



---

## STAINLESS STEEL FASTENERS

### **ACCEPTANCE**

Acceptance of stainless steel bolts, studs, rods, hex cap screws, nuts and washers shall be on the following basis:

1. Certified mill test report
2. Approved sources (listed in [Appendix A](#)) shall be on the approved list prior to the letting.
3. Sampling and testing by the Iowa Department of Transportation.

### **REQUIREMENTS**

Stainless steel bolts, hex cap screws, and studs .25" to 1.50" inclusive in nominal diameter shall meet the requirements of ASTM A 320 / A 320M Type 304 Class 1, 1A, or 2 or ASTM F 593 Alloy Group 1, 2, or 3 cold worked with optional condition A or CW<sub>1</sub> and / or CW<sub>2</sub>. Threads are to comply with ANSI B1.1 UNC thread series, Class 2A Fit. Threads can be either rolled or cut. Hexagonal bolt head shall be required.

Stainless steel nuts used with these type of fasteners shall conform to the requirements of ASTM F 594 and shall be the same alloy groups (Group 1, 2, or 3) cold worked with optional condition A or CW<sub>1</sub> and / or CW<sub>2</sub>. Threads shall have Class 2B. Threads shall be in accordance with ASME B1.1. Hexagonal nuts and jam nuts shall be required.

Note: A stainless steel lock washers may be used in lieu of the jam nuts.

Stainless steel washers and lock washers shall conform to the requirements of ASTM A 240/A 240 M and shall be of the same alloy group and condition of the bolts and nuts. For dimensions, type and permissible variations, washers shall meet the requirements of ASME B 18.22.1 and for lock washers shall meet the requirements of ASME B 18.21.1.

Stainless steel u-bolts shall meet the requirements of ASTM A 320 / A 320 M. Type 304 or ASTM F 593 alloy group 1, 2, or 3 cold worked with optional condition A or CW<sub>1</sub> and / or CW<sub>2</sub>. Threads, unless otherwise specified, shall have class 2A threads in accordance with ANSI B1.1. Threads can be either rolled or cut.

### **Properties – Stainless Steel Fasteners**

Type 304 and 316 are the most common stainless steel fasteners. Nut and washers should be of the same alloy group match the steel type of the bolts. Stainless steel bolts are supplied either hot finished or cold finished.

Condition A, nuts .25" to 1.50" nominal diameters shall have a minimum proof load of 75,000.00 psi (517 mpa)

Note: Cold finish bolts are only supplied if specifically specified and are not normally "a shelf item".

Lock Type Washers and Jam Nuts must be specified and used with all stainless steel fasteners. Lock washers must be placed under the nut to help reduce loosening due to structure vibration and load fluctuation.

Stainless steel fastener components shall be protected from the elements, dirt and moisture in closed / sealed containers at the site of installation.

Stainless steel fasteners shall be lubricated. No dry fasteners shall be allowed to be used. Fastener components shall not be cleaned of lubricant that is present when delivered to the project site.

Components that accumulate rust or dirt resulting from the processing plant or job site shall not be incorporated into the project.

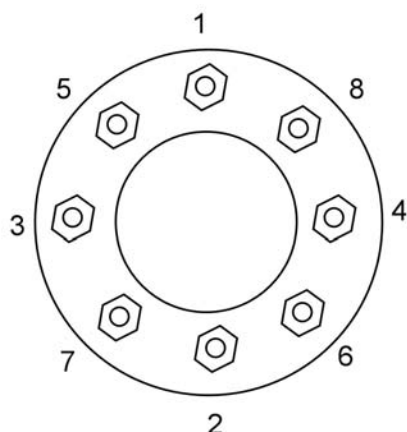
### **Installation – Bolt Fasteners**

All Bolts and miscellaneous fasteners shall be installed in accordance with either the requirements of the design plans, established industry practice, or manufacturer's recommendations.

A common bolted connection in ancillary structures consists of bolted flange or face plates that match face-to-face, such connections occurs at tense chord splices, long mast arm splices, and arm to pole connections.

Unless otherwise specified, and / or approved by the engineer, compressible materials such as gaskets, insulation, metal shims shall not be allowed to be placed between any bolted connection and should not be placed between any flanges.

Tightening of bolts should be performed in a manner that brings the faying surfaces up evenly. Unless otherwise specified differently in the design plans, a star tightening pattern is recommended (with the approval of the engineer)



### Snug-tightened Condition

Snug-tight condition is defined as the tightness that is attained with a few impacts (3 – 5) of an impact wrench or full effort with an ordinary spud wrench that brings the connected plies into firm contact.

Note #1: There should not be any surface visibly not in contact after snugging the bolts.

Note #2: Bolts to be tightened only to the snug-tight condition shall be clearly identified on the design and erection drawings.

Note #3: It's highly recommended and it could be beneficial to the state and as well to the contractor to perform torque / tension testing to establish the tension being provided for specific torques.

### Inspection of Snug-tightened Joints

After the connections have been assembled, it shall be visually ensured that the plies of the connected elements have been brought into firm contact and that washers (lock washers) have been used as required, there should be no further evidence of conformity is required for snug-tightened joints.

Summary of the inspection requirements for snug-tightened joints shall consists of the followings:

1. Verification that the proper fastener components were used
2. The connected elements were fabricated properly
3. The bolted joint was drawn into firm contact

Torque Values for Stainless Steel Bolts

Bolt Size	Type 304 (ft – lb)	Type 316 (ft – lb)

---

1/4"	6.0	7.0
5/16"	11.0	12.0
3/8"	20.0	21.0
7/16"	31.0	33.0
1/2"	43.0	45.0
9/16"	57.0	59.0
5/8"	93.0	97.0
3/4"	128.0	132.0
7/8"	194.0	203.0
1"	287.0	333.0
1 1/8"	413.0	432.0
1 1/4"	480.0	504.0
1 1/2"	703.0	732.0

### **Anchor Bolts (Rods)**

Anchor Bolts (Rods) shall conform to the specified requirements of the plans and the requirements of ASTM F1554 standard specifications for steel anchor bolts, grade 36, 55, and / or 105.

Anchor bolts shall be full length galvanized in accordance with the requirements of ASTM F 2329 or ASTM B 695, Class 50, Type 1 coating. For additional requirements (Nuts, Washers, Grades, Class, and Threads), refer to the requirements of [IM 453.08](#).