

June, 2023

SUBJECT: CRSI Manual of Standard Practice, 29th Edition

Clarification of change to finished bend diameters for No. 3, 4, & 5 stirrups and ties in Table 7-2

The 29th edition of the CRSI *Manual of Standard Practice*, revised finished bend diameters for no. 3, 4, and 5 reinforcing bars used for stirrups and ties, as provided in Table 7-2. In general, these values for stirrup and ties equate to a finished bend diameter of five bar diameters ($5d_b$) for all grades instead of four bar diameters ($4d_b$) for grades 40, 60 and 75, as given in earlier CRSI manuals and other current specifications and standards such as the American Concrete Institute's *Building Code Requirements for Structural Concrete* (ACI 318-19) and the American Association of State Highway and Transportation Officials' *AASHTO LRFD Bridge Design Specifications*.

During the balloting of the 29th edition of the CRSI *Manual of Standard Practice*, it seemed the ACI 318 committee was looking to adopt a $5d_b$ minimum bend diameter for no. 3, 4, and 5 stirrups and ties, when adopting Grade 80 and 100 reinforcement. At that time, ASTM A615/A615M-20 *Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement* was changing pin diameters for bend tests to $5d_b$ for steel reinforcement grades higher than 75. After consideration, the committee decided against requiring different minimum bend diameters for different grades and agreed that the 29th edition of the *Manual of Standard Practice* should be revised to reflect the change in ASTM and the anticipated change in ACI 318-19, while maintaining uniformity and simplicity of fabrication for stirrups and ties across all grades for no. 3, 4, and 5 reinforcing bars.

CRSI is currently working with the ACI 318 Subcommittee B, Anchorage and Reinforcement, to update ACI 318 minimum bend diameter values to comply with ASTM bend-test requirements for Grades 80 and 100.

At times, special fabrication requirements are needed to accommodate small bend diameters or tighter fabrication tolerances. CRSI does not prohibit the bending of Grade 60 stirrups and ties to the $4d_b$ bend diameter; however, the tighter bend diameter is not standard fabrication practice, is considered a special order item, and must be clearly noted on the construction documents. To ensure that the bending operations do not damage the reinforcing bars during fabrication, CRSI recommends the following: first, the inside bend diameters specified and fabricated are equal to or larger than the applicable minimum inside bend diameter that is defined in ACI 318-19 or AASHTO LRFD specifications; second, the



diameters of the bending pins used for reinforcing bar fabrication must be equal to or larger than the pin diameters described and required in the applicable ASTM specification.

More information on the differences between ASTM bend-test pin diameters, ACI 318 minimum bend diameters and CRSI finished bend diameters can be found in Section 7.4 of the CRSI *Manual of Standard Practice* and the CRSI Tech Note on *Measuring Fabricated Steel Reinforcing Bars*, ETN-M-12-19.

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