CHRŌMX®

ENGINEERING BULLETIN #7
JUNE 2015

ASTM A1035 SPECIFICATION

Chemical Requirements of Typical Alloys

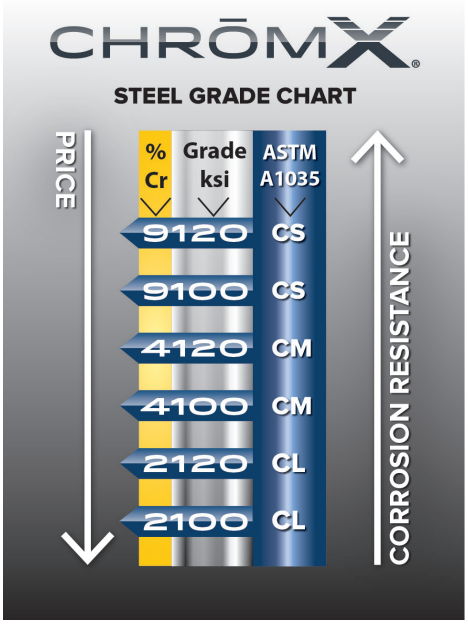
Composition Max, %[A]

ChrōmX	ASTM	Carbon	Chromium	Manganese	Nitrogen	Phosphorus	Sulfur	Silicon
2000	A1035 CL	0.30	2.0-3.9	1.5	0.05	0.035	0.045	0.5
4000	A1035 CM	0.20	4.0-7.9	1.5	0.05	0.035	0.045	0.5
9000	A1035 CS	0.15	8.0-10.9	1.5	0.05	0.035	0.045	0.5

[A] Maximum unless range is indicated percentages refer to weight percentages

Tensile Properties Requirements

Type	A1035 CL		A1035 CM		A1035 CS	
Grade	Grade 100 [690]	Grade 120 [830]	Grade 100 [690]	Grade 120 [830]	Grade 100 [690]	Grade 120 [830]
Tensile Strength, min, psi [MPa]	130,000 [900]	150,000 [1030]	150,000 [1030]	150,000 [1030]	150,000 [1030]	150,000 [1030]
Yield Strength (0.2% offset), min, psi [MPa]	100,000 [690]	120,000 [830]	100,000 [690]	120,000 [830]	100,000 [690]	120,000 [830]
Elongation in 8 in. [200 mm], min						
Bar Designation No. ~~3 through 11 [10 through 36]~~ ~~14, 18 [43, 57]~~	7 6	7 6	7 6	7 6	7 6	7 6



ChrōmX 9000 (formerly MMFX$_2$® concrete reinforcing steels) can be specified as **ASTM A1035 CS** either Grade 100 or 120. This chromium steel provides high corrosion protection for severe corrosive environments caused by seawater, aggressive soils and deicing salts. Designers can meet 100-year service life requirements called for on many infrastructure projects by specifying ChrōmX 9000.

ChrōmX 4000 (**ASTM A1035 CM** Grade 100 or 120) offers the same high-strength benefits with a medium level of corrosion resistance for projects requiring 40 to 60 years of service life.

ChrōmX 2000 (**ASTM A1035 CL** Grade 100 or 120) is a low cost product ideal for construction projects in which high-strength designs reduce the amount of steel used, improving constructability, and reducing construction time and costs for the owner.

By specifying ASTM A1035 CS, CM or CL, designers can take advantage of the high-strength efficiencies and match the appropriate corrosion resistance for the targeted service life of the structure.

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ASTM A1035 GRADE 100 VS A615 GRADE 100

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TOP 10 REASONS TO SPECIFY ASTM A1035 GRADE 100

10 ASTM A1035 steels have been produced and sold into the construction market since 2002.

9 ASTM A1035 rebar can be cut and bent on standard fabrication equipment, no special handling is required.

8 Over 100 research projects conducted over 15 years include ASTM A1035 concrete reinforcing steels.

7 ASTM A1035 has been tested by numerous highly-respected, independent third-party organizations.

6 Ductility of ASTM A1035 Grade 100 performs consistently throughout rebar sizes ~~#3 – #18.~~ Engineers should be encouraged to request elongation data on competitor 100 grade bars for the entire size range specified for a given project.

5 The production process for ChrōmX A1035 rebar provides consistent mechanical properties from batch to batch and bar to bar that other competing 100 grade products cannot duplicate.

4 ChrōmX A1035 Grade 100 is readily available from inventory. ~~ASTM A615 Grade 100 requires special mill orders.~~

3 MMFX offers high strength design know-how through its engineering support to help solve design challenges.

2 Design codes and guides for using ASTM A1035 Grade 100 are available (ACI ITG-6, ICC-ES AC429, AASHTO LRFD). ~~These high strength codes and guidelines apply to ASTM A1035 Grade 100 only and do not apply to ASTM A615 Grade 100 rebar.~~

1 ASTM A1035 provides a minimum actual tensile/yield (T/Y) ratio of 1.25. ASTM A615 Grade 100 has a minimum T/Y ratio of only 1.15. Due to this low T/Y ratio a cautionary note has been included in the A615 specification warning of the resulting lower margin of safety and reduced warning of failure inherent in A615 Grade 100 rebar. Note 1 of ASTM A615 is provided in full below. This cautionary note does not apply to ASTM A1035, because A1035 provides a minimum T/Y ratio of 1.25 in compliance with ACI 318 requirements.

"NOTE 1—Grade 100 [690] reinforcing bars were introduced in this specification in 2015. In contrast to the lower grades, which have ratios of specified tensile strength to specified yield strength that range from 1.31 to 1.5, Grade 100 [690] reinforcing bars have a ratio of specified tensile strength to specified yield strength of 1.15. Designers should be aware that there will, therefore, be a lower margin of safety and reduced warning of failure following yielding when Grade 100 [690] bars are used in structural members where strength is governed by the tensile strength of the reinforcement, primarily in beams and slabs. If this is of concern, the purchaser has the option of specifying a minimum ratio of tensile strength to actual yield strength. Consensus design codes and specifications such as "Building Code Requirements for Structural Concrete (ACI 318)" may not recognize Grade 100 [690] reinforcing bars: therefore the 125% of specified yield strength requirements in tension and compression are not applicable. Mechanical and welded splices should meet a minimum specified tensile strength of 115,000 psi [790 MPa]."

TODAY'S STEEL STANDARD®

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