quality control. The inspection program should be strengthened by increasing the quantity of engineers, accelerating training activities, and providing greater incentives in the Phase II directorates. In general, monitoring by USAID, the consultant, and the MOI needs to increase through the provision of more staff testing equipment and construction manuals. Preconstruction conferences with contractors should be used to promote quality control. The development of a data base will allow for monitoring of project impact. Improved water management techniques should be disseminated through the Ministry of Agriculture's extension system.

Lessons Learned: (1) Updating specifications combined with training can improve structure quality. (2) The enforcement of improved quality standards must include coordination with implementation contractors. (3) Structure designs and quality must anticipate changing use patterns. For example, structural deficiencies in bridges will become more serious as the weight of vehicles increases. (4) The establishment of baseline data is an essential part of monitoring project impact.

XD- AAQ-533-A 37804

December 18, 1984

EVALUATION OF THE STRUCTUTAL REPLACEMENT PROJECT

BY

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December 18, 1984

Attached is an evaluation of the structural Replacement (SR) Project which was carried out by the Ministry of Irrigation in Five Directorates in the Delta and the beginning of Phase II in the other directorates. The Appraisal Committee enjoyed the full cooperation and assistance of MOI personnel in five Directorates and at headquarters and of USAID personnel in Cairo.

The Committee was pleased with this cooperation and assistance and wishes to express its thanks to the MOI and USAID personnel for their help in this effort.

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I SUMMARY - RECOMMENDATIONS AND COMMENTS

Recommendations

A. It is recommended that implementation of new structures program in Districts should go in parallel with the district engineer completing the course entitled Construction Management and Quality Control.

B. Strengthen inspection

1. Accelerate training seminars and on the job training to update inspection forces so construction work can proceed as soon as possible.

   a) Senior Staff - three to four day training seminar to show importance of quality control to staff about district engineer level.

   b) District Engineers - three week seminar plus biannual one day on the job training.

2. Increase engineering staff to provide one district engineer for each 20 to 25 structures per year for the necessary inspection required to administer the SR program. This does not apply to small structures such as small intakes, aquaduct and steel gates.

   a. Study incentive pay system to see if adjustments are necessary to increase number of engineers, and encourage them to stay with the MDI

   b. Encourage additional efforts to recruit extra numbers of engineers.

3. Increase monitoring staff.

   a. USAID - two extra for field review
   b. Consultant - one extra for field review & training if possible
   c. MOI - SR section - two extra for field review.

4. Provide testing equipment and at least two personnel to perform quality control testing on major strcutures through the Training and Manpower Development project.

5. Have existing construction manual distributed to all personnel involved in SR program.

C. Preconstruction Conferences - At the time a contract is awarded, have a meeting between contractor, MOI staff, and expatriate engineer and USAID, if possible, and others to discuss important points of contract and general problems. Discuss important requirements of plans and specifications and schedule of pay to contractor etc.

D. Change specifications and design:

1. Require 5cm cover of reinforcing Bars

2. Transportation of mixed concrete by:

   a. Chute
   b. Dump buggie
   c. Wheel barrow
   d. Buckets for small structures

Instead of current practice of Transporting by 50# pans.

E. Repair existing structures with sandblasting and gunite or equivalent to bring structures to specification requirements.

F. Establish a data system for the purpose of providing

1. A survey of the structural inventory.

2. A bench mark from which changes could be measured for the follow up and evaluation of economic impact.

G. Education to the farmer to use less water through the extension system of the Ministry of Agriculture. Thus efforts of the government through SR and the farmers are consolidated for efficient use of water.

Comments

A. The specification from this time forward will require concrete to be mechanically mixed and vibrated into places. This, in our opinion, is an improvement to providing better quality structures.

B. We have been informed that the Training and Manpower Development Project will have complete materials testing equipment in place by April, 1985. This facility, if manned by the proper experienced personnel, can be used to design better concrete and to test the concrete as placed in the field to insure a quality product. We feel physical and chemical testing of the cement, aggregate and other items is necessary to insure a product that will meet required engineer design strengths.

C. It is our opinion MOI should investigate the possibility of redesigning their structures to the latest standard for engineer design. See CH2M Hill's International report of May 1981 entitled "Egyptian Irrigation Management System" which states a saving in natural resources of 30% to 50% could be obtained with the cost remaining constant.

D. Canals as observed are cleaned with a drag line once a year with weeds being cut 3 to 4 times per year. Canal cleaning observed looks very good.

E. Channel bank protective dry stone pitching is uniformly acceptable, but will require future maintenance.

F. The contracting procedures followed by the Directorates are adequate and are applied uniformly throughout the five Directorates.

G. Record keeping on a monthly basis needs to be maintained in the Directorates office for management control and review of progress of work.

H. Contracts for a group of structures in a relatively small area are grouped in some Directorates to improve contract management. This practice need to be encouraged in all Directorates.

I. The program of work in the five Directorates is essentially complete. Some minor construction remaining will be completed by March 1985.

J. No cash flow problems are experienced by the Directorates. The MOI has budgeted sufficient funds. Contacts are being carried out on schedule.

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II Introduction

The Structural Replacement (SR). Program was initially carried out in: East Dakahlia, West Dakahlia, Sharkia, Ismailia, and Beheira directorates in the delta. The SR program is being conducted within the Ministry of Irrigation (MOI). Conduct of the SR activity is the responsibility of the MOI. Contract services personnel provide advisory services under the administrative guidance and policy of the director of the SR activity.

The Irrigation Department is responsible for providing technical guidance and supervision of the field organizations of the MOI. The irrigation sector is under the direction of a senior undersecretary, who supervises water deliveries and technical guidance to field activities.

The technical services contractor provides technical advice in planning and implementing activities, in preparing work plans and reports in identifying needs in preparing work plans and reports in identifying needs and planning training and in evaluating activities.

USAID is responsible for day to day monitoring including regular visits to work sites and specific periodic checks on structures being replaced under the SR program. It also provides guidance on project implementation and becomes directly involved in training activities outside of Egypt.

Field operations are conducted under the supervision of regional Undersecretaries reporting to Cairo. Each Undersecretary directs one or more field directorates. The directorates are managed by a Director General for Irrigation residing in the directorate and reporting to the Undersecretary.

The Districts are the field units, with operational responsibilities for the irrigation systems. They are responsible for the Operation and Maintenance (O&M) of the canals, structures, drains, and new construction. They are staffed to conduct management functions, such as contracting, disbursement and accounting for funds, personnel administration and monitoring of contractor performance.

The general organizational structure for a directorate is shown in Enclosure I. The district engineers (DE's) have responsibility for direct oversight of system O&M and contractor site inspection. Each directorate's responsibility varies from 300,000 to 600,000 feddans.

A district engineer may be responsible for O&M for approximately 40,000 to 80,000 feddans under one or more main canal and other responsibilities including design, construction inspection and contract payment records. Some district engineers will also be responsible for 20 to 40 or more office and field/personnel.

Over the past 15 years, budget limitations and an emphasis on major canal maintenance and recently, increasing expenditures on tile to provide drainage of farmers fields have reduced the amount of funds for (SR). Many structures replaced were inoperative or only partially functional. Studies by the MOI show that SR has been identified as one of the principle constraints to satisfactory performance of irrigation. ThE SR program was designed to replace and/or rehabilitate the small and medium size structures consisting of: intake regulators, head regulators, weirs, tail escapes, spillways, bridges and channel crossings. These sturctures are constructed of reinforced concrete, masonary, pipe, and steel. A major problem confronting the irrigation sector is the large amount of accumulated SR backlog. A survey in 1981 by the MOI, estimated that the cost of the backlog of deferred small and medium SR amounts to LE 44 million, at 1981 prices.

The SR program partially funded by USAID was accelerated at a moderate pace. The most severe SR problems were addressed during the first two years, before expanding the program to include the remaining fifteen directorates. The MOI is directing special efforts to achieve improved quality control and ensure compliance with MOI specifications.

The USAID Irrigation Management Systems Project is designed to to improve the operating efficiency of the total irrigation system and strengthen the Ministry of Irrigation's operation, maintenance and planning capabilities . The SR component of this project is to improve the operation of the system through the rehabilitation of minor structures, thus improving water control and water use efficiency. Improved system operation has the potential for improvement of water delivery efficiency, contributing to bilharzia control reducing water logging, salinity, and water wastage and run-off and facilitating canal maintenance. Construction funding was matched at an 80-20 ration by USAID and the GOE through an actual cost reimbursement method.

The structural replacement component of the project is being evaluated separately to coincide with the other project reporting requirements. This evaluation will document progress in structural replacement and will serve as both an annual report on SR and as part of the overall project evaluation scheduled for the second quarter of FY 85. This evaluation also coincides with the initiation of the second phase of SR and will provide a basis for discussing improved monitoring and assisting with the Ministry of Irrigation.

III Scope of Work

A. Assess project inputs. The team should evaluate the quality and effectiveness of the technical assistance provided by the expatriate engineering advisor during the first two year phase. Given that this position is scheduled to terminate after phase one, assess the need for the continuation of ths service throughout the second phase of the SR program. Document and evaluate the provision of training as it relates to the structural replacement program.

B. Evaluate project outputs. Budget constraints have restricted SR in the past. The project calls for the achievement of a high level of quality control and full compliance with Ministry of Irrigation (MOI) specifications. Document the number and types of sturctures replaced or rehabilitated. The team should assess the quality of construction, adherence to specifications, and the development of ongoing procedures for maintaining standards. Has the quality and quantity of Ministry of Irrigation personnel been improved?

C. Assess the method of financing. Review the adequacy and effectiveness of mission procedures for mnonitoring this activity. Make recommendations for monitoring this activity. Make recommendations for monitoring this activity. Assess the effectiveness of using incentive pay for MOI engineers responsible for program implementation. Evaluate the contribution made through GOE funding and the likelihood of the MOI's sustaining of the system once the backlog has been eliminated.

D. Has this component of the project contributed to the achievement of the project purpose? Has the backlog of obsolete, poorly performing or non-functional structures been reduced? Can specific impacts be quantified such as: (1) more efficient utilization of water, (2) a more reliable delivery system, and (3) improved access for performance of operation and maintenance activities. Assess progress toward the more long-term goals of reduced water tables and increased agricultural productivity.

E. Identify project beneficiaries. Have the skills of MOI personnel improved? Has MOI management been upgraded? Have farmers identified benefits that have resulted from the project?

F. Document lessons learned thus far and make recommendations to enhance the achievement of the project purpose.

G. What recommendations from the evaluation dated June 16, 1983, have been followed and which ones have not been followed.

IV Assessment of Project Inputs

The inputs include training and advisory services of a consultant who provides tehnical assistance and training by the Irrigation Department's Training and Manpower Development Project. Training can be evaluated by indicators such as the number of trainees that report for training, quality of construction improves, better construction techniques are adopted by MOI and productivity increases.

Enclosure II (pages 1,2, & 3) shows the schedule for a Management Skills Seminar for Undersecretaries and General Director, conducted October 13 - 25, 1984.

The consultant provides technical assistance, and training to the project. Approximately 120 personnel are to be trained in six sessions of three week courses conducted from November of 1984 to November of 1985. The schedule is shown in Enclosure III (pages 1 thru 6). A Structural Replacement Workshop for Irrigation General Directors for the 15 directorates involved in Phase II was held September 15 - 18, 1984. The schedule is shown in Enclosure IV.

Three directorates who have sent personnel for training have provided data for Enclosures V, VI, & VII showing the personnel and their training. Copies of manuals used in the management and the structures replacement seminars were provided. The materials are very good.

Training by the Training and Manpower Project and technical assistance by the consultant should continue and should be accolorated and Technical assistance should be continued to be provided by the consultant in Phase II. The training should be intensified in the early part of Phase II to get improved quality control in the remaining directorates.

The quality of the structures will improve as the mixing of concrete is changed from hand to mechanical mixing and hand tamping is replaced by mechanical vibrators. Training and technical assistance has been helpful to bring about this change. Technical assistance by consultant and MOI personnel to the engineers and instructions to contractors will help to continually improve the quality of construction.

V Assessment of Project Outputs

Official visit were made by the team to five directorates. Three East Dakahlia, Sharkia and Ismailia directorates have had the SR Program completed in Phase I. The other directorates, Giza and Kalioubia are now in the SR Program as part of Phase II.

Completed structures were checked in directorates where the SR construction is program completed. One structure under construction was checked in Giza and two structures under construction were checked in Sharkia. Several structures to be replaced were also visited in Kalioubia Directorate. Field notes taken are included at the end of this report.

In general, the structures can be built very well when the specifications are followed, mechanical mixing and vibrators are used, the reinforcing steel is blocked and kept away from the forms and a strict inspection program is followed by qualified inspectors.

The quality of construction can continue to improve if training is continued, (both on-the-job and training by the Manpower and Training Development Projects) and consultant and MOI personnel visit to sites under construction frequently, and train the engineers, and give instructions to contractors in proper methods to achieve the quality desired. The MOI, consultant and USAID should periodically check the structures more frequently during construction and after completion.

The total number of structures, completed structures, and structures under construction for the five directorates of Phase I are shown in Enclosures VIII to Enclosure XII, Four of the five directorates have structures under construction. One directorate, Beheira, has seven structures under Phase I which are not yet started.

The quality of the MOI personnel will continue to improve with more on the job and classroom training as discussed under Inputs.

The quantity of the MOI personnel does not appear to have increased since the start of the project. The district engineers appear to be responsible for most of the design and field construction operations. The district engineers in the field appear to be responsible for twenty to forty personnel, operation and maintenance of the irrigation system for 40,000 to 80,000 feddans plus the responsibility for construction inspection, Due to this workload there is a possibility that construction inspection and, thereby, quality control suffers.

VI Assessment of Reimbursement

Payment of the SR projects structures is 80% US and 20% GOE funding. In theory this appears good to provide an incentive for the GOE to keep costs down. MOI is attempting to obtain the structures at the lowest cost unless the lowest bidder is not qualified to perform the construction.

USAID needs sufficient personnel to "make regular visits to work sites and specific to periodically checks on structures being replaced under the SR program" (page 74 of Project Plan) "to assure that the structures are built according to plans and specifications." USAID should make periodic inspection of 10% of the structures during construction.

VII Maintenance

It is logical that the maintenance of the structures is improving if the maintenance budget is remaining the same or increasing as some data shows. Since the poorer structures have been replaced less maintenance dollars are required on these structures. These extra dollars can be used on maintenance of other structures or canals. Training of district engineers should make the engineers more aware of the need for maintenance thereby improving this very necessary activity.

VIII Personnel

On Demcember 9, 1984, the MOI had 1330 approved professional engineering positions with 606 vacancies, which is a 45% vacancy factor..

The main problem is the lack of personnel assigned to this part of the SR program.

USAID has been able to periodically inspect approximately 2% of the structures and the consultant engineers has made periodic inspections of approximately 3% of the structures constructed under the SR program. The fact that only a total of 5% of the structures are being periodically inspected not all at critical stages of construction this strongly suggests that there is at present insufficient control of the work after reviewing the teams field inspection reports.

Since the SR program is going to be increased from 1000 structures in Phase I per year to 3000 structures in Phase II per year, the need for periodic inspection is much greater. Coordination of parodic inspections between USAID, MOI and the Consultant should be achieved to prevent overlaping of effort.

The directors state that incentive pay is based on effort and quality of work. Private contractors appear to pay as much as three times more than the government and foreign jobs pay as much as ten times more. The district engineers are needed to inspect the construction and have some of the highest vacancy rates.

Since quality control and good inspection requires sufficient motivated engineers, a study of pay for engineers in the MOI, other Ministries, and the private sector would be helpful. The study would need to determine what is required to successfully recruit and retain enough additional engineers to satisfactorily complete the work.

Since any quality improvement on the structures may have come from upgraded specifications, other indicators of quality improvement in the personnel may need to be used. As discussed earlier under training one could conclude that the quality of the personnel is improving based on personnel being taught in the training center and on the job training.

IX Achievement of Project Purpose

The purpose is to improve the operating efficiency of the total irrigation system. This purpose is being fulfilled.

Water savings after the SR program has been started in 1981 were estimated at 7 to 11% for the five directorates of Phase I. The directors attribute this to several factors including: properly designed vent size, reduction of leakage as steel gates are used to replace wooden flash boards; reduction in blockage of canal from previous "farmer's bridges" (blockages raised the water in parts of the ditch thereby providing excess water above the blockage and extended irrigation time below the blockage); improved reliability of the irrigation system; better assess of O&M, and moneys formerly used to maintain old structures can now be used to replace older structures or improve maintenance on other structures.

It appears that the backlog of obsolete, poorly performing or non-functioning structures has been reduced. Assuming an average structure replacement period of 50 years, 2% of the structures would need to be replaced every year on the average, replacing 10% of the structures during the five year span of the SR program would show no gain. Indications are that the SR program considerably exceeded 2% per year of total structures.

The water table has been rising in many irrigated areas. Since less water is used on the directorates (and assuming consumptive use is the same) there should be less water contributing to the ground water table. The evaluation team did not come up with any records to show changes in ground water levels in the five directorates of Phase I.

Agricultural production gains occurred in most directorates during the past three years according to available data. This was true on most SR and non-SR project directorates. It would be difficult to evaluate the SR projects effect on agricultural production without looking at all the variables, which would require considerable time and effort beyond the scope of the evaluation.

X Project Beneficiaries

Some farmers benefit from improved water distribution, fewer system leaks and easier access to their farms. Some engineers benefit from on the job training and training sessions. It is difficult to assess improvement of skills at this time. Some management personnel benefit from the upgrading in engineering knowledge and management training sessions. Again, this is difficult to evaluate. Training and change usually occur slowly.

The contractors benefit from the work available and upgrading of their skills. There appears to be a shortage of good contractors to construct the structures to specifications. Upgrading occurs from updating of specifications (such as mechanical mixing and vibrating) tighter inspection of projects and training and monitoring from USAID, the consultant, and district engineers (as the knowledge of the district engineer increases).

XI Implementation of Past Recommendations

The evaluation with a cover letter dated June 16, 1983, recommended better quality control, improved construction standards, use of mechanical mixers and vibrators, improved appearance and utilization of a portable test hammer. The portable concrete testing hammer is not a substitute for physical testing of a concrete cylinder taken at time of placing the concrete. The portable testing hammer is only an indicaction of strength unless it is calibrated to the concrete in the structure being tested. Quanlity control is improving with training, mechanical mixers and vibrators are now specified. The portable test hammer is available and has been used.

Improvement of structure design with improved quality of concrete was recommended. There have not been any changes in designs, probaoly because quality construction is not sufficient to use more up to date designs.

XII Documentation of Lessons Learned

Updating of specifications, such as including mechanical mixing and vibration, can improve structure quality.

More training of and forceful inspection by district engineers is needed to assure a more constant quality of structures. Two structures were built approximately the same time under one engineer. One was good and the another was rather poor. Better and more frequent inspection could have improved the poor structure.

Some structures already need repairs. Concrete tests, including slump and compression tests, better specifications and better inspection could have prevented many of these defects. This may also be caused by having insufficient number of experienced contractors to perform the work on the many small structures.

Less than desired quality control on 30 ton/ structures will be less noticeable if 1 to 5 ton. animals and vehicles use them. However, 30 ton/ vehicles could quickly show Structural problems on some structures. Surely the produce trucks will increase in size as is the experience in most countries.

Bridges with steel exposed on the bottom of the slab will be subject to a shorter life and higher maintenance costs. These structures should also be posted to a lower allowable vehicle load due to improper placement of steel bars and the lack of concrete cover over the reinforcing steel.

XIII. Economic Evaluation

Introduction:

The Structural Replacement Component (SR) of the Irrigation Management Systems Project (IMS) is to improve the operation of the system through the rehabilitation of minor structures which would lead to improving water control and water use efficiency. Improved system operation has the potential for improvement of water delivery efficiency contributing to reducing water logging, salinity, water waste and facilitating canal maintenance. The IMS project provides major capital support to reduce the backlog of SR hampering effective water management and control. The ultimate goal of the project is the effective control of water for all uses and particularly their optimal allocation to and within agriculture as a means to increase production and productivity.

Exessive use of water could lead to lower production, and more water could be going into drains, causing higher cost of drainage and maintenance in the shortrun. However subsurface water level would be rising, soils would be depleted affecting badly agricultural production and cost will be prohibitive in the long run.

Because of the government budget limitations during the last decade or so. the emphasis on major canal maintenance and the establishment of the tile drainage system, funds for replacement had been reduced. As a result many structures were not maintained and became partially functional. Structural replacement if not being carried out would be a major constraint to satisfactory performance of the irrigation system.

Assemsment of Project Output

Accoding to data of the five directories implementing SR project in Phase I, the total number of structures completed and under construction amounts to 3078 unit at a total value of about L.E. 20,048,000. Enclosure XIII shows the total number and total value by type of structure and directorates.
Work in phase I is expected to be completed by March 1985.

It should be noted that:

1. Reimbursement of funds of the 80% contributed by USAID is carried out according to rules and schedule.

2. Contracting procedures followed by directorates are adequate and are applied uniformly throughout the fine directorates.

3. Contracts for a group of structures in some cases are grouped to improve contract management.

4. No cash flow problems are experienced by the directorates.

Achieving The Project Purpose

1. the backlog of obsolete, poorly performing or non functioning structures has been reduced.

2. Improving the operation efficiency of the irrigation system is being fulfilled.

3. Water savings after the SR program were estimated at 7-11% for the directorates implimenting the project in phase I. This is due to different factors which have been stated else where in this report. Among these factors are the proper vent size, reduction of leakage, improved reliability of the irrigation system, better operation and maintenance.

4. There was no indication of changes in the underground water level.

Impact of SR on Agricultural Production:

Quantifying the impact of SR on agricultural production was not possible. Reviewing data collected by the Ministry of Agriculture on productivity of main crops in areas where SR is implemented showed an improvement over the last three years for three major crops. Productivity increases appeared also in other directorates. It was difficult to qualify the impact of SR projects. However, there is sufficient faith to beleive that the impact of SR is favorable on agricultural production which could be measured based on specific information that could be collected for that purpose in the future.

If the SR component was not carried out and was postponed to be effected in a future time, the backlog would have increased, causing more destruction to the irrigation system and which would be also reflected on Agricultural Production. Continuous maintenance of existing structures and canals is very crucial for the effective operation of the irrigation system and which is receiving greater attention from the government.

It is concluded from the above discussions, the discussions with the directors and engineers in the directorates as well as some farmers during the field visits, that SR project is sound from the economic and financial point of view.

1) Need for the establishment of a Data system that can serve the Structural Replacement Component (SR) of the Irrigation Management Systems Project (IMS):

The first stage of the Structural Replacement has been completed or very near completion. Appraisal of SR shows that three years have already elapsed since the Irrigation Management Systems Project started. There is need to assess statistically the impact of SR. A survey of structural inventory is also required. There is need to quantify the situation before and after any given structure has been replaced.

Examination of data collected by the Ministry of Agriculture on productivity in aeas where SR has been implemented did not serve the purpose. There was an indication of improvement over the last three years in productivity of wheat, cotton, and rice, but it may not be due to better control and more efficient use of water only. These gains also appeared in most of other directorates. It was difficult to evaluate the SR projects effect on agricultural production.

Productivity figures are based on the administrative setup of the Country (governorates and districts) and are not on irrigation localities or regions. In addition they are the resultant of all factors including the interaction of all inputs together. What we really need is a special data system to provide current information and to establish a bench mark from/which effects due to better operation and improvement in the efficiency of water use could be measured. We need relatively accurate data on productivity, the amount of water saved, the value of water and energy saved, measurements of the charges in soil salinity, soil and underground water levels, and other pertinent data. Depending on judgement to evaluate progress in the efficiency of using water and to assess the impact on agricultural production due to SR may lead to incorrect conclusions and effect could not be accurately costed.

Therefore it is recommended to establish a data system for the purpose of providing:

1. A survey of the structural inventory.

2. A benchmark from which changes could be measured for the follow up and evaluation of the economic impact of the structural replacement in the directorates. This should be done on sampling basis for different types of structures. Data should be collected before and continues after the establishment or rehabilitation of the structure.

2. Role of Extension in Improving Water control and Water Use Efficiency:

Entension has a role in teaching farmers to use less water for irrigation. The Egyptian farmers are accustomed to use exessive amounts of water. They believe that more water would lead to more production. However a study which has been carried out by the Ministry of Agriculture under the Farm Management Survey Project (FMS) in 1980, indicated that improved water control, improved soil and moisture conditions, could lead to higher multiple cropping intensity. Another study by the Ministry of Irrigation, under the Egyptian Water use and Management project (EWUP) in 1979, revealed that yield, can be increased even while using less water.

While extension has been used to a relatively great extent to improve agricultural practices, it has not been applied to any certain extent in improving the efficiency of using water on the farm level, which would lead to improve water control and water use efficiency on canals. Farmers should be educated to use less water. Better leveling of the soil, inducement to irrigated during the night, reducing the number of irrigations, less water to be used by the farmers at the opening of the canal, using mechanical pumps would greatly help to improve the use of water.

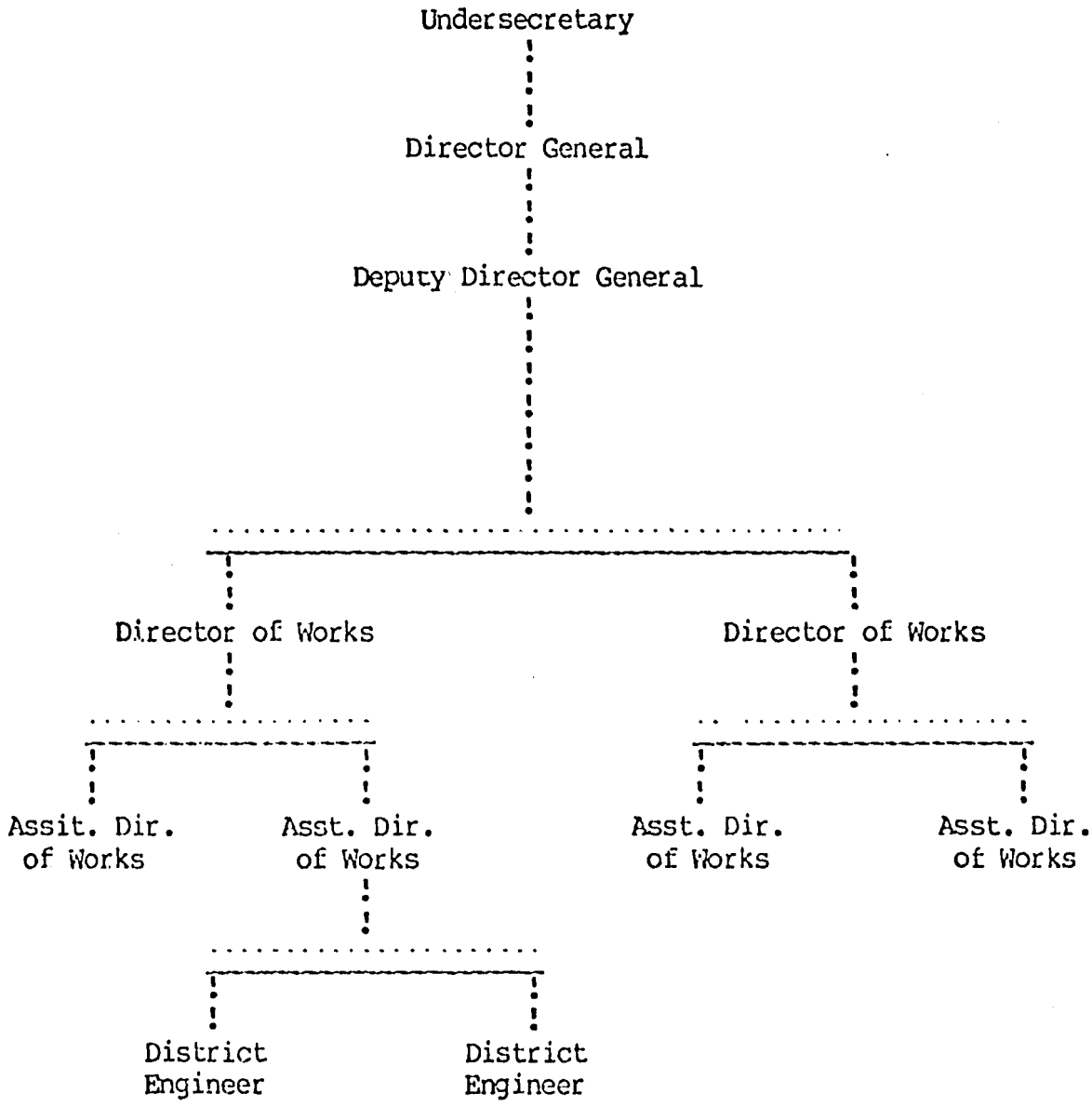
Only in this way that effort of the government in managing the water system through SR and efforts of the farmer could be consolidated for the benefit of the farmer and society. However also, it is not advisable to duplicate the extension system of the Ministry of Agriculture.

Therefore it is recommended

To encourage the existing extension systems of the Ministry of Agriculture to educate the farmer to use less water. Thus the efforts of the government through SR and the farmers are consolidated for the efficient use of water.

Enclosure I

Directorate Organizational Structute



MANAGEMENT SKILLS SEMINAR (MSS)
FOR
UNDER-SECRETARIES AND
GENERAL DIRECTORS
Oct. 13,1984 - Oct. 25,1984

Saturday 13.10.1984

9:00 - 10:30	Registration	
9:45 - 10:45	Orientation of Salt River Project	
	Opening Remarks	Eng. Ed Kirdar
	SRP Video Tape in Arabic (32 min)	
	Questions and Answers	Engrs. Kirdar, Wilkins, Gerdes.
11:00 - 12:00	Opening Ceremony	
11:00 - 11:10	Introduction	Engr. Farouk Shahin
11:10 - 11:20	Chairman of WRC	Dr. Mahmoud Abu-Zeid
11:20 - 11:30	Representation	Engr. Edib Kirdar
11:30 - 11:45	Irrigation Minister Speach	H.E. Essam Radi
12:00 - 12:30	Recess	
12:00 - 1:00	Orientation of Ministry of Irrigation	
1:00	Adjour	

Sunday 14.10.1984

Participative Management	Eng. Randy Gerdes

Monday 15-16.10.84

Identifying and Developing Personal Skills	Eng. Skip Wilkins

Wednesday 17.10.84

Communication	Eng. Randy Gerdes

Thursday 18.10.1984

Meeting Techniques	Eng. Randy Gerdes

حدائق شبرا - القاهرة
مسنى الزى - ثم ترعة الاسماعيلية (شبرا الخيمة) ص.ب

Friday 19.10.1984

Free day

Saturday 20.10.1984

Meeting Techniques (continued)	Eng. Randy Gerdes

Sunday 21.10.1984

Planning	Eng. Skip Wilkins

Monday 22.10.1984

Field Trip (Salhia Project)	All Participants

Tuesday 23.10.1984

Problem Solving	Eng. Skip Wilkins

Wednesday 24.10.84

Management Skills in Technical Applications	Eng. Edib Kirdar-

Thursday 25.10.1984

Summary Conclusion	Eng. Edib Kirdar Eng. Skip Wilkins Eng. Randy Gerdes
Graduation	Eng. Farouk Shahin

Daily schedule will be as follows;

1- 9:00 - 10:30
2- 15 minutes break
3- 10:45 - 12:15
4- 30 minutes break
5- 12:45 - 1:45
6- 15 minutes break
7- 2:00 - 2:30

12.00 - 2.00 MIXING AND PLACING CONCRETE

- Mixing Methods, Mechanical Mixing a Must
- Time Required for Adequate Mixing
- Sequence of placement within forms
- Cold joints
- Time constraints for placement
- Vibration: Reasons, Mechanical, When and How Long.

2.00 - 3.00 CURING AND FINISHING CONCRETE

- Impacts of Curing.
- Curing Methods.
- Finishing Objectives.
- Finishing Methods.
- Defective Concrete.

Tuesday 9,18.1984

9.00 - 11.00 Open Discussion: Special Problems

11.00 - 12.30 Closing Session: RECOMENDATIONS AND DESICIONS

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of DISTRICT ENGINEERS (MOI)
Subject was discussed with Dean Kamel Fa
Shown to Dr Adel.

CONSTRUCTION INSPECTION AND QUALITY CONTROL

FOR

(DISTRICT) ENGINEERS

1st WEEK

9:00 to 11:00	11:00 to 13:00	13:00 to 15:00
1st DAY OR Introduction welcome and opening ceremony	OR MOI plans and Activities	OR/EMK Structure Replacement(SR)Program - what is planned - Implementation - Engineering & Administrative Organizations in Directorates and Cairo
2nd DAY OR - Laws related to Construction Contracts	EMK. Monday 1-3/1 - The basic structures of (SR) program. - What has been learned from the first phase of the (SR) program. - Necessity for continual inspection.	EMK. Brief test to evaluate language and technical knowledge of participants.
Thursday 11-2 3rd DAY EMK - Building up an inspection organization. - Inspection practices in Egypt (MOI) - Responsibilities & Relationship between the Administrative/Engineering staff of MOI, from the Director General down to the technician.	EMK/OR - The importance of specification. - The importance of understanding the contract documents (drawings & specifications).	EMK/OR Necessary actions when executed work does not comply with the specification.

Materials of construction & Quality control. →

:h DAY EMK omponents of construction f the (SR) program: Exca-ation; dewatering; plain reinforced concrete; rick, stone and masonry ıortars; steel gates and ıisc. steel.	EMK Ma`erials of construction cement; aggregates; water reinforcing steel; bricks, stone, steel gates & steel works.	Open discussion
5th DAY EMK/OR Range of loads/stresses ; the components of construction. Range of pressures on soil.	OR - Brief review of excavation & dewatering methods. - What is practiced in similar construction works.	Substitute General Construction Management Soil Compaction - Effects of soil compaction on its bearing capacity. - Tests for soil compaction.
6th DAY EMK/OR Fundamentals of concrete - Hydration - Properties of Fresh concrete - Workability - Setting time - Properties of hardened concrete - Durability - Strength - Abrasion - Strength gain - Rate - Water Cement Ratio - Curing - Setting Sequences - Specifications	EMK/OR Reinforced concrete Design factors influencing inspection. Deflection and corresponding Placement of steel Steel for temp changes Main reinforcement for shear, tension, compression.	EMK/OR Quality of Ingredients - Cement - Factors affecting quality - Types - Water - Cleanliness - Undesirable chemicals - Aggregate - Gradation - Quality - Clearliness - Steel

9:00 to 11:00	11:00 to 13:00	13:00 to 15:00
1st DAY EMK Mixing & placing of concrete - Mixing methods - Time requried for adequate mixing - Sequence of placement within forms - Cold joints - Time costraints in placement (hot weather precautions). - Vibration	EMK Curing & finishing of concrete Impacts of curing Curing methods Finishing objectives Finishing methods	EMK Expansion & contraction - Effects of temp changes - Types of joints - How to construct joints - Spacing & location
2nd DAY EMK/ Design of concrete mixtures - Selection of strength - Water cement ratio - Quality of aggregates - Quality of ingredients WED 9-11 /2	SAT 9-11 EMK/OR Forms - Types - Braces & ties - Structural requirements - Tightness - Removal time	EMK/OR Testing of fresh & hardened concrete - Quality of ingredients - Slump - Temperature - Strength - Destructive, non-destructive
3rd DAY EMK SAT 11-1 Concrete Repairs Causes of defects in concrete Methods of repairs a) Prior to setting b) Immediately after setting c) After a longer time	EMK SAT 1-3 Necessary tools for concrete construction - Brief description of tools required, for mixing; delivery;consolidation; curing of concrete works.	EMK Thursday 1-3 /2 Open discussion or free afternoon
4th DAY F.F Masonry construction - Uses in MOI & particularly (SR) structures - Structural uses - Non-structural uses - Construction Techniques	F.F Masonry materials Types of clay bricks & concrete blocks - Qaulity requirements - Mortar - Inspection - Government laws related to production of clay bricks	F.F AWARD Repairs of Masonry structures Causes of defects Methods od repairs a) Immediately after construction b) After a longer time

5th DAY OR Gates - Types used in MOI works - Other types of gates - Installation procedures	OR Protection of metal works - Painting - Types of paint - Metal preparation - Application	OR Steel & metal construction Cutting Welding Shapes Tolerances
6th DAY EMK/OR Concrete pipe culverts - Quality control - Installation procedures	EMK/OR Pitching	EMK/OR Brief test to evaluate effect and understanding of course.

3RD WEEK

1ST DAY – Field trip to Cairo tunnels & 15TH MAY Bridge

2ND DAY – FIELD trip to Directorate of Ismailia.

3RD DAY – Field trip to Es-Salam project – Port said

4TH DAY – Alternative materials for brick construction or Trip to a Brick factory.

5TH DAY – Computation of Quantities for concrete, Brick & stone masonry, earthworks.

6TH DAY – CLOSING CEREMONIES

Note: Field trips may scheduled to be spread during the lecture period (one trip every four days).

STRUCTURAL REPLACEMENT WORKSHOP FOR IRRIGATION GENERAL DIRECTORS

Sept. 15th - Sept. 18th 1984

Saturday 9.15.1984

9.00 - 10.00 Registration, Introduction, Welcome, and Opening Ceremony

10.00 - 12.00 Structural Replacement Program and MOI Strategy
- What is planned.
- How it will be implemented.

12.00 - 1.30 Open Discussion

1.30 - 3.00 Construction Contracts and Laws Related to them

Sunday 9.16.1984

9.00 - 10.00 CONSTRUCTION MANAGEMENT (part 1)

- What has been learned from the first phase of the (SR) program.

  Necessity for continual inspection.

  Responsibilities and Relationship between the Administrative/Engineering staff of MOI, from the Director General down to the technicians

  Building up and inspection organization.

10.00 - 12.00 CONSTRUCTION MANAGEMENT (part 2)

The importance of specifications.

Necessity actions when executed work does not

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comply with specifications.

When test should be made.

Keeping construction records

12.00 - 2.00 C IPONENTS OF CONSTRUCTION FOR THE (SR))GRAM AND THEIR INGREDIENTS

Cement: Factors Affecting Quality, Types.

Aggregate: Quality, Gradation, Cleanliness

Water: Cleanliness, Undesirable Chemicals.

Reinforcing Steel: Types & Sizes, Quality, Field Storage, Cleanliness, Cover, Laps, Bonds, Placing & Securing.

Brick and brick mortars, forthcoming restrictions

Steel Gates, and steel works.

2.00 - 3.00 FORMS

- Specifications and Types.
- Braces and Ties.
- Structural Requirements.
- Tightness
- Removal Time

Monday 9.17.198!

9.00 - 10.30 DESIGN FACTORS INFLUENCING INSPECTION FOR REINFORCED CONCRETE

- Deflection and Corresponding Placement of Steel
- Steel for Temperature Changes.
- Shear and Placement of Steel

10.30 - 12.00 DESIGN OF CONCRETE MIXTURES

- Selection of: Strenth, Water-Cement Ratio, Quantity of Aggregates
  Quantity of Ingredients

Enclsoure V

TRAINING

ISMAILIA DIRECTORATE

TITLE OF EMPLOYEE	No. OF PERSONNEL IN THE DIRECTORATE	No. OF PERSONNEL TRAINED	TYPE OF TRAINING
U.S.	1	1	Management Skills
D.G.	1	-	-
Deputy	1	-	-
Insp.	2	-	-
D.W.	1	1	1 Design of Struct.
A.D.W.	3	1	1 Design of Pumps
Eng.	10	1	1 Design of Irrig. Structure

Enclosure VI

TRAINING

EAST DAKAHLIA

TITLE OF EMPLOYEE	No. OF PERSONNEL	No. OF PERSONNEL	TYPE OF TRAINING
U.S.	1	1	Water Management
D.G.	1	1	Management skills
Insp.	2		-
D.W.	6		-
A.D.W.	4		-
Eng.	30	2	Water Management Design of pipe-lines

TRAINING

EL Sharkia Directorate

TITLE OF EMPLOYEE	NUMBER OF PERSONNEL	NUMBER OF PERSONNEL TRAINED	TYPE OF TRAINING
U.S.	1	1	Management Skills
D.G.	2	2	Construction Mgt.
Ensp.	2	2	
D.W.	5	5	Design of Projects
D.W.	7	5	
Eng.	15	12	

Enclosure VIII

IRRIGATION STRUCTURE

WEST DAKAHLIA

TYPE OF STRUCTURE	PROGRAM STRUCTURES No.	PROGRAM STRUCTURES VALUE	COMPLETED STRUCTURES No.	COMPLETED STRUCTURES VALUE	UNDER CONST. STRUCTURES No.	UNDER CONST. STRUCTURES Value
Intake & Head Regulator	174	1,646,643	99	816,218	16	153,363
Steel Gates	169	401,584	75	258,711	21	13,236
Bridges	176	2,672,563	123	1,743,781	8	58,960
Tail Escapes	46	207,200	41	150,722	7	13,000
Siphons & Aquaducts	21	90,000	16	103,783	4	11,330
Weirs	16	70,000	-	-	-	-

Note: Program was an estimate; therefore, number of completed structures and structures under construction does not equal program structures.

Enclosure IX

IRRIGATION STRUCTURE

ISMAILIA

TYPE OF STRUCTURE	PROGRAM STRUCTURES		COMPLETED STRUCTURES		UNDER CONST. STRUCTURES	
	No.	Value	No.	Value	No.	Value
Intake & Head Regulator	524	567,790	703	488,276	62	283,404
Steel Gates	28	68,300	12	15,413	1	20,587
Bridges	22	279,261	16	182,407	17	150,823
Tail Escapes	7	24,180	7	24,517	-	-
Siphons & Aquaducts	4	33,000	-	-	8	46,713
Weirs	1	11,000	-	-	1	11,396

Note: Program was an estimate; therefore, number of completed structures and structures unc construction does not equa; program structures.

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Enclosure X

IRRIGATION STRUCTURE

SHARKIA

TYPE OF STRUCTURE	PROGRAM STRUCTURES		COMPLETED STRUCTURES		UNDER COST. STRUCTURES	
	No.	Value	No.	Value	No.	Value
Intake & Head Regulator	213	1,201,000	235	1,306,425	-	-
Stell Gates	168	495,500	173	607,000	-	-
Bridges	302	2,750,000	306	2,960,982	-	-
Tail Escapes	60	306,000	68	332,230	-	-
Siphons & Aqueducts	115	708,923	131	788,485	-	-
Weirs	-	-	-	-	-	

Note: Program was an estimate; therefore, number of completed structures and structures under construction does not equal program structures.

Enclosure XI

IRRIGATION STRUCTURE

EAST DAKAHLIA

TYPE OF STRUCTURE	PROGRAM STRUCTURES		COMPLETED STRUCTURES		UNDER COST. STRUCTURES	
	No.	Value	No.	Value	No.	Value
Intake & Head Regulator	94	1043,180	62	760,167	1	8,000
Steel Gates	177	529,000	113	376,000	31	82,500
Bridges	234	2,580,597	186	2,323,000	4	70,000
Tail Escapes	-	-	4	12,000	-	-
Siphons & Aqueducts	29	145,400	15	68,056	-	-
Weirs	6	19,000	-	-	-	-

Note: Program was an estimate; therefore, number of completed structures and structures under construcction does not equal program structures.

Enclosure XII

IRRIGATION STRUCTURE

BEHEIRA

TYPE OF STRUCTURE	PROGRAM STRUCTURES		COMPLETED STRUCTURES		UNDER COST. STRUCTURES		NOT STARTED CONT. STRUCT.	
	No.	Value	No.	Value	No.	Value	No.	
Intake & Head Regulator	61	2,078,795	62	2,014,321			5	
Stell Gates	257	700,836	153	618,717	37	62,917		
Bridges	214	2,843,995	197	2,765,875	18	60,000		
Tail Escapes	40	930,345	28	122,400				
Siphons & Aqueducts	-	-	14	59,468	-	-		
Weirs	2	59,000	3	105,000	-	-		

Note: Program was an estimate; therefore, number of completed structures and structures under construction does not equal program structures.

Enclosure XIII

Total Number and Value of Irrigation Structures
Completed and Under Construction in Phase I Directorates
(By Type of Structure and Directorates)

Value shown in L.E. 1000

Type of Structure	Total		East Dakahlia		West Dakahlia		Sharkia		Ismailia		Beheira	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Intake & Head Regulator	1240	5830	63	768	115	970	235	1306	765	772	62	2014
Steel Gates	616	2055	144	458	96	272	173	607	13	36	190	682
Bridges	875	19313	190	2391	131	1802	306	2961	33	333	215	2826
Tail Escapes	155	655	4	12	48	164	68	332	7	25	28	122
Siphones & Aquedacts	188	1079	15	68	20	115	131	789	8	47	14	60
Wers	4	116	–	–	–	–	–	–	1	11	3	105
Total	3078	20048	416	3697	410	3323	913	5995	827	1224	512	5809

FIELD NOTES 12-4-84

Inspected bridge slab being poured in Giza Directorate.

Personnel; John Addink, Larry Harris and Evan Krith.

Contractor Equipment; Engine driven one quarter CY mixer. Engine driven vibrator.

Many laborers - Cement is in 101# bag-Aggregate in three piles placed on ground, sizes 1 1/2" to 3/4", 3/4" No. 4, sand. Hand washed some sand and it appeared clean.

Concrete from mixer, look good but was over wet for high strength bridge slab. Workman were dragging concrete 15Ft. to 20Ft. from mixer, which is not desirable. Smooth reinforcing steel was laying on bottom forms and wall steel was touching wall and end forms. Also undesirable.

Inspection of El Ismailia Directorate 12-8-84

Personnel John Addink, Larry Harris, Ed Stains USAID, Dr. Meguid, Dr. Hindy and Mr. Nasser.

Ask standard questions as per list prepared by team in interview with officials.

Field Inspection

First Structure Inspected

Head Regulator Intake & Bridge - Location K. .07 - Bahr El Ramle El Gedid canal.

Description: Double square gated - screw operated - control structure with lateral turn (Intakes) out at 90 degrees to main canal. Observed bridge with parapet walls, concrete not finished - reinforcing, steel exposed on bottom of slab and sides of parapet walls - some pitching has broken up on down steam right slops. General appearances of structure look good - gate appear to be greased and operational, some signs of rock pockets in concrete. General appearance is good but construction practice make structural soundness questionable.

Second Structure 12-8-84

30 Ton Bridge - Location - K 1.5 - Bahr El Ramle El Gedid Canal

Third Structure

Head Regulator - Location - K. 4.0 - Bahr El Ramle El Gedid Canal

Description: Double squares gated control structure gear type lift - trunout 90 degrees to canal up steam from structure, bridge with parapet walls. Observation - concrete not finished - Steel exposed on bottom of slab and sides of parapet wall - Some steel exposed due to concrete spalling on corner at bridge slab - bridge slab rough. - General appearances of structure looks good. Some signs of rock pockets.

Fourth Structure Inspection - Location - Ismailia Canal to El Saadat

Canal - Intake Structure

Description: Double 1 meter Diameter Pipe Crossing with square gate to control flow from main canal to lateral canal, pipes are under main road. Pitching is eroding at down stream and - left bank some heavy silting is occuring at inlet end of pipes.

Field Inspection 12-10-84

Location - K. 1.5 Dababra Canal - Bridge

Field Inspection Structure No. 2 - Bridge - rockpockets - steel exposed - structure is less than three years old - should have maintenance repair soon - deck steel exposed 3 inches deep into slab - slab and bridge beams cold jointly with many rock pockets. Pitching was coming loose on ditch ınk in places.

Field Inspection - Intake Structure - Location - Bahmas Cnal From Dababra Canal

Structure No. 3 - Intake Gate Structure almost completed - mason were working on pitching - Structure poured with mechanical mixer and vibrating equipment. Structure looked good. Older structure on main canal to repalce older weir built in past - steel exposed and same problem as observed is other structures.

Field inspection Structure No. 4 - Head Regulator - Location - K. 5.2 El Kanayat Canal - Gated Control Structure - same problems of steel and pitching - general appearance of structure look o.k. Floating debris is a problem as it is in mamy areas.

Inspection of El Sharkia Directorate 12/10/84

Personnel J. Addink, L. Harris, Dr. Hindy, Mr. Nasser, Dr. Meguid and personnel from Directorate.

1. Observed irrigation canals that have been cleaned by mechanical equipment - large and small sized canal. Some trees cleared to clean small canal - cleaning work look good.

2. This directorate is not changing former head gate size under SR program to regulate farmers rate of flow as some other directorates are doing.

3. Intake Structure - Location K. 0.20 - Beny Shebl Canal from Dababra Canal - Field Inspction Structure No. 1 - Control gate - structure almost completed. Concrete has been mechanically mixed and vibrated - Appearance of structure was very good. Plywood Forms used - laborers were excavating for the placing of pitching. This structure is an improvement over other inspected. Existing bridges and Pitching in same area needs repair - 50 to 70 year old structures still sound but pitching needs rebuilding and structure needs grouting and other work repair.

Inspection of Kalioubia Directorate 12-11-84

Team imspected old structures prior to replacement of Phase II of SR program. This was the reference of what the condition of structures might have been that have been replaced in Phase I.

Personnel - L.Harris, John Addink, Dr. Hindy, Mr. Nasser, and Directorate personnel.

1. Field Inspection - Tail Escape - First Structure Replacement - 30 years old metal gate and 0.50 meter metal pipe needs replacement. Replace with same sizes.

2. Field Inspection - Head Regulator - Second Structure - 2.0 meter metal pipe and metal gate needs replacement - replace with same sizes.

3. Field Inspection - Intake Structure - Third Structure - 1.0 meter metal pipe and screw metal gate will replace with rectangle box with reinforced - concrete top and metal gate.

4. Field Inspection - Bridge - Fourth Structure - 0.75 arch road crossing to be replaced with 4.0 meter bridge to remove restriction of flow in canal. Debris and size of opening is a problem at present.

5. Field Inspection - Bridge - Fifth Structure replacement - 0.75 meter arch with 4 meter bridge and head walls also will fix Bridge inlet and laterial inlet with head wall and steel gate.

After our review of these structures we concur that they should be replaced under the SR program. This inspection has given Team the background necessary to understand what conditions the newly constructed structures were in before replacement in Phase I.

Inspection of East Dakahlia 12-12-84

Personnel - L. Harris, John Addink, Dr. Hindy, Mr. Nasser and directorate personnel.

Bridge Field Inspection - Location K. 1.35 - El Maslamania Canal - First Structure - 2 Span Birdge - End steel showing - Pitching is slipping into canal - crack at cold joint in parapet wall on down stream end. No sign of repair of rockpockets - Honeycomb areas where steel is exposed.

Head Regulator & Intake Structure - Location K. 6.5 - El Zahayra Canal - Field Inspection - Second Structure - Regulator & Intake structure - slab Bridge over 1.5 meter box and 3.0 meter box with head gates - gear operated gates to be installed later, construction in 1983 - bottom slab steel exposed.

Head Regulator - Field Inspection - Location - Temed Canal - Third Structure - Slab Bridge over 3.0 m wide box 2.5 m deep - Bottom slab steel exposed - steel poured on forms 40% of the bottom steel exposed, gate ready to be installed - some pitching failed. Gate is on job site to be installed later.

Head Regulator - Field Inspection - Fourth Structure - Location - El Shoun Sofla Canal - Slab bridge with regulator across 3M X 3M Box - Gate to be installed later - 50% steel exposed in Bridge slab - gate is on job site.

Intake Structure - Field Inspection - Fifth Structure - Location - El Shoun Sofla Canal - Slab bridge Intake Structure - over 1.5 m wide 2.0 deep - Box Structure made of brick - delivers water to small lateral 40% bottom slab reinforcing bar exposed.

Field Inspection - Sixth Structure - Box Culvort with Intake Structure - Location - Khazendar Canal - Slab Bridge over 2m X 2m - Box culvort type - Gate Operator in bad repair - structure 2 year old - some pitching has failed - stop logs in structure to shut off water conveys water under main road to lateral. Operator of gear operated gate out of alignment. Foundation slab failure.

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Field Inspection - Seventh Structure - Head Regulator - Location - K. 5.2 Abd El Naby Canal - Slab Bridge over - opening 2m CC 2m - Gate controlled by Gate Gear operator, structure looks good - 5% of steel exposed.

Field Inspection - Eighth Structure - Bridge - Location - Abd El Naby Canal - 5 bridge - no regulation of water, standard design - some rock pockets not repaired - general appearance good.