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# AASHTO LRFD Bridge Design Guide Specifications for GFRP-Reinforced Concrete

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**AASHTO**



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# SECTION 1

## INTRODUCTION

### 1.1—SCOPE

These specifications offer a description of the properties of glass fiber-reinforced polymer (GFRP) reinforcing bars as well as provisions for the design and construction of structural concrete bridge members reinforced with GFRP bars.

GFRP reinforcement shall be in the form of deformed or sand-coated bars, or both, to provide bond with concrete.

These specifications are not intended to supplant proper training or the exercise of judgment by the Design Professional, and state only the minimum requirements necessary to provide for public safety. The Owner or the Design Professional may require the sophistication of the design or the quality of materials and construction to be higher than the minimum requirements.

The Design Professional shall be familiar with the provisions of the *AASHTO LRFD Bridge Design Specifications* and latest interim specifications, as well as with the design of conventional reinforced concrete structures.

The commentary directs attention to other documents that provide suggestions for carrying out the requirements and intent of these specifications. However, those

### C1.1

GFRP materials have emerged as an alternative noncorrosive material for reinforcing bars for concrete structures (Iyer and Sen, 1991; Neale and Labossiere, 1992; White, 1992; Nanni, 1993; Nanni and Dolan, 1993; Dolan et al., 1996; El-Badry, 1996; Humar and Razaqpur, 2000; Burgoyne, 2001; Cosenza et al., 2001; Figueiras et al., 2001; Teng, 2001; Triantafillou, 2007; Bank, 2007; El-Sayed and Benmokrane, 2008; Nanni et al., 2014). GFRP reinforcing bars offer advantages over steel reinforcement due to their noncorrosive nature, which makes them attractive for bridge structures such as beams (Nanni 1993; 2003; Thériault and Benmokrane, 1998; Ashour, 2006; Bentz et al., 2010; Matta et al., 2013), columns (De Luca et al., 2010; Mohamed et al., 2014; Hadhood et al., 2017), decks (Bradberry, 2001; Nanni and Faza, 2002; Benmokrane et al., 2004; 2006; 2007a; 2007b), and traffic railings (Buth et al., 2003; El-Salakawy et al., 2003; Matta and Nanni, 2009; Ahmed et al., 2013; Sennah and Mostafa, 2018). Due to other differences in the physical and mechanical behavior of GFRP materials as opposed to steel, unique guidance on the design and construction of concrete bridges reinforced with GFRP bars is needed.

The term “shall” denotes a requirement for compliance with these specifications. The term “should” indicates a strong preference for a given criterion. The term “may” indicates a criterion that is usable, but other local and suitably documented, verified, and approved criteria may also be used in a manner consistent with the LRFD approach to bridge design.

Together with straight and hooked GFRP bars used as longitudinal reinforcement, GFRP stirrups in the form of C-shaped bars, spirals, etc., may be implemented to ensure that shear resistance meets safety requirements.