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Guide for the Use of ASTM A1035/A1035M Type CS Grade 100 (690) Steel Bars for Structural Concrete

Reported by ACI Committee 439

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American Concrete Institute
38800 Country Club Drive
Farmington Hills, MI 48331
Phone: +1.248.848.3700
Fax: +1.248.848.3701

www.concrete.org

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Reported by ACI Committee 439

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This guide provides recommendations on design provisions for the use of ASTM A1035/ASTM A1035M Type CS Grade 100 (690) deformed steel bars for reinforced concrete members. The recommendations address only those requirements of ACI 318-14 that limit efficient use of such steel bars. Other code requirements are not affected. Any other ACI 318 versions will be explicitly specified. Although there are limiting ACI 318 requirements, ACI 318-14 Section 1.10 would allow the use of high-strength reinforcement. "Sponsors...shall have the right to present the data on which their design is based to the building official or to a board of examiners appointed by the building official."

The International Building Code (IBC 2012) would allow the same under Section 104.11, "Alternative materials, design and methods of construction and equipment." To approve an alternative material under this section, a building department would typically require an ICC Evaluation Service (ICC-ES) Evaluation Report, which would be based on an ICC-ES Acceptance Criteria (AC) document. An AC document (ICC-ES AC429) and an Evaluation Report (ICC-ES ESR-2107) exist, permitting the use of ASTM A1035/A1035M Grade 100 reinforcement.

This guide includes a discussion of the material characteristics of Grade 100 (690) ASTM A1035/A1035M (CS) deformed steel bars and recommends design criteria for beams, columns, slab, systems, walls, and footings for Seismic Design Category (SDC) A, B, or C, and for structural components not designated as part of the seismic-force-resisting system for SDC D, E, or F.

A structure assigned to SDC A, B, or C is required to be designed for all applicable gravity and environmental loads. In the case of SDC A structures, seismic forces are notional structural integrity forces. This guide addresses all design required for SDC A, B, and C structures.

Because the modulus of elasticity for ASTM A1035/A1035M (CS) is similar to that of carbon steel (ASTM A615/A615M) using higher specified minimum yield strength f_y may result in higher steel stress at service load condition and potentially cause wider cracks and larger deflections, which may be objectionable if aesthetics and water-tightness are critical design requirements. Higher deflection can also contribute to serviceability issues. Also, with higher f_y, the required development length will be longer.

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