

1.2 Method of Calculating Tap End Stud Lengths for Type 6B and 6BX Flanges

1.2.1 Calculation

Equation (1.2) is used in establishing tap end stud lengths listed in Table I.3, Table I.4, Table I.5, and Table I.6 and is included here for convenience of industry. Length shown in tables results from rounding as specified in I.2.2.

$$L = T + t + d + S + P + TL + RF \quad (1.2)$$

where

- L is calculated tap end stud length;
- T is total flange thickness;
- t is plus tolerance for flange thickness;
- d is heavy hex nut thickness (equals nominal bolt diameter; see ASME B18.2.2);
- S is flange face standoff; $S = 0$ for BX assemblies [see Table D.8 (groove)/Table E.8 (groove) and Table D.9 (gasket)/Table E.9 (gasket)—Type R and Table D.10 (gasket)/Table E.10 (gasket)—Type RX];
- P is maximum end point height (1.5 x pitch of thread);
- TL is tap end thread length, maximum [(one diameter + 1.5 pitch) + $1/16$];
- RF add amount of raised face present on studed flanges, if not omitted, to the length of studs in table.

2. Rounding off Procedure

Add $1/16$ in. to the calculated length and then round up to the next $1/8$ in. increment after this addition. This rounding procedure allows for variation in stud installation methods and ensures sufficient extension for full nut engagement.

3. Endpoint Height of Tap End Studs

The endpoint is the end portion of a stud bolt beyond the complete thread and may be chamfered, rounded, or sheared. The maximum height of each endpoint shall be 1.5 x pitch of thread.

4. Tap End Thread Length

One diameter of tap end stud + 1.5 pitch of thread, with a tolerance of $+1/16/-0$ (this includes point height).

5. Nut End Thread Length

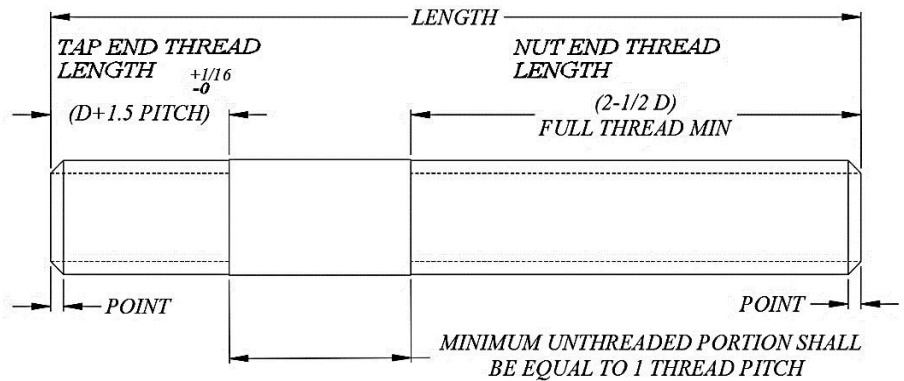
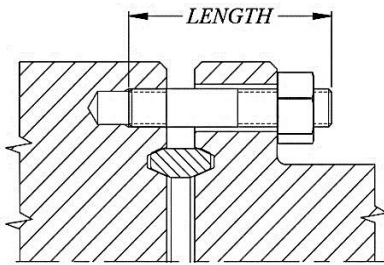
2.5 x diameter of tap end stud minimum. However, if necessary, this length shall be limited to provide minimum unthreaded portion equal to one thread pitch between the tap end threads and nut end threads.

1.2.6 Flange Face Standoff Values, S

The approximate distance between faces of made-up flanges, S (see Figure I.2) is given in Table D.9/Table E.9—Type R gasket and Table D.10/Table E.10—Type RX gasket.

Table I.3—Tap End Stud Length Table for 6B Studded Flange Connectors with “R” and “RX” Gaskets

*ACCOMODATES
"R" AND "RX" TYPE GASKETS*



$LENGTH = T + t + d + S + P + TL + RF$

T is total flange thickness;

t is plus tolerance for flange thickness;

d is heavy hex nut thickness;

S is flange face standoff (with “RX” gasket);

P is point, max. (1.5 x pitch);

TL is tap end thread length, max. [(one diameter + 1.5 pitch) + 1/16];

RF add amount of raised face present on studded flanges, if not omitted, to the length of studs in table.

Dimensions in inches

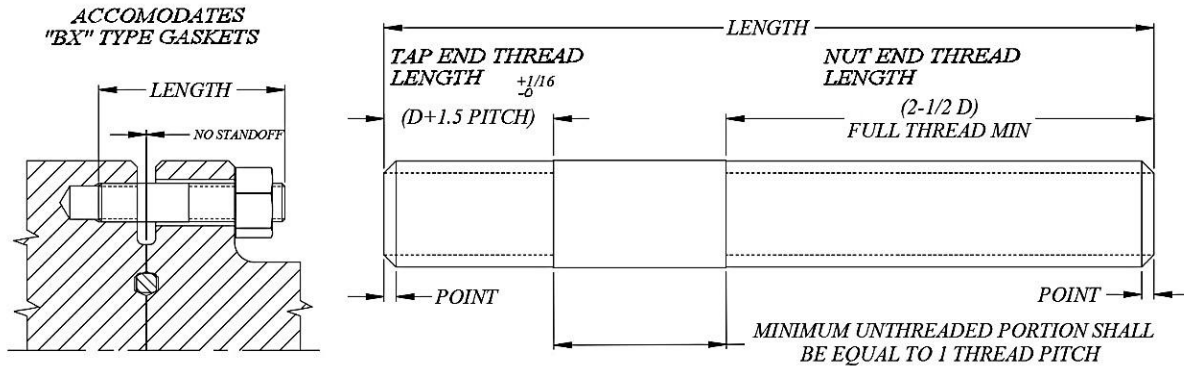
Flange Size and Pressure	Bolt Size and Thread	Tap End Length*	Nut End Length	Length**	Flange Size and Pressure	Bolt Size and Thread	Tap End Length*	Nut End Length	Length**
2 ¹ / ₁₆ 2000	5/8-11 UNC	0.761	1.563	3.625	7 ¹ / ₁₆ 2000	1-8 UNC	1.188	2.500	5.375
2 ¹ / ₁₆ 3000	7/8-9 UNC	1.042	2.188	4.625	7 ¹ / ₁₆ 3000	1 1/8-8 UN	1.313	2.813	5.875
2 ¹ / ₁₆ 5000	7/8-9 UNC	1.042	2.188	4.625	7 ¹ / ₁₆ 5000	1 3/8-8 UN	1.563	3.438	7.500
2 ⁹ / ₁₆ 2000	3/4-10 UNC	0.900	1.875	4.000	9 2000	1 1/8-8 UN	1.313	2.813	5.875
2 ⁹ / ₁₆ 3000	1-8 UNC	1.188	2.500	5.125	9 3000	1 3/8-8 UN	1.563	3.438	6.750
2 ⁹ / ₁₆ 5000	1-8 UNC	1.188	2.500	5.125	9 5000	1 5/8-8 UN	1.813	4.063	8.500
3 ¹ / ₈ 2000	3/4-10 UNC	0.900	1.875	4.125	11 2000	1 1/4-8 UN	1.438	3.125	6.500
3 ¹ / ₈ 3000	7/8-9 UNC	1.042	2.188	4.625	11 3000	1 3/8-8 UN	1.563	3.438	7.000
3 ¹ / ₈ 5000	1 1/8-8 UN	1.313	2.813	5.625	11 5000	1 7/8-8 UN	2.063	4.688	9.625
4 ¹ / ₁₆ 2000	7/8-9 UNC	1.042	2.188	4.625	13 ⁵ / ₈ 2000	1 1/4-8 UN	1.438	3.125	6.625
4 ¹ / ₁₆ 3000	1 1/8-8 UN	1.313	2.813	5.500	13 ⁵ / ₈ 3000	1 3/8-8 UN	1.563	3.438	7.375
4 ¹ / ₁₆ 5000	1 1/4-8 UN	1.438	3.125	6.125	16 ³ / ₄ 2000	1 1/2-8 UN	1.688	3.750	7.500
5 ¹ / ₈ 2000	1-8 UNC	1.188	2.500	5.250	16 ³ / ₄ 3000	1 5/8-8 UN	1.813	4.063	8.375
5 ¹ / ₈ 3000	1 1/4-8 UN	1.438	3.125	6.000	21 ¹ / ₄ 2000	1 5/8-8 UN	1.813	4.063	8.375
5 ¹ / ₈ 5000	1 1/2-8 UN	1.688	3.750	7.375	20 ³ / ₄ 3000	2-8 UN	2.188	5.000	10.125

FOOTNOTES

* Tolerance on tap end thread length: +0.063/-0 in.

** Tolerance on tap end stud length: +0.125/-0 in.

Table I.4—Tap End Stud Length Table for 6BX Studded Flange Connectors



$LENGTH = T + t + d + S + P + TL + RF$

- T* is total flange thickness;
- t* is plus tolerance for flange thickness;
- d* is heavy hex nut thickness;
- S* is flange face standoff;
- P* is point, max. (1.5 x pitch);
- TL* is tap end thread length, max. [(one diameter + 1.5 pitch) + 1/16];
- RF* add amount of raised face present on studded flanges, if not omitted, to the length of studs in table.

Dimensions in inches

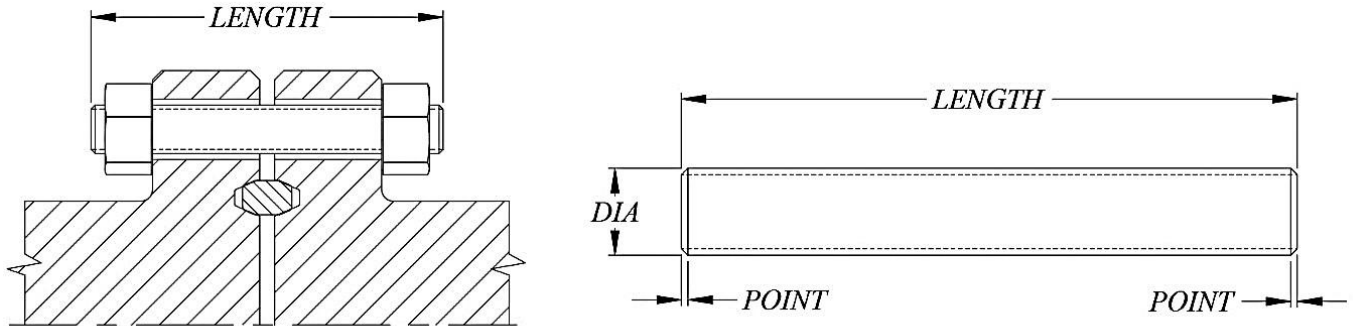
Flange Size and Pressure	Bolt Size and Thread	Tap End Length*	Nut End Length	Length**	Flange Size and Pressure	Bolt Size and Thread	Tap End Length*	Nut End Length	Length**
1 13/16 10,000	3/4-10 UNC	0.900	1.875	3.750	11 10,000	1 3/4-8 UN	1.938	4.375	9.750
1 13/16 15,000	7/8-9 UNC	1.042	2.188	4.125	11 15,000	2-8 UN	2.188	5.000	12.000
1 13/16 20,000	1-8 UNC	1.188	2.500	5.125	11 20,000	2 3/4-8 UN	2.938	6.875	15.000
2 1/16 10,000	3/4-10 UNC	0.900	1.875	3.875	13 5/8 5000	1 5/8-8 UN	1.813	4.063	8.375
2 1/16 15,000	7/8-9 UNC	1.042	2.188	4.375	13 5/8 10,000	1 7/8-8 UN	2.063	4.688	11.000
2 1/16 20,000	1 1/8-8 UN	1.313	2.813	5.750	13 5/8 15,000	2 1/4-8 UN	2.438	5.625	13.250
2 9/16 10,000	7/8-9 UNC	1.042	2.188	4.375	13 5/8 20,000	3-8 UN	3.188	7.500	18.125
2 9/16 15,000	1-8 UNC	1.188	2.500	4.875	16 3/4 5000	1 7/8-8 UN	2.063	4.688	9.500
2 9/16 20,000	1 1/4-8 UN	1.438	3.125	6.250	16 3/4 10,000	1 7/8-8 UN	2.063	4.688	11.000
3 1/16 10,000	1-8 UNC	1.188	2.500	5.000	18 3/4 5000	2-8 UN	2.188	5.000	11.250
3 1/16 15,000	1 1/8-8 UN	1.313	2.813	5.500	18 3/4 10,000	2 1/4-8 UN	2.438	5.625	14.000
3 1/16 20,000	1 3/8-8 UN	1.563	3.438	6.750	18 3/4 15,000	3-8 UN	3.188	7.500	16.750
4 1/16 10,000	1 1/8-8 UN	1.313	2.813	5.750	21 1/4 5000	2-8 UN	2.188	5.000	11.750
4 1/16 15,000	1 3/8-8 UN	1.563	3.438	6.500	21 1/4 10,000	2 1/2-8 UN	2.688	6.250	15.125
4 1/16 20,000	1 3/4-8 UN	1.938	4.375	8.375	26 3/4 2000	1 3/4-8 UN	1.938	4.375	9.125
5 1/8 10,000	1 1/8-8 UN	1.313	2.813	6.000	26 3/4 3000	2-8 UN	2.188	5.000	11.000
5 1/8 15,000	1 1/2-8 UN	1.688	3.750	7.625	30 2000	1 5/8-8 UN	1.813	4.063	9.250
7 1/16 10,000	1 1/2-8 UN	1.688	3.750	7.750	30 3000	1 7/8-8 UN	2.063	4.688	11.000
7 1/16 15,000	1 1/2-8 UN	1.688	3.750	8.375					
7 1/16 20,000	2-8 UN	2.188	5.000	11.125					
9 10,000	1 1/2-8 UN	1.688	3.750	8.500					
9 15,000	1 7/8-8 UN	2.063	4.688	10.125					
9 20,000	2 1/2-8 UN	2.688	6.250	13.750					

FOOTNOTES

- * Tolerance on tap end thread length: + 0.063/-0 in.
- ** Tolerance on tap end stud length: + 0.125/-0 in.

Table I.5—Stud Bolt Length Table for 6B Flange Connectors with “R” Gaskets (USC Units)

*ACCOMMODATES
"R" TYPE GASKETS ONLY*



$$\text{LENGTH} = 2(T + t + d) + S + 2(P)$$

T is total flange thickness;

t is plus tolerance for flange thickness;

d is heavy hex nut thickness;

S is flange face standoff (with “R” gasket);

P is point max. (1.5 x pitch).

Dimensions in inches

Flange Size and Pressure	Bolt Size and Thread	Length*	Flange Size and Pressure	Bolt Size and Thread	Length*
2 ¹ / ₁₆ 2000	5/8-11 UNC	4.750	7 ¹ / ₁₆ 2000	1-8 UNC	7.250
2 ¹ / ₁₆ 3000	7/8-9 UNC	6.250	7 ¹ / ₁₆ 3000	1 ¹ / ₈ -8 UN	8.250
2 ¹ / ₁₆ 5000	7/8-9 UNC	6.250	7 ¹ / ₁₆ 5000	1 ³ / ₈ -8 UN	11.000
2 ⁹ / ₁₆ 2000	3/4-10 UNC	5.250	9 2000	1 ¹ / ₈ -8 UN	8.250
2 ⁹ / ₁₆ 3000	1-8 UNC	6.750	9 3000	1 ³ / ₈ -8 UN	9.250
2 ⁹ / ₁₆ 5000	1-8 UNC	6.750	9 5000	1 ⁵ / ₈ -8 UN	12.250
3 ¹ / ₈ 2000	3/4-10 UNC	5.500	11 2000	1 ¹ / ₄ -8 UN	9.000
3 ¹ / ₈ 3000	7/8-9 UNC	6.250	11 3000	1 ³ / ₈ -8 UN	9.750
3 ¹ / ₈ 5000	1 ¹ / ₈ -8 UN	7.500	11 5000	1 ⁷ / ₈ -8 UN	14.000
4 ¹ / ₁₆ 2000	7/8-9 UNC	6.250	13 ⁵ / ₈ 2000	1 ¹ / ₄ -8 UN	9.250
4 ¹ / ₁₆ 3000	1 ¹ / ₈ -8 UN	7.250	13 ⁵ / ₈ 3000	1 ³ / ₈ -8 UN	10.500
4 ¹ / ₁₆ 5000	1 ¹ / ₄ -8 UN	8.250	16 ³ / ₄ 2000	1 ¹ / ₂ -8 UN	10.500
5 ¹ / ₈ 2000	1-8 UNC	7.000	16 ³ / ₄ 3000	1 ⁵ / ₈ -8 UN	12.000
5 ¹ / ₈ 3000	1 ¹ / ₄ -8 UN	8.000	21 ¹ / ₄ 2000	1 ⁵ / ₈ -8 UN	11.750
5 ¹ / ₈ 5000	1 ¹ / ₂ -8 UN	10.250	20 ³ / ₄ 3000	2-8 UN	14.500

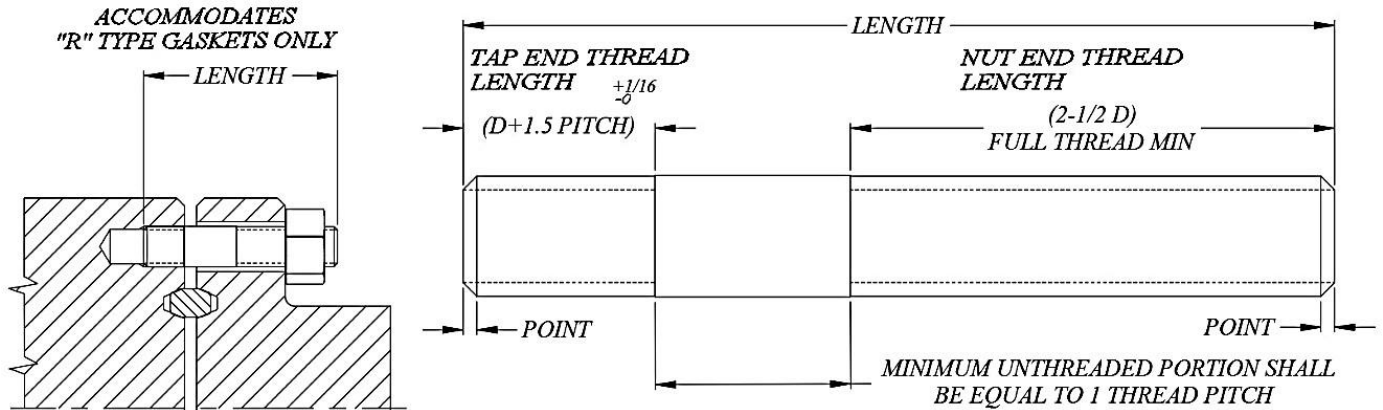
FOOTNOTES

* Tolerance on bolt length:

+0.125, -0 in. for lengths up to 12 in.

+0.250, -0 in. for lengths over 12 in.

Table I.6—Tap End Stud Length Table for 6B Studded Flange Connectors with “R” Gaskets



$LENGTH = T + t + d + S + P + TL + RF$

- T* is total flange thickness;
- t* is plus tolerance for flange thickness;
- d* is heavy hex nut thickness;
- S* is flange face standoff (with “R” gasket);
- P* is point, max. (1.5 x pitch);
- TL* is tap end thread length, max. [(one diameter + 1.5 pitch) + $\frac{1}{16}$];

RF add amount of raised face present on studded flanges, if not omitted, to the length of studs in table.

Dimensions in inches

Flange Size and Pressure	Bolt Size and Thread	Tap End Length*	Nut End Length	Length**	Flange Size and Pressure	Bolt Size and Thread	Tap End Length*	Nut End Length	Length**
2 ¹ / ₁₆ 2000	5/8-11 UNC	0.761	1.563	3.375	7 ¹ / ₁₆ 2000	1-8 UNC	1.188	2.500	5.000
2 ¹ / ₁₆ 3000	7/8-9 UNC	1.042	2.188	4.375	7 ¹ / ₁₆ 3000	1 ¹ / ₈ -8 UN	1.313	2.813	5.625
2 ¹ / ₁₆ 5000	7/8-9 UNC	1.042	2.188	4.375	7 ¹ / ₁₆ 5000	1 ³ / ₈ -8 UN	1.563	3.438	7.250
2 ⁹ / ₁₆ 2000	3/4-10 UNC	0.900	1.875	3.750	9 2000	1 ¹ / ₈ -8 UN	1.313	2.813	5.625
2 ⁹ / ₁₆ 3000	1-8 UNC	1.188	2.500	4.750	9 3000	1 ³ / ₈ -8 UN	1.563	3.438	6.375
2 ⁹ / ₁₆ 5000	1-8 UNC	1.188	2.500	4.750	9 5000	1 ⁵ / ₈ -8 UN	1.813	4.063	8.125
3 ¹ / ₈ 2000	3/4-10 UNC	0.900	1.875	3.875	11 2000	1 ¹ / ₄ -8 UN	1.438	3.125	6.125
3 ¹ / ₈ 3000	7/8-9 UNC	1.042	2.188	4.375	11 3000	1 ³ / ₈ -8 UN	1.563	3.438	6.625
3 ¹ / ₈ 5000	1 ¹ / ₈ -8 UN	1.313	2.813	5.250	11 5000	1 ⁷ / ₈ -8 UN	2.063	4.688	9.250
4 ¹ / ₁₆ 2000	7/8-9 UNC	1.042	2.188	4.375	13 ⁵ / ₈ 2000	1 ¹ / ₄ -8 UN	1.438	3.125	6.250
4 ¹ / ₁₆ 3000	1 ¹ / ₈ -8 UN	1.313	2.813	5.125	13 ⁵ / ₈ 3000	1 ³ / ₈ -8 UN	1.563	3.438	7.000
4 ¹ / ₁₆ 5000	1 ¹ / ₄ -8 UN	1.438	3.125	5.750	16 ³ / ₄ 2000	1 ¹ / ₂ -8 UN	1.688	3.750	7.125
5 ¹ / ₈ 2000	1-8 UNC	1.188	2.500	4.875	16 ³ / ₄ 3000	1 ⁵ / ₈ -8 UN	1.813	4.063	8.000
5 ¹ / ₈ 3000	1 ¹ / ₄ -8 UN	1.438	3.125	5.625	21 ¹ / ₄ 2000	1 ⁵ / ₈ -8 UN	1.813	4.063	8.000
5 ¹ / ₈ 5000	1 ¹ / ₂ -8 UN	1.688	3.750	7.000	20 ³ / ₄ 3000	2-8 UN	2.188	5.000	9.625

FOOTNOTES

* Tolerance on tap end thread length: +0.063/-0 in.

** Tolerance on tap end stud length; +0.125/-0 in.

Annex J **(normative)**

Weld-neck Flanges

J.1 General

J.1.1 Application

There shall be two applications of weld-neck flanges as follows.

- Standard: Weld-neck flanges designed and manufactured to be welded to equipment covered by this specification, with or without additional machining, to meet the requirements of 14.1 for integral flanges when completed.
- Nonstandard: Weld-neck flanges designed and manufactured to be welded to piping or other types of equipment not covered by this specification.

J.1.2 Type and Pressure Rating

There shall be two types of weld-neck flanges.

- Type 6B weld-neck flanges shall be designed and manufactured such that they can be bolted to a matching 6B flanged or studded connector with a rated working pressure of 13.8 MPa, 20.7 MPa, or 34.5 MPa (2000 psi, 3000 psi, or 5000 psi).
- Type 6BX weld-neck flanges shall be designed and manufactured such that they can be bolted to a matching 6BX flanged or studded connector with a rated working pressure of 69.0 MPa, 103.5 MPa, or 138.0 MPa (10,000 psi, 15,000 psi, or 20,000 psi).

J.2 Design

J.2.1 Design Responsibility

NOTE A loose weld-neck flange has two distinct sections as shown in Figure J.1, a flange (rim) section and a hub (neck) section.

The following shall apply.

- Design of the flange section in the finished state as an integral flange shall be fully established by the requirements in part 14.1.
- Design of the hub section shall be the responsibility of the manufacturer.