MST BAR
MAXIMUM STRENGTH GFRP

Manufactured by MST Rebar Inc.

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MST Rebar Inc.
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Oct. 14th, 2021

Re : 90 Degree Corners with MST-BAR GFRP bars

To Whom It May Concern:

MST-BAR has some unique characteristics that can not be found in Steel reinforcement and other Fiber Reinforced Polymer(FRP) rebars. In general FRP rebars have a much lower Poisson's ratio(nu) than steel. What does that mean and why is it helpful?
Possion's Ratio is the change in lateral direction over longitudinal direction. Steel has a high Possion's Ratio and it will stretch and change the cross sectional area when subjected to load and that is enough to cause the bar to slip from the concrete. This is the primary reason of why engineers use bent bar for anchorage.
However MST-BAR has a much lower passion's ratio meaning the material holds it diameter until the final failure of minimum 1000 MPa(twice as steel).

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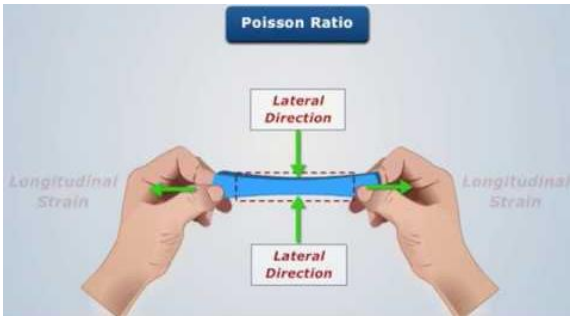

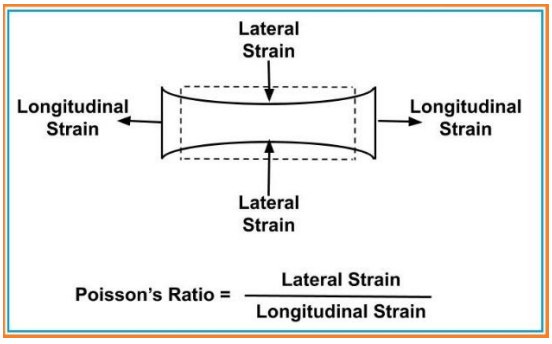

For the above mentioned reason MST-BAR does not change it cross sectional area and it does not slip in the concrete once embedded. This test has been done on a CIP and post-installed bar.

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From the technical point of view, the embedded length needs to be satisfied, which is a function of bar diameter. If not, extra 90-degree bend bars should be placed at the corner to compensate for the lack of development length.

Nonetheless, simpler detail can be used for ***temperature and shrinkage reinforcement*** to control cracks at the end of ICF panels. This detail is only applicable for MST-BAR GFRP bars because of its high bond strength to concrete based on the test results achieved by pullout tests for different bar sizes. Horizontal GFRP bars can be cited as temperature and shrinkage reinforcement in the walls in which the ratio of their length to height is equal or more than 2.

Reinforcement just designed to control cracks shall be extended by the end of walls. At least one bar per horizontal layer of bars of MST-BAR straight bars need to be placed at each corner at a spacing equal to or less than the spacing of horizontal reinforcement. In any case, a clear concrete cover of 1.5” shall be provided over the MST-BAR GFRP bars. More details can be seen in Figure 1.

Yours sincerely,

Babak Hajimiragha

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Figure 1. Details of shrinkage reinforcement anchored at the corner of walls.