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Emerging Technology Series

Guide for the Design and Construction of Externally Bonded Fiber-Reinforced Polymer Systems for Strengthening Unreinforced Masonry Structures

Reported by ACI Committee 440

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Fiber-reinforced polymer (FRP) systems are an option to consider for strengthening unreinforced masonry (URM) structures. Traditional strengthening systems include external steel plates, reinforced concrete (RC) overlays, span shortening with steel subframing or bracing, and internal steel reinforcement. Relative to traditional systems, features of FRP systems include high tensile strength, light weight, ease of construction, and resistance to corrosion. This guide offers general information on FRP systems use, a description of their unique material properties, and recommendations for the design, construction, and inspection of FRP systems for strengthening URM structures. These guidelines are based on knowledge gained from a comprehensive review of experimental and analytical investigations and field applications.

Keywords: buildings; cracking; cyclic loading; detailing; earthquake resistance; fiber-reinforced polymers; fibers; flexure; masonry; shear; structural analysis;structural design; unreinforced.

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CHAPTER 1—INTRODUCTION AND SCOPE

1.1—Introduction

Masonry is a generic term used to describe a type of construction where clay, or concrete masonry units, or natural stones are bonded together to form a load-bearing structure or a component in a structure. Non-load-bearing masonry includes partitions and veneers.

Although masonry is used in flexural applications such as retaining walls, roof and floor beams, and lintels, it is more frequently used in load-bearing walls primarily resisting compression loads. Reinforced and unreinforced masonry (URM) walls have been used in constructing structural load-bearing components. In buildings, masonry walls can serve effectively as part of the lateral load-resisting system to resist wind and earthquake loads. Infill masonry walls play a significant role in enhancing in-plane stiffness and shear resistance of both reinforced concrete (RC) and steel frames, if properly connected to the structural frame.