BOLTS, NUTS AND HARDWARE

Stud Bolts and Nuts, Machine Bolts and Nuts, Steel

1. SCOPE

This specification covers alloy steel stud bolts and carbon steel machine bolts and nuts used for ANSI Class 150, 300 and 600 flange sizes 1-inch through 26-inch and ANSI Class 300, 400 and 600 flange sizes 2-inch through 36-inch.

2. APPLICABLE DOCUMENTS

2.1 American National Standards Institute (ANSI) B-1.20.1, "Pipe Threads, General Purpose (INCH)."

2.2 American National Standards Institute (ANSI) B-18.2.2, "Square and Hex Nuts."

2.3 ASTM International (ASTM) A-193, "Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Services."

2.4 ASTM International (ASTM) A-194, "Alloy Steel and Stainless Steel Bolting Material for High Temperature Services."

2.5 ASTM International (ASTM) A-307 "Specifications for Carbon Steel Bolts and Studs 60,000 psig Tensile."

2.6 ASTM International (ASTM) A-563, “Specification for Carbon and Alloy Steel Nuts.”

2.7 Southwest Gas Corporation Operations Manual, "Selection of Material Design.”

2.8 United States Department of Transportation (DOT) Code of Federal Regulations (CFR), Title 49, Part 192, “Transportation of Natural and Other Gas by Pipeline, Minimum Safety Standards.”

NOTE: Unless otherwise specified, the editions of the above documents incorporated by DOT 49 CFR 192 are applicable. Documents not incorporated by DOT 49 CFR 192 will be the most recent edition.

3. TERMINOLOGY

3.1 General

3.1.1 "Southwest Gas," "Southwest" or "SWG" wherever used in this specification and other related documents will refer exclusively to Southwest Gas Corporation.

3. TERMINOLOGY (Cont'd)

3.1.2 The terms "approved," "as approved," "satisfactory," "as directed," "or equal" or other similar terms wherever used in this specification and other related documents will mean "as determined by Southwest Gas," unless specifically stated otherwise.

3.1.3 "Product Information Package" or "PIP" wherever used in this specification and other related documents will mean the required information that a manufacturer must submit to SWG to determine if the product is suitable for use by SWG, unless specifically stated otherwise.

4. MATERIALS AND MANUFACTURING

4.1 Stud bolts shall comply with the chemical and physical requirements of ASTM A-193, Grade B-7 material.

4.2 Nuts for stud bolts shall comply with the chemical and physical requirements of ASTM A-194, Grades 1 or 2-H material. Nuts made from bar stock are not acceptable.

4.3 Stud bolts shall be threaded in full length.

4.4 Nuts for stud bolts and stud bolts shall be threaded in accordance with ANSI B-1.20.1, Classes 2-A and 2-B fit. One inch diameter and smaller will be sized with the coarse-thread series and 1 1/8-inch diameter and larger will be sized with the 8-pitch thread series.

4.5 Nuts for machine bolts and machine bolts shall be threaded in accordance with ANSI B-1.20.1, Coarse Thread Series, Classes 2A and 2B fit.

4.6 Machine bolts shall be manufactured to conform to ANSI B-18.2.2.

4.7 Nuts manufactured to conform to the requirements for Heavy Hex Nuts of ANSI B-18.2.2 shall be produced by cold forging.

4.8 Machine bolts and nuts shall comply with the chemical and physical requirements of ASTM A-307, Grade B bolt material. This material shall be without heat treatment other than stress relief.

4.9 Nuts for machine bolts shall be ASTM A-563, Grade A, heavy hex. Nuts of other grades and styles having specified proof load stresses greater than 100 psig are acceptable.

5. PERFORMANCE REQUIREMENTS

5.1 Recommended bolt sizes for standard and insulating flange connections are shown in Tables N-1.1, N-1.2, N-1.3 and N-1.4. The bolt lengths shown may be greater than those found in other sources to allow for thicker gaskets and to allow at least one thread showing on each end of stud bolts.

5.2 Bolt sizes shall be in accordance with the torque specifications of Tables N-1.1, N-1.2, N-1.3 and N-1.4.

RECOMMENDED BOLT SIZES FOR CLASS 125 CAST IRON OR ANSI 150 STEEL FLANGES

Pipe Size (Inches)	Number of Bolts Required	Bolt Diameter (Inches)	Bolt Type	Bolt Length (Inches)	Torque Specifications (Ft.-Lbs.)
1	4	1/2	Machine	2 1/2	20
			Stud	3	45
1 1/2	4	1/2	Machine	2 3/4	20
			Stud	3 1/4	45
2	4	5/8	Machine	3	40
			Stud	3 1/2	90
3	4	5/8	Machine	3 1/2	40
			Stud	4	90
4	8	5/8	Machine	3 1/2	40
			Stud	4	90
6	8	3/4	Machine	3 3/4	80
			Stud	4 1/2	150
8	8	3/4	Machine	4	80
			Stud	4 3/4	150
10	12	7/8	Stud	5	240
12	12	7/8	Stud	5 1/4	240
16	16	1	Stud	5 3/4	370
18	16	1 1/8	Stud	6 1/2	530
20	20	1 1/8	Stud	6 3/4	530
22	20	1 1/4	Stud	7 1/4	750
24	20	1 1/4	Stud	7 1/4	750
26	24	1 1/4	Stud	7 1/2	750

TABLE N-1.1

5. PERFORMANCE REQUIREMENTS (Cont'd)

RECOMMENDED BOLT SIZES FOR CLASS 250 CAST IRON OR ANSI 300 STEEL FLANGES					
Pipe Size (Inches)	**Number of Bolts Required**	**Bolt Diameter (Inches)**	**Bolt Type**	**Bolt Length (Inches)**	**Torque specifications (Ft.-Lbs.)**
1	4	5/8	Machine	2 3/4	40
			Stud	3 1/2	90
2	8	5/8	Machine	3 1/4	40
			Stud	3 3/4	90
3	8	3/4	Machine	4	80
			Stud	4 3/4	150
4	8	3/4	Machine	4 1/4	80
			Stud	5	150
6	12	3/4	Machine	4 3/4	80
			Stud	5 1/4	150
8	12	7/8	Machine	5 1/4	125
			Stud	6	240
10	16	1	Stud	6 3/4	370
12	16	1 1/8	Stud	7 1/4	530
16	20	1 1/4	Stud	8	750
18	24	1 1/4	Stud	8 1/4	750
20	24	1 1/4	Stud	8 1/2	1380
22	24	1 1/2	Stud	9 1/4	1380
24	24	1 1/2	Stud	9 1/2	1675
26	28	1 5/8	Stud	10 1/2	2190
30	28	1 3/4	Stud	11 3/4	2190
34	28	1 7/8	Stud	13	2190
36	32	2	Stud	13 1/2	3300
Note: Machine bolts are to be used only when one or both flanges are cast iron.					

TABLE N-1.2

5. PERFORMANCE REQUIREMENTS (Cont'd)

RECOMMENDED STUD BOLT SIZES FOR ANSI 400 STEEL FLANGES

Pipe Size (Inches)	Number of Bolts Required	Bolt Diameter (Inches)	Bolt Length (Inches)	Torque Specifications (Ft.-Lbs.)
2	8	5/8	4 1/2	90
3	8	3/4	5 1/2	150
4	8	7/8	6	240
6	12	7/8	6 3/4	240
8	12	1	7 1/4	370
10	16	1 1/8	8	530
12	16	1 1/4	8 3/4	750
16	20	1 3/8	9 1/4	1050
18	24	1 3/8	9 1/2	1050
20	24	1 1/2	10	1380
22	24	1 5/8	10 1/2	1675
24	24	1 3/4	11	2190
26	28	1 3/4	12	2190
30	28	2	13 3/4	3300
34	28	2	14 1/2	3300
36	32	2	14 3/4	3300

TABLE N-1.3

5. PERFORMANCE REQUIREMENTS (Cont'd)

RECOMMENDED STUD BOLT SIZES FOR ANSI 600 STEEL FLANGES

Pipe Size (Inches)	Number of Bolts Required	Bolt Diameter (Inches)	Bolt Length (Inches)	Torque Specifications (Ft.-Lbs.)
1	4	5/8	4	90
2	8	5/8	4 1/2	90
3	8	3/4	5 1/2	150
4	8	7/8	6 1/4	240
6	12	1	7 1/4	370
8	12	1 1/8	8 1/4	530
10	16	1 1/4	9	750
12	20	1 1/4	9 1/4	1380
16	20	1 1/2	10 1/2	1675
18	20	1 5/8	11 1/4	1675
20	24	1 5/8	11 3/4	2190
22	24	1 3/4	12 1/2	3000
24	24	1 7/8	13 1/2	3000
26	28	1 7/8	14	3300
30	28	2	14 3/4	3300
34	28	2 1/4	15 3/4	4770
36	28	2 1/2	16 1/2	6600

TABLE N-1.4

6. DIMENSIONS AND TOLERANCES

Stud bolt lengths are given from end of thread to end of thread and do not include the height of point (the part of the bolt that extends beyond the thread and may be chamfered, rounded or sheared).

7. INSPECTION

7.1 Successful review of the Product Information Package (PIP), as well as any future reference by SWG to the seller's part number or internal code number in any future contract or purchase, will mean only that no conflict with the specification was found, and will not relieve the seller from meeting all the requirements of this specification.

7.2 SWG retains the option to inspect the manufacture and testing of any and all materials, products or systems referenced in this specification that are sold to SWG.

7.3 SWG will make appropriate inspections and tests of any and all materials, products or systems supplied to this specification. SWG will have the right, at their option, to reject any material which fails to conform to this specification. Any such rejection may take place at the manufacturer's facility; the supplier's warehouse or any subsequent delivery location, before or after SWG assumes possession. Notice of the rejection will be made promptly to the supplier by SWG. The defective product will be replaced or returned for credit at the manufacturer's expense.

7.4 Any changes in the manufacturing of previously approved materials, products or systems described in this material specification for sale to SWG, must be approved by SWG's Engineering Staff. **Failure to obtain SWG's approval may be cause for rejection and disqualification as an approved supplier.**

8. CERTIFICATION

The manufacturer's or supplier's certification will be furnished to Southwest. This certification shall state that samples representing each lot have been manufactured, tested and inspected in accordance with this specification and that all requirements have been met. When requested or specified in the purchase order or contract, a report of test results will be provided.

Upon the request of Southwest, the certification of an independent third party indicating conformance to the specification may be considered at Southwest's expense.

9. SAFETY DATA SHEETS

In accordance with law, the seller will supply Safety Data Sheets for all applicable items supplied under this specification to the following:

1) The Receiving Location
2) Engineering Staff
3) Southwest Gas Corporation
   Corporate Safety
   Mail Station LVA-120
   P.O. Box 98510
   Las Vegas, NV 89193-8510

10. PRODUCT MARKING

Machine bolts shall be marked as follows:

- Bolt heads shall be marked with a unique identifier by the manufacturer.
- Bolt heads shall be marked with the grade marking “307B”.

Stud bolts shall be marked as follows:

- The grade and manufacturer‘s identification symbols shall be applied to one end of studs 3/8-inch in diameter and larger. (If the available area is inadequate, the grade symbol may be marked on one end and the manufacturer’s identification symbol marked on the other end.)
- The grade identification symbol shall be “B7”.

Nuts for machine bolts manufactured to ASTM A-563 specifications are not required to be marked unless individual marking is specified on the order. When individual marking is required, the mark shall be the grade letter symbol “A” on one face of the nut. Any nut for machine bolts manufactured to a different ASTM specification and meeting the requirements of paragraph 4.9 must be marked in accordance with that specification.

Nuts for stud bolts shall be marked as follows:

- All nuts shall bear the manufacturer’s identification mark.
- Nuts shall be legibly marked to indicate the grade and process of the manufacturer, either a “1” or a “2H”.

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11. PACKAGING AND PACKAGE MARKING

All products covered in this specification will be packaged in a manner to prevent damage during transportation and storage.

The package should be marked with:

- Size
- Specification
- Manufacturer's Name or Trademark

12. STOCK CLASSIFICATION DESCRIPTION

BOLT, MACHINE, HEAVY HEX, ____-INCH X ____-INCH, ASTM A-307, GRADE B.

BOLT, STUD, B-7, ____-INCH X ____-INCH, FULL THREAD.

BOLT, STUD, B-7, ____-INCH X ____-INCH, FULL THREAD.

NUT, HEX, HEAVY, ____-INCH X ____-INCH.