

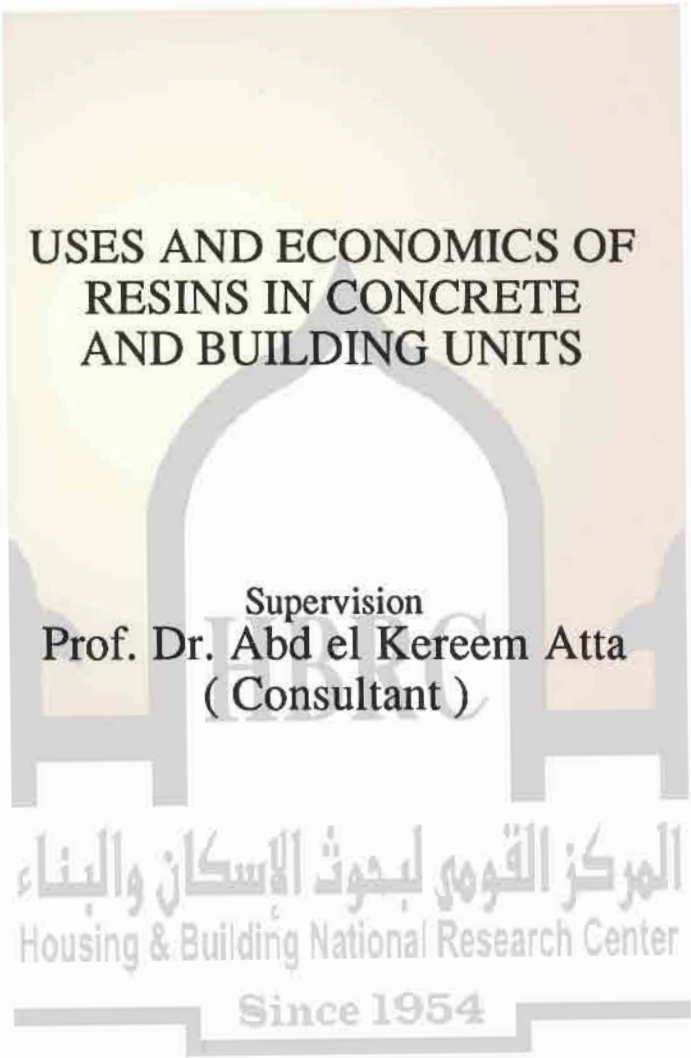
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Planning Research



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# INTRODUCTION

The use of resin systems in civil engineering applications has been established for over forty years of this century. Resins are now being used extensively, mainly in repair applications and also, to a limited but growing extent, in structural design concepts and in other less critical applications where the use of high performance resin materials have proved more cost effective than traditional construction materials in view of time and/or labour saving. It is likely that the mid-20<sup>th</sup> century into the 21<sup>st</sup> century will be known as the age of resins or synthetics. Resins are essentially high molecular weight materials belonging to the general class of polymers.

This research includes an extensive literature review concerning the use and economic of resins in concrete and building units. More than 200 references were summarized and discussed with special attention to the chemistry of polymers and their properties, use of polymers in different civil engineering constructions, polymer concrete family and the different application of resins in reinforced concrete structures.

The economic aspects of using resins in the field of civil works has also been discussed. Suggestions for further research work needed in this work were also elucidated.

## Research Out Lines

The different definitions used in polymer science were included at the beginning of this research followed by chapter (1) which contains the basic



concepts of polymers, their structures, polymerization, molecular weight, secondary bonding, polymer crystallinity, thermal transitions, elastomers, fibres, plastics, additives and properties and characteristics of different polymers. Disadvantages of using polymers are also included.

The building and construction applications of polymers are included in chapter (2) with special attention to coatings, flexible films and sheeting, resilient sheets and shapes, thermal insulation, rigid sheets and shapes, and adhesives and cements, soil stabilization and the future developments.

The use of polymers in concrete, mortar and building units is included in chapter (3). The different types of polymer concrete are exhibited which include polymer cement concrete (PCC), polymer impregnated concrete (PIC) and polymer or resin concrete (PC). The manufacture, properties and applications of these types of polymer concrete are extensively displayed. The safety aspects concerning the use of polymers in concrete are also included in chapter (3).

The role of resins in repair and strengthening of reinforced concrete constructions are included in chapter (4) with special attention to the applications of resins as adhesive, coatings, structural mortars, heavy duty resin grouts for the precision installation of machinery and crane rails and concrete repairs.

The potentiality of using locally available resins in protection, repair and strengthening of reinforced concrete elements is included in chapter (5). Research work concerning the basic properties of some commonly used resin mortars under different surrounding conditions is presented. Research work carried out on the locally available resin materials to elucidate their efficiency as protective coatings, bonding newly casted concrete to hardened concrete and bonding of precast concrete segments is also included. Potentiality of using resins

in repair works is included in this chapter with special attention to specific topics among which are; injection of cracked R.C. beams, strengthening and repair of R.C. beams in flexure with steel plates, repair and strengthening of R.C. beams and slabs with polymer fibre reinforced concrete and finally, the long term behaviour of repaired beams with resin mortar.

The main conclusions of this research, economic considerations regarding the usage of resins in concrete and building units, recommendations and the suggested further work are included in chapters.

