

CODE

20.2.1.5 Welded deformed bar mats shall conform to **ASTM A184**. Deformed bars used in welded deformed bar mats shall conform to **ASTM A615** or **A706**.

20.2.1.6 Headed deformed bars shall conform to **ASTM A970**, including Annex A1 requirements for Class HA head dimensions.

20.2.1.7 Deformed wire, plain wire, welded deformed wire reinforcement, and welded plain wire reinforcement shall conform to (a) or (b), except that yield strength shall be determined in accordance with 20.2.1.2:

- (a) **ASTM A1064** – carbon steel
- (b) **ASTM A1022** – stainless steel

20.2.1.7.1 Deformed wire sizes MD25 through MD200 shall be permitted.

20.2.1.7.2 Deformed wire sizes larger than MD200 shall be permitted in welded wire reinforcement if treated as plain wire for calculation of development and splice lengths in accordance with **25.4.7** and **25.5.4**, respectively.

20.2.1.7.3 Except as permitted for welded wire reinforcement used as stirrups in accordance with **25.7.1**, spacing of welded intersections in welded wire reinforcement in the direction of calculated stress shall not exceed (a) or (b):

- (a) 400 mm for welded deformed wire reinforcement
- (b) 300 mm for welded plain wire reinforcement

20.2.2 Design properties

20.2.2.1 For nonprestressed bars and wires, the stress below f_y shall be E_s times steel strain. For strains greater than that corresponding to f_y , stress shall be considered independent of strain and equal to f_y .

COMMENTARY

transverse reinforcement for shear and torsion, or confining reinforcement for splices.

R20.2.1.6 The limitation to Class HA head dimensions from Annex A1 of **ASTM A970** is due to a lack of test data for headed deformed bars that do not meet Class HA dimensional requirements. Heads not conforming to Class HA limits on bar deformation obstructions and bearing face features have been shown to provide lower anchorage strength than the heads used in the tests that serve as the basis for **25.4.4** (**Shao et al. 2016**).

R20.2.1.7 Plain wire is permitted only for spiral reinforcement and in welded plain wire reinforcement, the latter of which is considered deformed. Stainless steel wire and stainless steel welded wire reinforcement are used in applications where high corrosion resistance or controlled magnetic permeability is required. The physical and mechanical property requirements for deformed stainless steel wire and deformed and plain welded wire reinforcement under **ASTM A1022** are the same as those for deformed wire, deformed welded wire reinforcement, and plain welded wire reinforcement under **ASTM A1064**.

R20.2.1.7.1 An upper limit is placed on the size of deformed wire because tests (**Rutledge and Devries 2002**) have shown that MD290 wire will achieve only approximately 60 percent of the bond strength in tension given by Eq. (25.4.2.4a).

R20.2.2 Design properties

R20.2.2.1 For deformed reinforcement, it is reasonably accurate to assume that the stress in reinforcement is proportional to strain below the specified yield strength f_y . The increase in strength due to the effect of strain hardening of the reinforcement is neglected for nominal strength calculations. In nominal strength calculations, the force developed in tension or compression reinforcement is calculated as: