



******GENERAL REWRITE. – PLEASE READ CAREFULLY.******

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](#))
3. Sampling and testing by the Iowa Department of Transportation.

REQUIREMENTS

Stainless steel bolts, hex cap screws and studs (0.25 to 1.50 inch), inclusive in nominal diameter shall meet the requirements of ASTM F 593 of the specified group (Alloys 304- Group 1) and (Alloy 316- Group 2) and condition (cold worked – CW). Threads can be either rolled or cut.

Stainless steel nuts used with these fasteners shall conform to the requirements of ASTM F 594 and shall be of the same alloy group (Group 1 or Group 2) and the same condition (cold worked – CW) as required for bolts, studs, hex cap screws. Threads shall have Class 2B threads in accordance with ASME B1.1 (United Screw Thread Standard).

Stainless steel washers shall conform to the requirements of ASTM A 240 / A 240M dimensions and permissible variations and shall be of the same alloy group and condition of the bolts and nuts.

Properties – Stainless Steel Fasteners

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

Cold finished, Type 304 and 316 bolts have an ultimate tensile strength of 90 KSI (620 MPA), versus 75 KSI (516 MPa) for hot finished.

Note: Cold finish bolts are only supplied if specifically specified and are not normally “off the shelf items”.

Lock Type Washers 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.

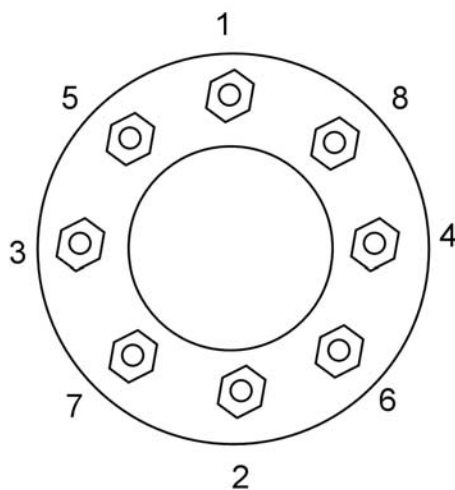
Installation – Bolt Fasteners

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-tightened condition is defined as the tightness that is attained with a few impacts (3 – 5) of an impact wrench or the full effort of an iron worker using an ordinary spud wrench to bring the 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](#).