

# Example of structural bolts research paper

[Engineering](#), [Aviation](#)



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In the U. S. two types of standard structural bolts have been approved for use: ASTM A490 and ASTM A395 (Williams, 2001, p. 44).

## **ASTM A395**

Usually, the ASTM A325 covers the heavy structural bolts with high strength that range in size from half diameter to one and half diameter. The given bolts are often used in various structural connections (Williams, 2001, p. 54). They characteristically have shorter thread lengths when compared to the standard hex bolts. There are two types of A325: Type 1 and type 3. Type 1 is made of carbon baron, medium carbon, or an alloy of medium carbon and steel. Type 3 is made of weathering steel (Kutner, 2007, p. 88)

In terms of connection types of ASTM A325: There are N, SC and X. SC implies a given slip critical connection (Kurner, 2000, p. 67). This is the situation where the given bolts are not used while in shear, but when the existing tension from the given connection offers resistance to the shearing force. X implies a given A325 that is commonly used in bearing type connection (Kurner, 2000, p. 67). In this situation, the given threads are often excluded from the given shear plane. N implies the A325 bolts that got

threads being part of the given shear plane (Kurner, 2000, p. 68).

In terms of mechanical properties, for those sized between half to one in diameter, they usually possess a tensile of 120 min ksi, yield of 92 min ksi, 14 % Elong and 35 RA % (Kutner, 2007, p. 60). Those ranging from 1 diameter to 1 and half diameter in size possess a tensile strength of 105 min ksi, yield of 81 min ksi, 14 % Elong and 35 RA % (Williams, 2001, p. 456).

## **ASTM A449**

This usually covers a range of headed bolts, anchor bolts, and rods which have diameters which range from a quarter up to including a diameter of three (Kutner, 2007, p. 98). It is often a medium strength bolt usually manufactured from alloy steel or medium carbon which then develops its given mechanical values via a heat treating process (Green, 1964, p. 52).

ASTM is often recommended for some general engineering applications (Kurner, 2000, p. 99). In as much as ASTM A449 bears some resemblance in terms of its chemical makeup and strength to the given ASTM A325 structural bolts, it is also shows more flexibility thereby covering quite a large range of diameter. In addition, it is often not restricted when it came to certain specific configurations (Kurner, 2000, p. 80).

In terms of chemical structure, ASTM A449 got 2 types namely: Type 1 and type 3. Type 1 constitutes of alloy boron steel or alloy steel, carbon boron steel or plain carbon steel. Type 3 constitutes of weathering steel (Kurner, 2000, p. 82). In terms of mechanical properties, those bolts of size between a quarter to one diameter usually possess a tensile strength of 120 min ksi, Yield of 92 ksi, 14 % Elong and RA of 35 % (Green, 1964, p. 53). Those with diameters between one to one and half diameter usually have a tensile

strength of 105 min ksi, yield of 81 min ksi, 14 % Elong and RA of 35 % (Hoffman, 1996, p. 54). The bolts of size between more than one and a half to 3 in diameter usually have a tensile strength of 90 min ksi, yield of 81 min ksi, 14 % Elong and RA of 35 % (Hoffman, 1996, p. 56).

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## **ASTM A490**

Usually, the ASTM A490 often exists as a high strength bolt that ranges in size between half diameter to one and half diameter (Williams, 2001, p. 75). They often cover tempered and quenched, alloy steel that got heavy hex given structural bolts. They usually exert tensile strengths on minimum 150 ksi. (Williams, 2001, p. 76). They characteristically have shorter thread lengths when compared to the standard hex bolts. There are two types of A490: Type 1 and type 3. Type 1 is made of boron steel, medium carbon steel, or an alloy of medium carbon and steel. Type 3 is made of weathering steel (Kutner, 2007, p. 90).

In terms of connection types of ASTM A490: There are N, SC and X. SC implies a given slip critical connection (Kurner, 2000, p. 64). This is the situation where the given bolts are not used while in shear, but when the existing tension from the given connection offers resistance to the shearing force. X implies a given A490 that is commonly used in bearing type connection (Kurner, 2000, p. 78). In this situation, the given threads are often excluded from the given shear plane. N implies the A490 bolts that got threads being part of the given shear plane (Kurner, 2000, p. 79).

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