

NON-DESTRUCTIVE TESTING OF CONCRETE

BY

PAPHIOU KYRIAKI

MAVROUDI MARIA

PROJECT REPORT

Submitted to

The Department of Civil Engineering

of the Higher Technical Institute

Nicosia-Cyprus

in partial fulfillment of the requirements

for the diploma of

TECHNICIAN ENGINEER

IN CIVIL ENGINEERING

JUNE 2003

HIGHER TECHNICAL INSTITUTE	PROJECT NO. 3386
----------------------------------	---------------------

NON – DESTRUCTIVE METHODS OF TESTING CONCRETE

Maria Mavroudi

Kyriaki Paphiou

SUMMARY

Non-destructive methods of testing concrete are described in detail concerning their methodology, purpose and limitations. The two methods that were used in the experimental part of the project, the Ultrasonic Pulse Velocity measurement and the Surface Hardness, are also described but in a more extensive way.

All experiments performed are presented and fully analyzed. The procedures and the apparatus are clearly specified, while all calculations are shown. The results are stated in the form of tables and charts.

These methods of assessment and the analysis of the results obtained, proved the important influence of the water/cement ratio on the concrete properties. All the conclusions we came to are in agreement with already existing information and experimental evidence.

LIST OF CONTENTS

Acknowledgements	1
Summary	2
Introduction	3-4
Objective 1	
Methods of non-destructive testing of concrete	5-10
Diametral Core Test	11-12
Penetration Tests	13-17
Impact Echo	18
Tomographic Image	19
Impulse Radar	20
Laser Interferometry	21
Shear Testing	22-23
Pull-out	24-26
Radiography	27-34
Liquid Penetrant Inspection	35-38
Thermography	39
Pull-off Tests	40
Pulse Velocity	41
Objective 2	
Ultrasonic Pulse Velocity Method	
Introduction	42-43
Historical Background	44-45
Ultrasonic Waves	46-47
Pulse shape and beam shape	48-49
Applications	50-53
Apparatus	54
Ultrasonic Transducers	55-61
Couplants	62-63

Procedure	64-67
Factors influencing pulse velocity measurements	68-75
Rebound Hammer	
Introduction	76-79
Background	80
Equipment	81-82
Test procedure	83-84
Factors influencing the measured hardness	85-88
Instructions for use	89-92
Analysis of results	93
Correlation between strength and rebound number	94-95

Objective 3

Objective	96
Apparatus	96-98
Procedure	99-106
Tables and charts	107-141
Conclusions	142-144

References	145
------------	-----

Appendix 1	1-3
Appendix 2	1-7