Index D21310 Fiber Reinforced Polymer (FRP) Bar Bending Details

Design Criteria

ACI 440.1R-06 Guide for the Design and Construction of Structural Concrete Reinforced with FRP bars; ACI 440.6-08 Specification for Carbon and Glass Fiber-Reinforced Polymer bar Materials for Concrete Reinforcement; 2009 AASHTO LRFD Bridge Design Specifications for GFRP-Reinforced Concrete Bridge Decks and Traffic Railings; Structures Detailing Manual (SDM)

Design Assumptions and Limitations

Developmental Design Standards Index 21310 includes commonly used types, shapes and configurations of straight and bent pultruded reinforcing Fiber-Reinforced Polymer (FRP) reinforcing bars. This standard works with the REINFORCING BAR LIST that must be completed and included in the plans for cast-in-place concrete components where the reinforcing FRP reinforcing bars within the component are not considered incidental to the cost of the component.

Due to the manufacturing process of pultrusion, the bar bend types and properties are limited and cannot be field formed or modified. Because of these limitations, certain shapes must be obtained utilizing splices with correct development lengths established by the equations found in ACI440.1R. The Design Aids section below contains examples of typical composite shapes that can obtained using the single shapes located on Developmental Design Standards Index 21310.

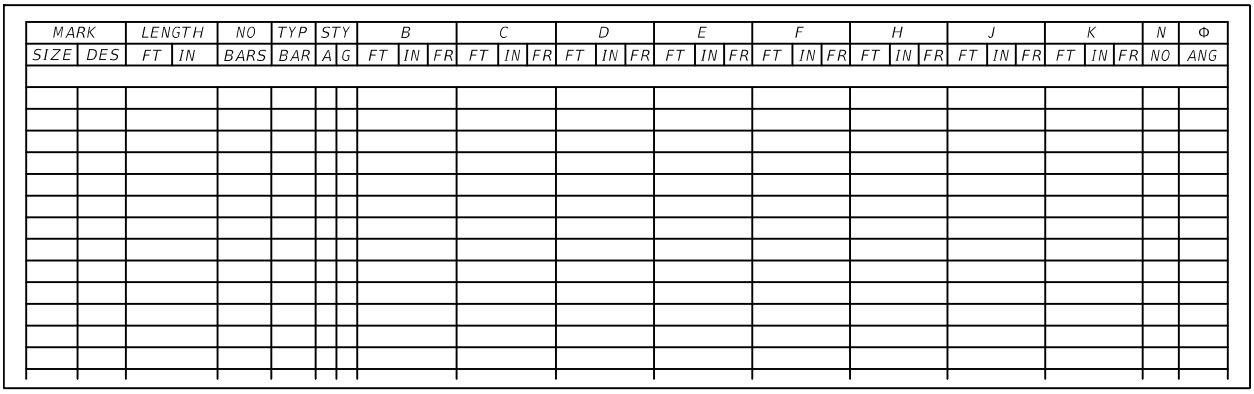
Plan Content Requirements

Insert the entire ***Developmental Design Standards*** Index, received from the Central Office monitor, into the appropriate component plan set in accordance with ***PPM***, Volume 2, Section 3.8.

Complete and include in the plans the REINFORCING BAR LIST. Do not include reinforcing FRP bars for drilled shafts, auger cast piles and standard traffic and pedestrian railings, and all precast components, e.g. prestressed concrete piles and beams, MSE wall copings and precast noise wall posts and panels. For additional information and guidance see the Specifications, Design Standards and/or Instructions for Design Standards for a given component.

The REINFORCING BAR LIST may be completed using the Rebar Application provided with the FDOT CADD Bar Menu (with manual modifications for the length definitions) or it may be prepared by other manual, automated or combination methods. See ***SDM*** 4.3 for FRP reinforcing bar detailing procedures.

Include a reference to Developmental Design Standards Index 21310 on the REINFORCING BAR LIST sheets.

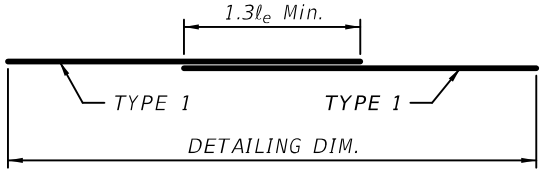


MARK		LENGTH		NO	TYP	STY		B			C			D			E			F			H			J			K			N	Φ
SIZE	DES	FT	IN	BARS	BAR	A	G	FT	IN	FR	FT	IN	FR	FT	IN	FR	FT	IN	FR	FT	IN	FR	FT	IN	FR	FT	IN	FR	FT	IN	FR	NO	ANG

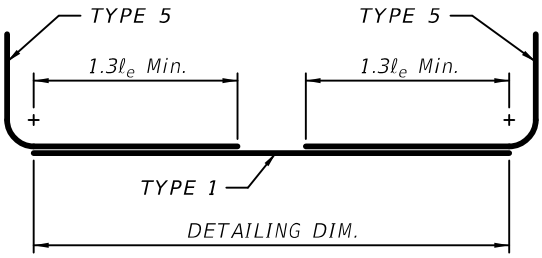
Payment

Item number	Item description	Unit Measure
914-415-AAA	FRP Reinforcing Bars	LB

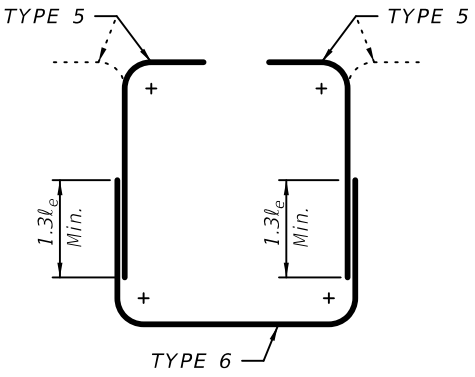
Design Aids



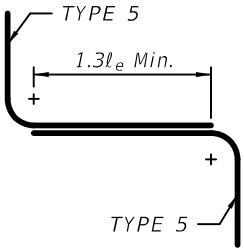
LAPPED STRAIGHT BARS



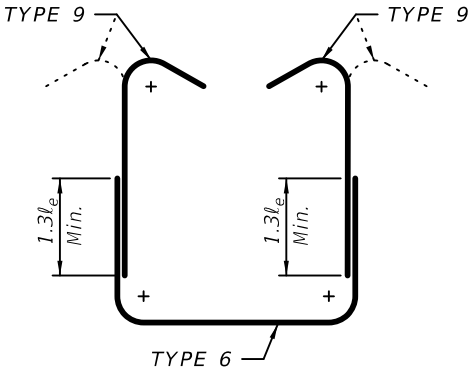
LONG LEG U SHAPE



OPEN STIRRUP 1



Z BAR SHAPE



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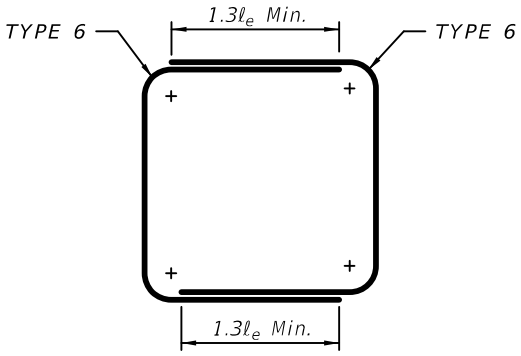
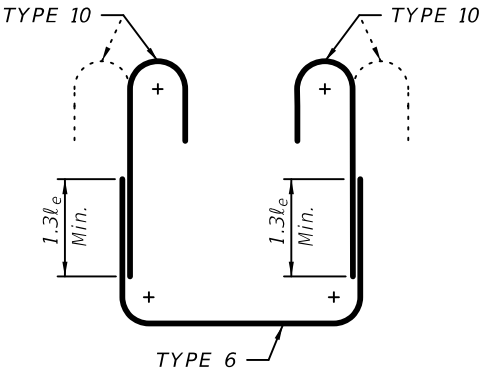


CLOSED STIRRUP 1



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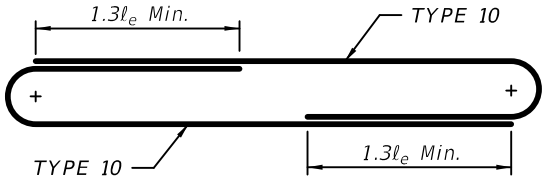

CLOSED STIRRUP 2

NOTE: See Developmental Standard D21310 for referenced Single Bar Bending Types.

TYP. COMPOSITE SHAPES