ACADEMY OF SCIENCE AND TECHNOLOGY

.



GENERAL ORGANIZATION FOR HOUSING, BUILDING & PLANNING RESEARCH

Strength - of - Materials Research and Quality Control Division

# FEASIBILLITY STUDY ON CENTRALIZED CONCRETE MIXING IN EGYPT ( Ready Mixed Concrete )

Principal Investigator	:	Prof. M. Moustala El-Said
Vice Principal Investigator	:	Eng. Ali Abou Yousit
Co - ordinator	:	Prof. Ezzat H. Morsy

April, 1985

Cairo - Egypt

### FOREWORD

The use of ready mixed concrete by the construction industry, in most industrialized countries has been well established for years. In many of them, it presently accounts for about 50-90% of all in situ concrete used annually. In Egypt, it is only recently that ready mixed concrete can be seen used in few localities. The present study has been carried out with a view to throw light on the major aspects associated with the production methods and production costs. Then the study deals with a techno-economical aspects on the possibility of introducing the ready-mixed-concrete technology to the construction industry in some Egyptian regions of importance.

The study was carried out under the fulfillment of the protocol of a contract between the Academy of Science and Technology and the Research Centre for Housing, Building and Physical Planning.

III

#### FOREWORD

The use of ready mixed concrete by the construction industry, in most industrialized countries has been well established for years. In many of them, it presently accounts for about 50-90Z of all in situ concrete used annually. In Egypt, it is only recently that ready mixed concrete can be seen used in few localities. The present study has been carried out with a view to throw light on the major aspects associated with the production methods and production costs. Then the study deals with a techno-economical aspects on the possibility of introducing the ready-mixed-concrete technology to the construction industry in some Egyptian regions of importance.

The study was carried out under the fulfillment of the protocol of a contract between the Academy of Science and Technology and the Research Centre for Housing, Building and Physical Planning.

III

## ACKNOWLEDGMENTS

This study was carried out by a team effort. On behalf of the team, the leader would like to express his appreciation for the Academy of Science and Technology for its financial support.

Acknowledgment is also given to the Chairman of the Board, Research Centre for Housing, Building and Physical Planning for all the facilities extended.

1

Principal Investigator

M-ELSail

M. M. EL-SAID

#### MEMBERS OF THE STUDY TEAM

 Prof. M.M. El-Said, Previous Chairman of the Research Centre for Housing, Building and Physical Planning, presently the head of the Arab Research and Consulting Center, Arab International Bank, Cairo.

(TEAM LEADER)

 Eng. Ali Abou Yousif, Chairma, Misr Iran Building Materials, Consulting Engineer.

(VICE-TEAM LEADER)

 Prof. E.H. Morsy, Head of Strength of Materials Research Division, General Organization for Housing, Building and Planning Research.

(CO-ORDINATOR)

- Dr. Fatma E. El-Refai, Associate Prof., SNRD, General Organization for Housing, Building and Planning Research.
- 5. Dr. Omaima A. Salah Eldin, Researcher, SMRD, General Organization for Housing, Building and Planning Research.

6. Eng. R. Eskandar, Consulting Engineer.

7. Emg. S. Rasmy, Under-Secretary, Ministry of Planning.

In addition, Dr. A. Sh. Girgis (Researcher, GOHBPR) and Mr. F. Haggag have participated, partially, in the preliminary work.

## TABLE OF CONTENTS

Front Page I
Abstract II
Foreword III
Acknowledgmente IV
Members of the Study Team V
Table of Contents VI
SECTION ONE INTRODUCTION
1.1 OBJECTIVES OF THE STUDY 1.1
1.2 SCOPE OF THE STUDY 1.2
SECTION TWO READY MIXED CONCRETE TECHNOLOGY
2.1 ORIENTATION 2.1
2.2 DEFINITION
2.2.1. Dry Batch Plant, Truck or Transit Mixing Plant.2.22.2.2. Central Mixing Plant.2.22.2.3. Shrink Mixing2.2
2.3 HISTORICAL BACKGROUND ON THE STATUS OF READY MIXED CONCRETE IN SOME COUNTRIES
2.3.1. General       2.5         2.3.2. Present Situation       2.5         . Australia       2.9         . Britain       2.1         . Germany       2.1         . United States of America       2.1         . Egypt       2.1

2.4	FACTORS FAVOURING THE USE OF READY MIXED CONCRETE	2.16
2.5	ADVANTAGES OF READY MIXED CONCRETE	2.19
2.6	LOCATION OF BATCHING PLANTS; (DELIVERY RADIUS)	2.20
2.7	CLASSIFICATION OF BATCHING PLANTS	2.21
2.8	PRODUCTION OF READY MIXED CONCRETE	2.22
2.0		
	2.8.1. Materials Storage2.8.2. Cement Storage2.8.3. Aggregate Storage2.8.4. Mixing Water2.8.5. Admixtures	2.22 2.22 2.23 2.26 2.26
• .	2.8.6. Design of Concrete Mixes and Quality Control	2.26
	. Introduction . Design of Mixes . Production Capacity . Quality Control and Testing 2.8.7. Equipment	2.26 2.27 2.32 2.33 2.39
	<ul> <li>Quarrying and Transport Equipment for the Aggregate.</li> <li>Mixing Plant Equipment</li></ul>	2.39 2.43 2.51 2.56
	. Running Maintenance Running Repairs Major Repairs 2.8.9. Labour	2.36 2.57 2.57 2.57
	<ul> <li>Management</li> <li>Running Operations</li> <li>Repair Shop</li> <li>General Services Labour</li> <li>Site Services Labour</li> </ul>	2.57 2.58 2,58 2,58 2,58 2,59
	ION THREE	
	MATED ECONOMIC ADVANTAGES OF READY D CONCRETE FOR DIFFERENT REGIONS	3.1
3.1	SELECTED REGIONS OF IMPORTANCE	3.1

-

3.2	PUTURE STATUS OF SELECTED REGIONS	.1
	3.2.1. Greater Cairo Region (Represented by	
	3.2.2. Alexandria Region (Represented by Alexandria	.1
		.2
		.4
3.3	ORECASTED CONSTRUCTION VOLUME	. •
		.5
	3.3.2. 1981-1982 Status of Plan 3 3.3.3. 1981-1982 Plan in Selected Areas of	•5
		.6
	3.3.4. The Five Year Plan 1982/83 - 1986/87	•8
		.9
3.4	ORECASTED CONCRETE DEMAND	.10
		.10
	3.4.2. Cement Consumption vs. Construction Investments by General Pointers Method	.10
	3.4.3. Cement Consumption vs. Construction Investments	•=-
		.11
	3.4.5. Forecasted Concrete Volumes in Selected	.13
	Regions of Importance	.13
3.5	ATERIALS SUPPLY FOR CONCRETE	.19
	3,5.1. Orientation	.19
		.19
3.6	COST OF CONCRETE PRODUCED BY TRADITIONAL METHODS	.23
	3.6.1. Orientation	.23
	3.6.2. General Considerations	.23
	3.6.3. Cost-Items for Concrete Produced by Traditional Methods	.27
3.7	CRITERIA FOR THE SELECTION OF READY (IXED CONCRETE PLANTS	3.33
	TVED CONCRETE LEGATO.	

3.8	PRODUCTION COSTS OF READY AND SITE-MIXED CONCRETES	3.37
	3.8.1. General	3.37
	Mixed Concrete	3.37
	3.8.3. Cost Analysis of Ready Mixed Concrete 3.8.4. Cost of Transport (Transit Mixer	3,38
	and Relevants)	3,39
3.9	ESTIMATED ECONOMIC ADVANTAGES OF READY	
	MIXED CONCRETE FOR DIFFERENT LOCATIONS	3.40
	3.9.1. General	3.40
	3.9.2. Profitability of Ready Mixed Concrete	3.40
	3.9.3. Concrete-Cost Saving in Selected	· ;
	Areas of Importance	3,43
	ON FOUR USION AND RECOMMENDATIONS	4.1
SOME	SELECTED REFERENCES	
APPEN	DIX 1:	
	Some Examples of Units Relevant to R.M.C. Technology	
	IDIX 2: Total Investments Distributed between Governorates, Region and Economic Sectors - Ministry of Planning	8
APPEN	IDIX 3: Production of Construction Sector, Distributed between Gov norates, Regions and Economic Sectors - Ministry of Planni	er- ng.
ADDEN	DIX 4:	
AT T DN	Distribution of Total Investments in Greater Cairo Gover- norate, 1981-1982 Plan, Ministry of Planning.	
	DIX 5: Construction Investments for Economic Sectors in Greater-	
	Cairo Governorate, 1981-1982 Plan, Ministry of Planning.	
APPEN	IDIX 6:	
	Construction Investments for Economic Sectors in Alexandria Governorate, 1981-1982 Plan, Ministry of Planning.	1
APPEN	DIX 7:	
	Construction Investments for Economic Sectors in Suez City, 1981-1982 Plan, Ministry of Planning.	•
		•

"¥:

1

.

IX

## APPENDIX 8:

Construction Investments for Economic Sectors in Elsadat City, 1981-1982 Plan, Ministry of Planning.

**APPENDIX 9:** 

Occurrences of Sand, Gravel and Crushed Stones in Selected Regions - Locations and Quarries.