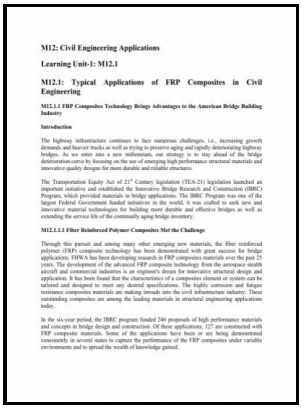
Bridge design and performance and composite materials.

Transportation Research Board, National Research Council - Materials Used for Bridge Construction


M12: Civil Engineering Applications

Learning Unit-1: M12.1

M12.1: Typical Applications of FRP Composites in Civil Engineering

M12.1.1 FRP Composites Technology Brings Advantages to the American Bridge Building Industry

Introduction

The highway infrastructure continues to face numerous challenges, i.e., increasing growth demands and heavier trucks as well as trying to preserve aging and rapidly deteriorating highway bridges. As we enter into a new millennium, our strategy is to stay ahead of the bridge deterioration curve by focusing on the use of emerging high performance structural materials and innovative quality designs for more durable and reliable structures.

The Transportation Equity Act of 21st Century legislation (TEA-21) legislation launched an important initiative and established the Innovative Bridge Research and Construction (IBRC) Program, which provided materials in bridge applications. The IBRC Program was one of the largest Federal Government funded initiatives in the world; it was crafted to seek new and innovative material technologies for building more durable and effective bridges as well as extending the service life of the continually aging bridge inventory.

M12.1.1.1 Fiber Reinforced Polymer Composites Met the Challenge

Through this pursuit and among many other emerging new materials, the fiber reinforced polymer (FRP) composite technology has been demonstrated with great success for bridge applications. FHWA has been developing research in FRP composites materials over the past 25 years. The development of the advanced FRP composite technology from the aerospace stealth aircraft and commercial industries is an engineer's dream for innovative structural design and application. It has been found that the characteristics of a composites element or system can be tailored and designed to meet any desired specifications. The highly corrosion and fatigue resistance composites materials are making inroads into the civil infrastructure industry. These outstanding composites are among the leading materials in structural engineering applications today.

In the six-year period, the IBRC program funded 246 proposals of high performance materials and concepts in bridge design and construction. Of these applications, 127 are constructed with FRP composite materials. Some of the applications have been or are being demonstrated consistently in several states to capture the performance of the FRP composites under variable environments and to spread the wealth of knowledge gained.

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Bridges -- Design and constructionBridge design and performance and composite materials.
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Cement and Concrete Composites

Imperme- able forms can allow surface voids to occur, resulting in increased surface permeability, reduced strength, and an overall decrease in durability.

Cement and Concrete Composites

Retrofitting with FRP composite materials has undergone extensive testing and development in California and has been accepted by Caltrans as an established method for column strengthening.

Performance evaluation of innovative composite pedestrian bridge

The use of improved formwork technologies can improve the quality of the con- crete surface, increasing its impermeability.

Building a durable bridge

Several variants have been developed. These advantages have made it possible to easily install pedestrian bridges in areas that are inaccessible by heavy construction equipment and environmentally restrictive. The wet curing process also helps maintain thermal control of the bridge deck in its critical early stages of hydration.

And finally... Network Rail to design concept composite footbridge

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Bridge Engineering Books

The main disadvantages of these decks include the quality of concrete produced as a result of workmanship and the curing processes. Cyclic freezing and thawing of the water absorbed in the deck surface can result in bridge-deck deterioration in the form of cracking, scaling, and spalling.

Innovative Bridge Design Handbook

The degree of frost damage to concrete is also highly dependent on the degree of saturation. If you believe that this work infringes copyright please provide details by email to qut.

Composite

Show more As known, each bridge presents a unique set of design, construction, and maintenance challenges. This is the deformation capability before the final breakage tends to happen. Although concrete in compression is considered a very durable construction material, tension introduced through various loading and bridge restraint conditions can result in significant ten- sion that can exceed the materialâs tension strength limits, resulting in cracking.

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