

XD-AAP-707-A

• ISN 35794

EVALUATION OF
CONSTRUCTION MANAGEMENT CONTRACT

BEEN

DDR INTERNATIONAL OF ATLANTA, GEORGIA

AND

THE MINISTRY OF DEVELOPMENT, STATE OF
HOUSING AND LAND RECLAMATION, A.R.E.

FOR

USAID/CAIRO
U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

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JULY 22, 1984

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EVALUATION OF CONSTRUCTION MANAGEMENT CONTRACT

I. EXECUTIVE SUMMARY

The purpose of this evaluation was to determine the effectiveness of a pilot-type project for the transfer of Construction Management (CM)^(*) technology to selected Egyptian construction firms by DDR International, a U.S. firm specializing in construction management services. The chronic and lengthy delays in completion, and cost overruns on USAID-financed construction projects in Egypt, especially those undertaken by Egyptian firms, greatly concerned USAID/Cairo and it was evident, at an early date, that these firms needed expatriate assistance to upgrade their implementation capabilities. At about the same time, during 1980-1981, DDR was coincidentally providing limited CM services to the El Nasr General Construction Company (ENGC - a local public sector firm with the Ministry of Development, State of Housing, and Land Reclamation (MCHAR)). ENGC, which had contracted DDR with its own funds, strongly desired that DDR continue to assist them and, consequently, requested its parent Ministry to approach USAID/Cairo to finance the dollar portion of a longer term contract between itself and DDR. As these events progressed, it became apparent to USAID/Cairo that a broader CM assistance program would be more useful, and that DDR, because of its success with ENGC, was the most logical firm to implement such a program. Accordingly, a sole-source waiver to permit MCHAR to contract with DDR was requested from AID/W and this was subsequently approved by the Administrator of AID on November 6, 1981. Thus, on March 28, 1982, a contract was signed between MCHAR and DDR in the amount of US \$1.25 million and L.E. 360,476. The duration of the contract was for 18 months. DDR was to provide for 238 person-months of services (138 expatriate-100 Egyptian). The contract

(*) CM is basically the conduct of construction operations utilizing network scheduling techniques such as the Critical Path Method (CPM), or Precedence Diagramming Method (PDM). The development of a CM schedule is the result of a systematic logic process and it represents the ultimate tool for controlling the entire project. The schedule details key elements of the job which must be either concurrently or sequentially accomplished to permit efficient progression of the work.

also specified that CM assistance was to be extended to 4 other firms, in addition to ENGC. One of the other firms was the El Nasr Company for Civil Works (ENCW), which had a contract with the Ministry of Irrigation (MOI) for construction of 37 irrigation pumping stations on the Nile River.

DDR officially commenced work under the contract on August 15, 1982 and implemented their assignments in two phases: Phase I applied to all five firms (4 from the public sector; 1 from the private sector) -- these firms received direct engineering assistance on selected projects; training in CM techniques (formal instruction was given under the auspices of MOHAR's Training Office (TOMCHAR); and analysis of their existing organizational structure and practices to better support project implementation. Phase II was exclusively directed to ENGC, the company DDR had previously worked with. This phase consisted of overall managerial assistance which involved the design of improved management systems and subsystems.

DDR's assistance to the ENCW should also be specially noted. Under the original contract, DDR provided only direct engineering assistance to ENCW on 7 of the 37 pumping stations. The construction of these 7 stations soon showed a much better rate of progress due to DDR's inputs while the other 30 continued to languish. In mid-1983, the MOI requested USAID/Cairo to extend DDR's services to cover the remaining 30 stations, and expand the CM training to both ENCW and MOI personnel. The need for and value of this extra effort on the part of DDR was quickly recognized by USAID/Cairo and another waiver to amend DDR's contract was consequently approved by the Acting Administrator of AID on August 24, 1983. The amendment to the contract between DDR and MCHAR was formally signed on February 11, 1984 for US \$208,800 and approximately L.E. 65,000. DDR agreed to provide an additional 32 person-months of services (17.5 expatriate-14.5 Egyptian) through February 1985.

On the basis of its findings, the Evaluation Team concludes that DDR achieved most of the contract's objectives involving direct engineering assistance, management systems, organizational design and training. The Team is further satisfied that DDR, under the provisions of its contract amendment, is continuing to provide beneficial services to ENCW on the irrigation pumping

stations. The Team found that DDR carried out its work to the highest standards and its performance was in the good to excellent range. DDR was most successful in providing direct assistance on the project site. The rate of completion on projects where they made personal inputs increased, and some were even finished on-time or ahead of schedule. Less successful was the formal classroom instruction mainly because of the language barrier and the advanced nature of the subject. Overall, the record positively indicates that DDR's assistance to those Egyptian contractors participating (particularly ENGC and ENCW) was beneficial and that CM techniques can be successfully introduced in Egypt.

The success of this pilot-project indicates that an expanded technical assistance program in CM could result in very substantial benefits to the Egyptian economy and development of the nation's infrastructure. Consequently, the Team recommends that USAID/Cairo consider an expanded CM technical assistance program, basically structured along the lines of the DDR effort, and implement it as soon as possible. A 30-month effort, which would cost approximately US \$3.5-4.0 million is suggested. This effort would encompass at least double the number of firms worked with under the pilot project and provide the additional on-site time to achieve the best results.

In addition, the Evaluation Team recommends that henceforth, all AID-financed construction projects undertaken by U.S. firms, have a CM requirement. The mode of CM application should be decided on a case-by-case basis, considering the nature, status, and size of the project.

Although not specifically within the purview of this evaluation, but considered relevant to effecting greater economies on large engineering and construction projects, the Team also recommends that project designs by Architect-Engineer firms be subjected to Value Engineering/Value Analysis. (VE/VA is basically the evaluation of designs by a separate team of experts considering the function of the facility or process).

This evaluation spanned a period from June 6 (commencing with a two-day visit to Atlanta by a member of the Team) to July 22, 1984. This time span included 4 weeks spent in Cairo by each Team member.

II. INTRODUCTION

The purpose of this evaluation was to determine the effectiveness of a pilot-type project for the transfer of Construction Management technology to selected Egyptian construction firms by DDR International, a U.S. firm specializing in construction management services. The effort was to measure the degree of success or failure of DDR's services under their AID-financed contract with the Ministry of Development, State of Housing and Land Reclamation (MOCHAR), in order to ascertain whether such services would be beneficial to the Egyptian construction industry as a whole. Hopefully, this evaluation will provide USAID/Cairo guidance as to the validity of continuing to assist Egyptian construction contractors through an expanded Construction Management Technical Assistance Program, or to cease its efforts altogether.

Construction Management (CM) is basically the conduct of construction operations utilizing network scheduling techniques such as the Critical Path Method (CPM), or Precedence Diagramming Method (PDM). The development of a CM construction schedule is the result of a systematic logic process and it represents the ultimate tool for controlling the entire project. The schedule is not an inflexible one, but must be updated regularly for efficient utilization as the job progresses or changed conditions occur. Besides construction operations scheduling, network scheduling includes estimating resource requirements (labor, materials, and equipment); job costing; construction methodology; materials handling; and cost accounting. Network schedules are far superior to bar charts as they detail the key or critical elements of the job which must be either concurrently or sequentially accomplished to permit efficient progression of the work.

The methodology employed by the Evaluation Team to produce this evaluation was essentially a data gathering, review and interview process conducted to support an objective judgment of DDR's performance. All available files were reviewed in USAID/Cairo, the contractor's home office in Atlanta, Georgia, and in his Cairo office. Interviews were conducted with the two Ministries involved, i.e. MOCHAR and its Training Office (TOMCHAR), and the

Ministry of Irrigation (MOI). Numerous discussions were also held with USAID/Cairo personnel knowledgeable about the project and the contractor's performance. Further, key personnel were interviewed in each of the five Egyptian companies with which DDR worked. The Team held talks with several students that either had exposure to the DDR orientation course given in the U.S., or had attended one or more of the seminars that DDR gave in Egypt. DDR's company background was also reviewed for purposes of ascertaining its approach and design programs that are carried out for a client when employed for project implementation of construction management techniques.

This evaluation spanned a period from June 6 (commencing with a two-day visit to Atlanta by a member of the Team) to July 22, 1984. This time span included 4 weeks spent in Cairo by each Team member. A listing of the persons contacted and interviewed during this evaluation is contained in Attachment No. 1.

III. BACKGROUND:

A. USAID/CAIRO'S INVOLVEMENT WITH CONSTRUCTION MANAGEMENT

Long before USAID/Cairo became involved in financing any assistance for construction management services, it recognized that there was a decided need to assist Egyptian construction firms improve their organizational skills in planning and executing projects. Chronic and lengthy delays in completion, and cost overruns on construction projects prompted consideration to the introduction of modern scheduling techniques to help these firms upgrade their implementation capability. However, even though USAID/Cairo was aware of these shortcomings, and the need for technical assistance, it never designed a construction management component into its construction projects.

This need for but lack of know-how in construction management techniques was not only of concern to USAID/Cairo, but also to several farsighted Egyptian construction companies. One such company was the El Nasr General Construction Company (ENGC). To help ENGC overcome such deficiencies, it engaged with its own financing (in L.E.) the services of DDR in 1980-81. After recognizing the value of such assistance from this construction management firm, ENGC sought to have this firm continue with its services on a longer contractual basis but financed from donor sources such as AID. Thus, ENGC being a public company made overtures to its parent Ministry; i.e. The Ministry of Development, State of Housing and Land Reclamation (MCHAR) to seek assistance from USAID/Cairo to help finance a long term contract between itself and DDR.

By this time, MCHAR was well aware of DDR's successful assistance to ENGC, and thus agreed to make a request to USAID/Cairo for financial assistance. AID desired however, that such assistance should cover a much broader range of Egyptian construction companies rather than have DDR's efforts be concentrated on a single company. From this background, the AID

Administrator, at the request of USAID/Cairo, through the office of the Assistant Administrator for the Near East Bureau (AA/NE), approved a non-competitive contract award to DDR on November 6, 1981.

Satisfied with DDR's expertise and company background, a USAID/Cairo committee was formed and subsequently met and entered into negotiations with DDR. This committee was instrumental in reducing DDR's draft contract dollar-wise, and brought it in-line with the dollar amount that USAID/Cairo had budgeted for such services. This reduction, namely from 36 months to 18 months of contract services time, preserved the essential elements of DDR's services that the committee felt would adequately accomplish USAID/Cairo's view for a pilot-type project in construction management. Thus, on March 28, 1982 a contract was signed between MOHAR and DDR for 18 months duration at a cost of US \$1.25 million financed by AID and LÉ 360,476 provided for by the Egyptian Government. Under the contract terms, DDR was to provide for 138 person-months of expatriate, and 100 person-months of local services, for a total of 238 person-months. The contract represented a USAID/Cairo pilot program which focused on five companies (4 public and 1 private) in the Egyptian construction industry. The Letter of Commitment was issued April 4, 1982. Actual work on the contract commenced on August 15, 1982 and ended 18 months thereafter in February 1984. The contract was financed from the Technical and Feasibility Studies Project Grant (263-0042).

B. EXTENSION OF DDR CONSTRUCTION MANAGEMENT SERVICES

One of the companies that received assistance under DDR's original 18 months contract was the El-Nasr Company for Civil Works (ENCW). This company is a public company which reports to its parent Ministry, MOHAR. However, the 37 pumping stations fall within the purview of the Ministry of Irrigation's (MOI) responsibility. During the 18 months covered under the original contract, DDR provided only direct engineering assistance to ENCW for the rehabilitation of 7 of the 37 irrigation pumping stations on the Nile River. AID's involvement with the Irrigation Pumping Project (263-0040) is to finance \$19 million for the purchase of irrigation pumps and related

equipment. All infrastructure involving civil works (less the pumps and related equipment) is to be financed by the Egyptian Government and constructed by ENCW. Prompted by ENCW's inability to keep up with a realistic construction schedule to complete the remaining 30 stations, due to the company's poor managerial ability, it became evident that help was needed.

USAID/Cairo was contacted by MOI for an extension of DDR's services. The purpose of the extension was for DDR to provide direct management assistance and training in construction management topics to ENCW for the remaining 30 irrigation pumping stations which would require additional time beyond the ending date of the original DDR contract. On the basis of MOI's request, and USAID/Cairo's desire to expedite construction to bring it in-line with the PACD of August 31, 1984 for the Irrigation Pumps Project, AID/W was called upon for approval of such an extension. On August 24, 1983 the Acting Administrator signed an action memorandum from the AA/NE which gave approval for an extension of the sole source waiver for DDR. This extension provided for 32 person-months of services by DDR at a cost of US \$250,000 which was to be funded from the Irrigation Pumps Project (263-0040).

The amendment to the contract was signed on February 11, 1984 between MCHAR and DDR. This amendment called for DDR's direct project construction management and training to the ENCW to cover the additional 30 irrigation pumping stations. A total of 32 person-months (17.5 expatriate - 14.5 Egyptian) was to be provided at the negotiated price of US \$208,800 and approximately LE 65,800.

C. DDR'S SCOPE OF WORK

1. Original Contract

- Provide overall managerial assistance to El Nasr General Contracting Company (Hassam Allam) (ENGC), and specific project assistance to the four other firms. The latter firms were selected after the contract was signed. The four additional firms were:

- o El. Nasr Company for Civil Works (ENCW)
- o Societe Egyptienne d'Enterprises (SEDE)
- o MISR Concrete Development Company (MISR)
- o Urban Development Co. for Investment & Contracting (UDICO)

Improve ENGC management systems in subsystems areas and implementation of these systems on the ENGC computer where possible.

Analyze the five companies' existing organizational structure and their refinement to better support projects, goals, and objectives.

Design a training program to upgrade individuals to perform in a new organizational environment.

Make the benefits of the work with these five firms available to the Egyptian construction industry through publications, presentations, conferences etc.

The DDR effort was to be carried out under the guidance of a Steering Committee that was to be headed by a representative of MOHAR. DDR chose to carry out the scope of work by dividing it into two phases. Phase I applied to all five companies. They were to receive only special or direct engineering assistance. Phase II applied only to ENGC. In this phase, it consisted of overall managerial assistance which involved the design of improved management systems and subsystems. Such systems, where possible, were to be programmed on the existing ENGC computer. Further, an analysis was to be made of ENGC's organizational structure. Training was to be involved in both phases.

2. Amendment to Contract (Extension)

This extension essentially called for DDR to provide the following services:

- Direct project management assistance to ENCW on the additional 30 pumping stations in the Irrigation Pumping Project (263-0040). This activity was to cover project planning, project team organization, scheduling, material and equipment expediting, construction methods engineering, time control and production expediting, site utilization, and training (OJT).
- Training in construction management topics in Egypt for ENCW and selected Ministry of Irrigation personnel.
- A final report was called for at the completion of services.

The amendment stipulated that the work was to be carried out under the guidance of a project committee headed by a representative of MOI.

D. STAFFING AND WORK PLAN

DDR initially staffed its contract with MOHAR with a small group of U.S. and Egyptian technical experts and administrative personnel that were in Cairo and Alexandria under the auspices of a short term contract financed by ENGC. This work involved services for the Ras El Soda Sewerage project in which DDR enjoyed considerable success and gained the confidence of its employer (ENGC) as a company which could offer them the needed construction management assistance. From this small staff stemmed a larger one which was comprised of US expatriates (director, engineers, system analysis personnel), and Egyptian engineers and technical personnel. This larger staff was assembled for DDR's contract with MOHAR. Attachment No. 2 lists DDR's Cairo team organization as it was comprised 15 March 1983. It should be noted that Dr. Gordon Davis, a principal in the firm of DDR, was not in Cairo full time. He made periodic trips to Egypt for the dual purpose of observing the progress of DDR's work effort, and to give the formal instruction for the three CM seminars that were held in Cairo. The consultant's engineer assignments are indicated in Attachment No. 3. Further, the consultant also prepared a comprehensive work plan (Linear Responsibility Matrix) for the entire 18 months which was followed closely throughout the course of the work. This work plan is shown in Attachment No. 4.

IV. DDR's PERFORMANCE

A. FROM PERSPECTIVE OF CLIENT MINISTRY (MOHAR) AND RECIPIENT COMPANIES
(Original Contract)

It was the consensus of the Ministry and the four public companies that DDR achieved about 80% of the contract's objectives. The consultant's expertise, efficiency and effort expended in implementing his assistance was rated as highly satisfactory. All believed that DDR was very capable and well suited to perform as a construction management firm. One company's chairman expressed DDR's greatest strength as "they kept plugging away." This remark was made in view of the fact that he felt that his company's engineers and other technicians did not know how to fully utilize DDR services. Another comment made and shared by all of the others interviewed, concerned DDR's management approach when formalized instruction was given. In this case, such delivery was considered to be a little too much, and given too fast for absorption by those who were being instructed or lectured. Some of the instruction was also lost since it was given in English, and, as such, was not readily understood in its entirety by those being instructed. However, it was felt DDR did its best in getting its instruction across.

The time element given the pilot program came into conversation with all of those interviewed. By and large, it was felt that had DDR's contract time been longer, much more could have been accomplished and the impact of construction management techniques as taught by DDR would have had more effect. It was also stated that more time should have been devoted to the various management concepts and techniques so that the various principles involved could have been better understood and learned. However, this comment did not apply to all persons receiving instruction since there were some who previously had exposure to construction management before DDR became engaged in this work in Egypt. It was obvious therefore, as one of the interviewees put it, that those who received the most benefit from the instruction were those who had been exposed to the material beforehand.

Other shortcomings that were expressed, not so much on the part of the consultant but on the contract's scope of work, were the absence of quality assurance, central controls such as cost control, a transportation network, equipment control, quantity surveying, and a total information system that a construction contractor needs to perform his work. Although most of these items were not specifically called for in the contract, DDR did cover them to some extent.

On the subject of training, it was generally stated that the consultant had not specifically "trained trainers" as called for in the contract. Had the contractor been given more time, they believed, this shortcoming would have been overcome. However, El Nasr General Contracting Company (ENGC) (Hassam Allam) which received the bulk of the effort under DDR's contract, actually set up during the contract period an "Allam Operating Group". The purpose of this group, as it was stated, was to carry on with construction management techniques as taught by DDR after the consultant's departure. Two of the ENGC engineers appointed to this group are full time instructors, having previously received DDR training. As a whole, and with the constraints of the contract, those interviewed generally agreed that they were satisfied with the training as given by DDR. However, they believed more formalized classroom training should have been introduced along with the direct assistance training that was given at the job sites.

The Company UDICO (Seoudi and Partners) fits into a special category than the other four. Specifically, it is a private company and not public like the others. UDICO gave the consultant a 90-day trial period after which they chose not to continue with their services. As stated by this company's officials, it desired to have Phase II services as accorded ENGC instead of Phase I assistance that the other four companies were receiving and which, in its opinion, it did not need. (See Section III-C-1 for definitions of Phase I and Phase II). It is worth noting, that UDICO, in the two-year period since DDR came and went, has grown substantially and is applying CM techniques as standard practice on their projects. However, they readily admitted they could use additional technical assistance and would like to participate in any

expanded CM assistance program. UDICO had, in fact, in February 1984 hired a British CM consultant to do an organizational and managerial study of their firm (in essence the Phase II assistance which they wanted from DDR).

B. FROM PERSPECTIVE OF RECIPIENT MINISTRY (MOI) AND ENCW
(Amendment to Contract)

It should be noted that the Ministry of Irrigation (MOI) became involved in both the major contract and the amendment through the assistance given by DDR to El Nasr Company for Civil Works (ENCW).

There appeared to be general agreement between the Ministry and ENCW that DDR had carried out its assignment in a most satisfactory manner. It was pointed out that with DDR assistance under the original contract, accelerated progress toward completion was made on the 7 irrigation pumping stations. It was here that DDR applied direct assistance using construction management techniques. It was revealed that a steering committee had been established in which DDR played a major role and had met on a regular basis or more often when a special situation arose which required remedial action. A noteworthy comment on training was that it was given to company level personnel but not to others in MOI as required by the contract. However, the on-the-job training given by DDR was well received and continues to be so under the amendment which involves 30 irrigation pumping stations. All expressed full satisfaction with DDR's methods and approach used in providing direct assistance on project management. For this endeavor, high marks were given. The time element involved in the contract arose here as it had with those interviewed in the other companies. It was expressed that the DDR engineers' visits at the various job-sites were too short in duration although a recognition was again given to contractual constraints. It was felt that under the circumstances however, company engineers and other technical personnel on the job-sites had and are still significantly benefiting from DDR's assistance.

C. EVALUATION TEAM'S FINDINGS

Much of what was stated by the two Ministries and the five companies was to a large extent acknowledged by conversations with DDR key personnel (in Atlanta and Cairo). Some of the shortcomings on the part of the consultant were not entirely his doing since the contract did not provide for certain services over a longer period of time. The greatest difficulty which the consultant encountered in carrying out the work was that involving time. Even though the time allotted for this USAID/Cairo pilot project was limited, the consultant managed to cover all aspects of the scope of work. DDR readily admits that the formalized training and direct project assistance could have been more rewarding had the contract been for 36 months rather than for 18 months.

Overall, there was conclusive evidence through conversations, interviews, record checks, files, monthly reports, and 6-month progress reviews, which corroborated the fact that DDR generally covered all aspects of their contract in a very satisfactory manner. Some of the more important aspects are as follows:

- DDR fielded a team of highly qualified and professional personnel.
- Direct engineering assistance was provided to the five companies, although the private sector company UDICO chose not to continue with such assistance for reasons of its own, and not because of DDR's efforts.
- ENGC was provided with managerial assistance on systems and subsystems, and such systems were programed, where possible, on the ENGC's existing English ICL computer. DDR also prepared programs for the eventual purchase of a NCR 8250 computer by ENGC.
- Steering committees in both Ministries were established and functioned with regularity as far as could be determined. DDR played an important and key role at these meetings.

- DDR conducted seminars in the U.S. and Egypt, although those in the U.S. can only be classified as orientation.
- Quality Control was adequately covered although Quality Assurance was not, since it was not a part of the contract.

The Evaluation Team found DDR's monthly reports and the 6-month progress reviews well prepared, informative and comprehensive. The final 6-month review covering the period September 1983 through February 1984 was not complete at the time of this evaluation. However, the Team obtained from DDR's Cairo office a draft (less Annexes) for review purposes. Since the extension to the contract is still in progress for the remaining 30 irrigation pumping stations, no final report is required by DDR at this time.

V. SUMMATION OF FINDINGS - BENEFITS/DRAWBACKS

Based on its findings, the Evaluation Team is satisfied that DDR achieved most of the objectives under the contract covering construction management assistance for direct assistance, management systems, organizational design and training. The team is further satisfied that DDR under provisions for its contract extension, is continuing to provide to ENCW, on the irrigation pumping stations, its services for direct project management assistance and training in construction management procedures. Further, the Evaluation Team concludes that DDR carried out its contractual work using the highest of standards and performance. The degree and quality to which such work was implemented is determined to be in the good to excellent range. This judgment is rendered on the basis of all of the team's findings, as well as an acknowledgement on the part of all of the companies that were exposed to DDR's efforts, that their respective company's operating effectiveness had risen.

However, the degree of success is impossible to measure in finite terms. DDR's self-evaluation indicates "80 percent" accomplishment of the objectives (relatively a very good mark), as measured against the performance standards they established, and arbitrary values assigned to these standards by them at the beginning of the job. These standards served a useful purpose in measuring achievement, but the numerical values assigned and reported as indicating progress are more qualitative than quantitative in nature—generally reflecting the degree of success by DDR. However, viewed, the record positively indicates that DDR's assistance to those Egyptian contractors participating (particularly ENGC and ENCW), was beneficial.

DDR was most successful in providing direct assistance on the project site. The rate of completion on projects, where they made personal inputs, increased, and some were even finished on time or ahead of schedule. Although DDR's claims of progress appear to be exaggerated in several instances, their presence and inputs undeniably had a positive effect. Less successful was the classroom instruction mainly because of the language barrier (instruction was given in English), and the fact that some of the subject material was "over

the students' heads. "These deficiencies emphasize the need for a more fundamental approach and instruction in Arabic. Of little value was the tour of U.S. facilities and projects by selected participants.

Except for ENGC (the Hassan Allam Company), which had previous exposure to CM techniques and was actively promoting its use within the company, and to some extent SEDE, the concept of CM had to be "sold" to the other public sector companies. Thus, because of CM's newness, and relative unfamiliarity of most Egyptian contractors with it, it is believed that this "sales effort" will continue to be necessary, at least for several years, or until CM practices take hold. The success of this pilot project indicates that an expanded technical assistance program in CM could result in substantial benefits to the Egyptian economy and development of the nation's infrastructure which is so vital to meeting its goal of self-sufficiency.

The situation of public sector vis-a-vis private sector construction firms in Egypt bears some comment. The public sector firms, all part of one Ministry or another, are inherently inefficient due to numerous GOE regulations which are disincentive in nature: e.g., (1) the workforce remains fairly constant regardless of the workload; (2) the hiring, firing, promotion and reassignment (sometimes arbitrarily done to the detriment of the job) of personnel requires Ministry approval -- inefficient or incompetent personnel are often simply shifted to mundane or unimportant tasks but they stay on the payroll at the same salary or wage; (3) completion schedules are seldom met (when imposed) since there are no punitive measures that can be invoked; (4) pay scales are fixed by the Ministry and although bonuses may be awarded, there are limits placed on these. Thus, in general, the incentives to produce quality work within specified time-frames for maximum profit simply do not exist. No public sector company ever goes out of business -- if it has a poor performance record, the Chairman is simply replaced. The private sector companies on the other hand, have no such restrictions -- they are in business for one reason, i.e., to make money, and their operations are conducted accordingly.

Although the utilization of CM techniques by the public sector companies should significantly improve their implementation capability, it will never be the panacea that might be envisaged by some unless operational constraints are rescinded or greatly modified by the GOE. However, corrective measures just may be induced sooner than later, if the private companies continue to enjoy the rapid growth growth rate they have experienced the last few years and, if they are successful in securing some of the major projects now being done exclusively by the largest public firms. In any case, it seems that somewhere along the line, the high cost of public sector construction and the current monopoly of the public firms should be evaluated against the economies that can be achieved by the private companies operating in a truly competitive environment.

VI. FRAMEWORK FOR AN EXPANDED CM TECHNICAL ASSISTANCE PROGRAM

In recent years, the complexity, cost, and coordination of large projects, to which CM is most applicable, has greatly spurred the utilization of CM techniques by U.S. and European firms. CM is indisputedly here to stay and is growing in sophistication and range of application, most recently being extended to cost evaluation and claims analysis. Computers have extended CM applications and a good deal of mainframe and mini-based management software has been developed for usage in project control.

CM can be either broadly or exclusively applied to projects. CM techniques may be utilized solely by the construction contractor to control his internal operations, as demonstrated in this pilot project. Or, CM responsibility may be vested in one firm which is responsible for total project control, from conception to completion, and whose services would include engineering design, inspection of the works, possible procurement of long-lead items, and application of Value Engineering/Value Analysis techniques. CM may also be vested in a third-party firm specializing only in CM, to oversee the design consultant and the construction contractor. By whichever mode, CM is rapidly supplanting the traditional process of an owner/client engaging an Architect-Engineer firm for design and supervision of construction, and then a contractor for the construction. Many of the larger A-E firms in the U.S. have developed their own in-house CM capability in response to the growing market for these services. Thus, there are both qualified A-E firms and specialized CM firms (like DDR) which can capably provide such services. Some construction firms and design/construct firms also offer CM services.

DDR's phased approach to familiarizing the Egyptian contractors it worked with is considered basically the best way to achieve success in any expanded CM technical assistance program. The first phase of classroom instruction and organizational studies of the respective company's management to structure CM into its operations and, the second phase, of direct project assistance on the job-site, worked rather well. Limitations were due to insufficient DDR staff,

the short tenure of their contract, and the language barrier. This emphasis on on-site operations is basically the best means of introducing CM in Egypt. To require CM on a total project level would be premature, where Egyptian contractors are solely involved.

The effectiveness and efficiency of TOMCHAR (Training Office) in MCHAR was extensively looked into by the Evaluation Team. It was concluded that TOMCHAR is the best GOE entity now existing to promote and effect CM in the Egyptian construction industry. No other Ministry has a similar organization as well-qualified. Moreover, the largest construction contractors in Egypt (including Arab Contractors, which accounts for over half of the construction volume) are part of the MCHAR. TOMCHAR's staff, though few in number, is competent, progressive, and deeply interested in teaching and promoting CM. In fact, TOMCHAR's training curriculum currently includes the CM course material developed by advisors from the International Labor Organization (ILO) (in 1980-81-82), but its application is largely academic. The training record of TOMCHAR over the last 3 years is also impressive--some 700-800 personnel have been trained in various technical, economic, and management subjects. To implement an expanded CM training program, TOMCHAR would require additional bilingual staff and funds.

Any expanded CM technical assistance program considered by USAID/Cairo should be essentially tailored along the lines of the DDR program and its mode of implementation as noted above (excluding the "training" component in the U.S. which was of little value). However, one of the primary and first objectives of such a program should be to make TOMCHAR capable of teaching CM principles and practices on its own. Despite the ILO and DDR efforts, TOMCHAR needs additional training in CM techniques. Training the trainer in this manner would then largely circumvent the language gap in getting the subject across. TOMCHAR's capability should be developed right at the outset and prior to undertaking classroom instruction for contractor's personnel. Instruction of contractor personnel would then be done by TOMCHAR staff with the continued advice of expatriate advisors. As contractor's staff are trained in CM principles and practices, and they return to their respective

companies, expatriate construction advisors would also join them for organizational studies and to provide direct on-the-job assistance. The only significant complaint by contractors on DDR's inputs was that their staff were not able to spend enough time with them at the work site. An expanded program should provide for substantial, if not full-time, advisory services by expatriate staff. These services should also be spent on large projects, and at the start of the work, insofar as possible. The duration of an expanded CM assistance program should span a period of at least 30 months to have maximum impact.

DDR worked with four public sector companies for the greater part of its contract, the private sector company UDICO having dropped out early in the process. The number of companies participating in an expanded effort should be at least double this sampling -- there are over 100 companies that are part of MCHAR alone -- and include the private sector. Thus, the program might involve, say, 8 public sector companies and 2 from the private sector. The public companies should be selected from the top and middle-range of contractors in MCHAR. DDR's success was mainly attributable to their excellent staff; they had the right temperament, tact, and were well-qualified in their line of work. Similar emphasis on staff quality should be a prerequisite for any new consultant.

VII. CONCLUSIONS AND RECOMMENDATIONS

On the basis of the results achieved by DDR on this pilot project, and from the numerous discussions with USAID/Cairo, GOE officials, DDR and Egyptian contractors' personnel, the Evaluation Team concludes that Construction Management techniques can be successfully introduced in Egypt. The CM seed has been firmly planted but further technical assistance is required for it to develop. Acceptance of CM will also be over the long-term, 5 to 10 years, but it is believed that significant results would be evident on several discrete projects much sooner. Consequently, the Evaluation Team recommends:

1. That USAID/Cairo consider an expanded CM technical assistance program structured along the lines of the DDR effort (modified as noted in the preceding Section) and implement it as soon as possible. It is roughly estimated that such a program, of 30 months duration, would cost approximately US \$3.5-4.0 million plus about 25 percent in local currency.

In addition, the Evaluation Team recommends:

2. That henceforth, all AID-financed construction projects undertaken by U.S. firms have a Construction Management requirement. Whether CM is implemented under the total project management concept, or under the 3rd-party mode, the decision should be on a case-by-case basis, considering the nature, status, and size of project.

Although not specifically within the purview of this evaluation, but considered relevant to effecting greater economies on engineering and construction projects financed by AID, the Team also recommends:

3. That project designs by A-E firms be subjected to Value Engineering or Value Analysis (basically the evaluation of design by a separate team of experts considering the function of the facility or process). The VE/VA team could be contracted for separately, or provided for as an independent entity in the contract with the A-E design firm. (AID already has an Indefinite Quantity Contract (IQC) with a firm for VE/VA purposes.)

PERSONS INTERVIEWED BY EVALUATION TEAM

DDR International

Dr. Gordon Davis	Principal in firm
Mr. Farid F. Naom	Former DDR Director/Cairo Office
Mr. Robert Faulkender	Current DDR Director/Cairo Office
Mr. Edward DuPree	Project Manager

GOE Ministries

Ministry of Development, State of Housing and Land Reclamation (MINH)

Mr. Said Abd El-Kader	First Undersecretary of State and President of T.O.M.O.H.A.R
Mr. El Sayed Abdallah Mohamed	General Director of T.O.M.O.H.A.R

Ministry of Irrigation

Mr. Ismail Badawi	Deputy Minister
Mr. Salah Shehab	First Undersecretary of State

Egyptian Construction Companies

Mr. Mohamed Hassan Allam	Chairman, El Nasr General Contracting Company (ENGC)
Mr. Mohamed Helmy Abdel Aziz	Head of all Construction Projects (ENGC)
Mr. Yosri Hussein	Manager Misr Concrete Development Company
Mr. Moustafa Atiba	Chairman, El Nasr Company for Civil Works
Mr. Ahmed Ibrahim Sayed Ahmed	General Manager for Upper Egypt (ENCW)
Mr. Mohamed Atif Zein	Chairman, Societe Egyptienne D'Entreprise
Mr. Mourad Nagi Aziz	Chief Engineer
Dr. Eng. S.A. Kareem	Board Member, Urban Development Company for Investment & Contracting (UDICO)
Mr. Taher Abdel Moneem	Director for Training and Cost Control (UDICO)

USAID/Cairo

Mr. Roy L. Robieson	DRPS/IDPS (Project Officer)
Mr. Robert B. Cook	DRPS/UAD (former project officer)
Mr. Tawfik Adly Kamal	DRPS/IDPS (project officer)
Mr. Riad Mounir Imam	DRPS/IDPS (Senior Engr. Advisor)

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DDR'S CAIRO TEAM ORGANIZATION

AS OF 15 MARCH 1983

Dr. Gordon Davis	Principal-in-charge
Mr. Farid F. Naom	Director, Cairo Office
Mr. Ed Dupree	Associate Director & Technical Mgr.
Mr. Victor Jackson	Associate Technical Mgr.-Projects
Mr. Robert Faulkender	Associate Technical Mgr.-Systems Analysis
Mr. Ray Self	Senior Engineer
Mr. James McCormick	Senior Engineer
Mr. Timothy Tonyan	Senior Engineer
Mr. Cecil Copeland	Senior Engineer
Mr. Michael Davis	Chief of Graphics
Mr. Hafez Afifi	Systems Engineer
Mr. Amr Hosny	Staff Engineer
Mr. Ayman Abdel Wanab	Staff Engineer
Mr. Magdy Mahmoud	Staff Engineer
Mr. Moustafa Koura	Staff Engineer
Mr. Baliegh	Staff Engineer

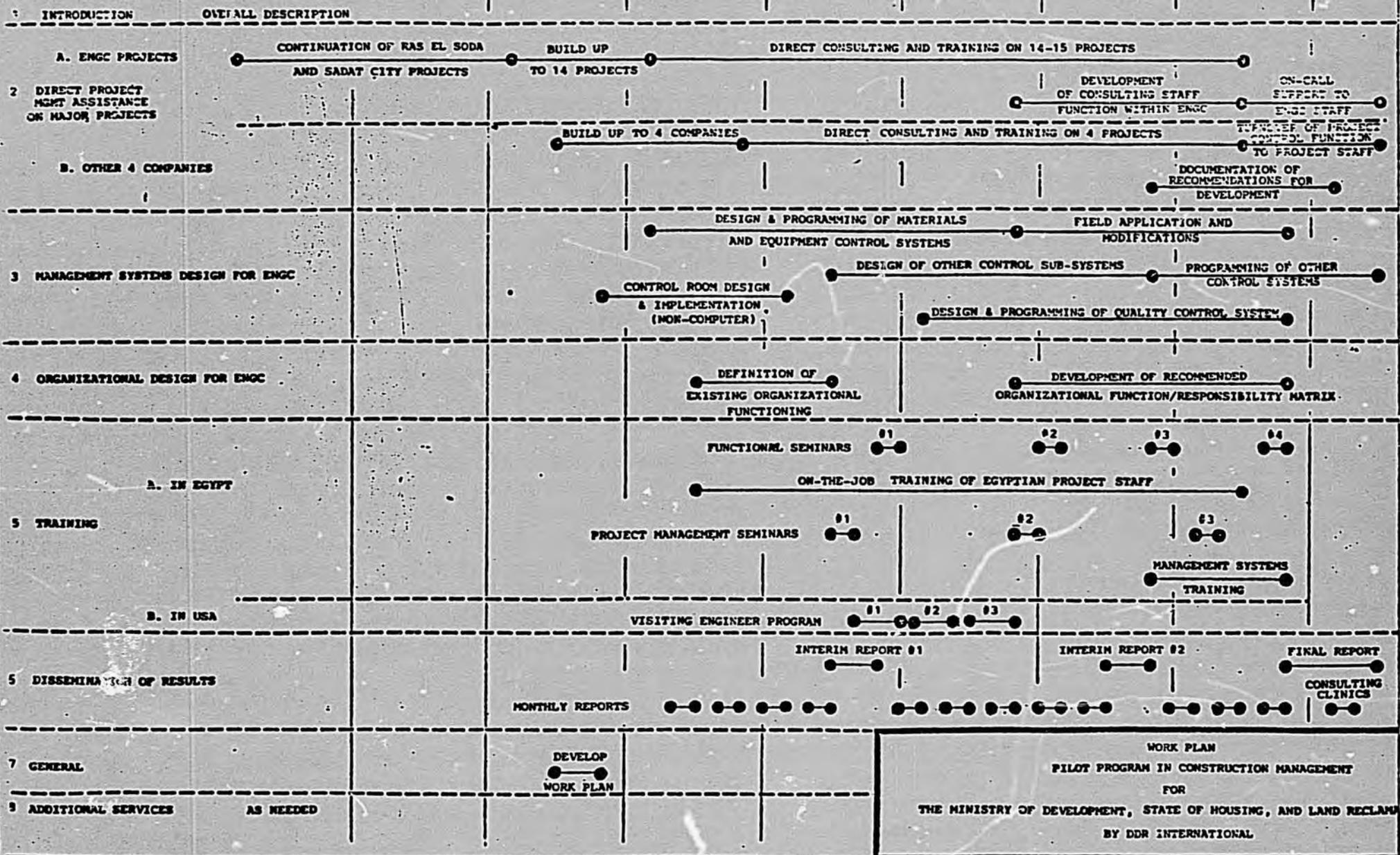
DDR'S ENGINEER ASSIGNMENTS

<u>NAME</u>	<u>PROJECT</u>	<u>COMPANY</u>
<u>Dupree</u> Tech. Manager & Associate Dir.	Irrigation Pumping Stations	El Nasr Co. for Civil works
<u>Jackson</u> Associate Tech. Manager	Auto Strade Ductile Iron Pipe Plant Housing Project	Allam Company Misr co. Urban Development Co.
<u>McCormick</u> Proj. Engr.	Sadat City Hotel Sadat City Visitors Center 6th Oct. City Sewer/Water 15th of May City Adm. Bldg. 6th Oct. City Roads Housing Project	Allam Company Allam Company Allam Allam Urban Development Co.
<u>Self</u> Proj. Engr.	Desert Road CAI/Alex Abu El Saoud Sewer 6th Oct. City Roads/Sewer	Allam Allam S.E.D.E.
<u>Tonyan</u> Staff Engr.	Ras El Soda I II III Ras El Soda Housing El Alamein Road	Allam Allam Allam
<u>Copeland</u> Eng. Asst.	Ras El Soda I II III Ras El Soda Housing El Alamein Road	Allam Allam Allam
<u>Hosny</u> Staff Engr.	CAI/Alex Desert Road Irrigation Project 6th Oc. Infrastructure Ductile Iron Pipe Plant	Allam El Nasr Co. S.E.D.E. Misr Co.
<u>Magdi</u> Staff Engr.	Sadat City Visitors Center 6th Oct. City Sewer/Water 6th Oct. City Roads Abu El Saoud Sewer	Allam Allam Allam Allam
<u>Michael</u>	Ras El Soda Sewer I II III El Alamein Road	Allam Allam
<u>Moustafa</u>	Ras El Soda Sewer I II III El Alamein Road	Allam
<u>Ayman</u> Staff Engr.	Sadat City Hotel 15th of May Adm. Bldg. Abu El Saoud Sewer. Housing Project	Allam Allam Allam Urban Development Co.

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INTENT CONTRACT EFFECTIVE DATE
 JAN. 25 EST. MAR 78 AUG 12, 1982
 1982 1983 1984

SCOPE OF WORK ITEMS | JAN -7 | FEB -6 | MAR -5 | APR -4 | MAY -3 | JUN -2 | JUL -1 | AUG 0 | SEP 1 | OCT 2 | NOV 3 | DEC 4 | JAN 5 | FEB 6 | MAR 7 | APR 8 | MAY 9 | JUN 10 | JUL 11 | AUG 12 | SEP 13 | OCT 14 | NOV 15 | DEC 16 | JAN 17 | FEB 18



WORK PLAN
 PILOT PROGRAM IN CONSTRUCTION MANAGEMENT
 FOR
 THE MINISTRY OF DEVELOPMENT, STATE OF HOUSING, AND LAND RECLAMATION
 BY DDR INTERNATIONAL

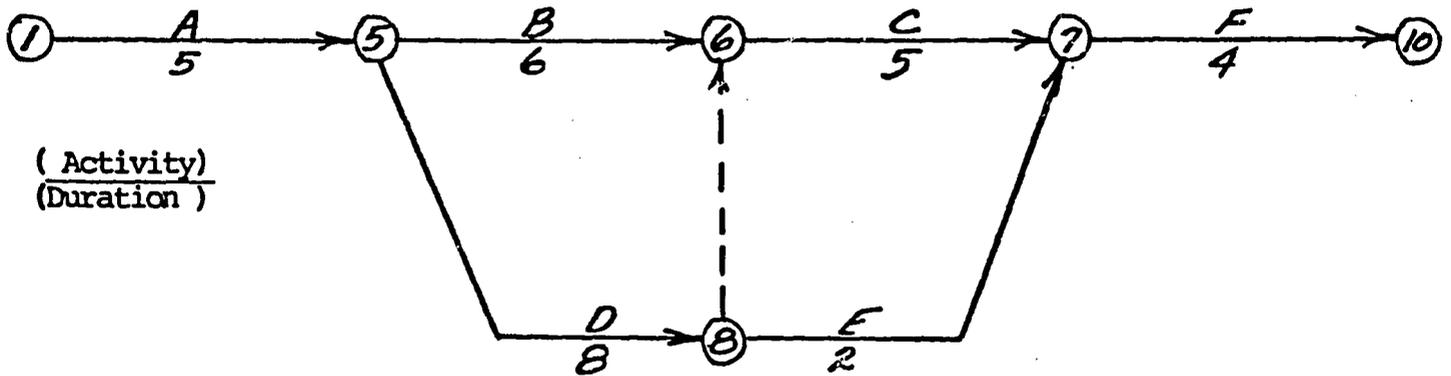
CRITICAL PATH METHOD (CPM) ILLUSTRATION
(i-j node computing)

NODE TABLE

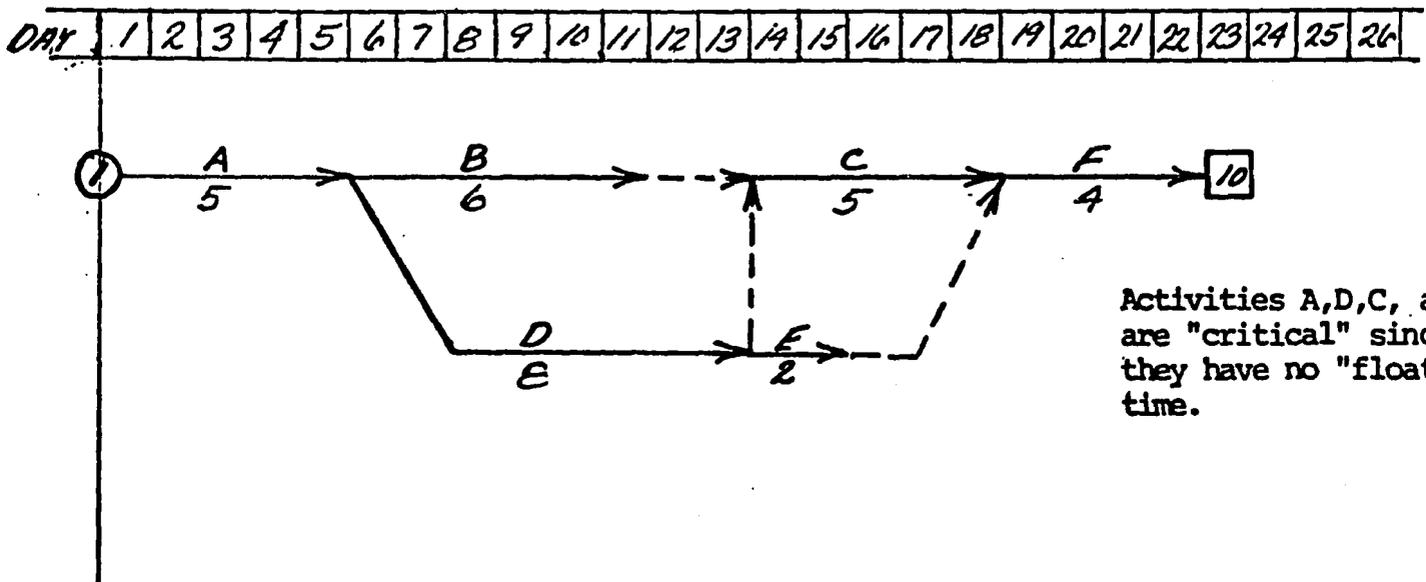
<u>i-j Numbers</u>	<u>Activity Description</u>	<u>Days Duration</u>
1-5	A	5
5-6	B	6
6-7	C	5
5-8	D	8
8-6	Dummy	-
8-7	E	2
7-10	F	4

Activities B and D must be finished before C can start.
B takes 6 days and D takes 8 days.

BASIC ARROW DIAGRAM
(22 Day Job)



TIME-SCALE ARROW DIAGRAM



PRECEDENCE DIAGRAMMING METHOD (PDM)

Assigns one number to the activity itself and simply lists all preceding activities - easier to update and revise than the i-j node method.

<u>ACTIVITY NO.</u>	<u>PRECEDING ACTIVITY NO.</u>	<u>ACTIVITY DESCRIPTION</u>
1	-	A
2	1	B
3	2,4	C
4	1	D
5	4	E
6	3,5	F

PRECEDENCE DIAGRAM

