

No: \_\_\_\_\_

**SUBMITTAL COVERSHEET**  
**Nanuet UFSD –Phase 3 Projects**

**Architect:**

KSQ Architects  
215 W 40<sup>th</sup> Street, 15<sup>th</sup> Floor  
New York, NY 10018

**Owner:**

Nanuet Union Free School District  
101 Church Street  
Nanuet, NY 10954

**Construction Manager:**

Jacobs  
One Penn Plaza, 54<sup>th</sup> floor  
New York, NY 10019

**Contractor:** Joe Lombardo Plumbing & Heating of Rockland Inc

**Contract:** Ron Lombardo

**Address:** 321 Spook Rock Road Suite 109A

845-357-6537

Suffern, New York 10901

**Telephone:**

**Fax:** 845-357-8529

**School Name:** Nanuet Union Free School District Phase 3 Bond Projects @ Barr Middle School & Nanuet High School

**Type of Submittal:**

**Re-submittal:** [ ] No [ ] Yes

[ ] Shop Drawings

[ ] Product Data

[ ] Schedule

[ ] Sample

[ ] \_\_\_\_\_

[ ] Test Report

[ ] Certificate

[ ] Color Sample

[ ] Warranty

[ ] \_\_\_\_\_

**Submittal Description:**

STEAM AND CONDENSATE PIPING REVISION # 1

**Product Name:**

**Manufacturer:** ALL

**Subcontractor/  
Supplier:** FERGUSON

NO ONE MAKES A CLASS 300 SWP  
FLANGED VALVE

**References:**

**Spec. Section No.:** 232213

**Drawing No(s):** \_\_\_\_\_

**Paragraph:** \_\_\_\_\_

**Rm. or Detail No(s):** \_\_\_\_\_

**Architect's/ Engineer's Review Stamp**

SAGE ENGINEERING ASSOCIATES, LLP

☐ Reviewed

☒ Furnish as Corrected

☐ Rejected

☐ Revise and Resubmit

☐ Submit Specified Item

This review is only for general conformance with the design concept and the information given in the Construction Documents. Corrections or comments made on the shop drawings during this review do not relieve the contractor from compliance with the requirements of the plans and specifications. Review of a specific item shall not include review of an assembly of which the item is a component. The Contractor is responsible for dimensions to be confirmed and correlated at the jobsite; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination of the Work with that of all other trades and performing all Work in a safe and satisfactory manner.

**SAGE LOG NO. M-6.1**

Date: 9/29/2023

By: J. Venditte

**Contractor Review Statement:**

These documents have been checked for accuracy and coordinated with job conditions and Contract requirements by this office and have been found to comply with the provisions of the Contract Documents.

Ronald J. Lombardo

9-28-23

Name:

Date:

Company Name:

Joe Lombardo Plumbing & Heating of Rockland Inc.

**Remarks:**

1. Flanged gate valves 2-1/2" and up can be furnished as class 250 valves.



## Wheatland ASTM A 53 Schedule 40 and Schedule 80 Pipe

[www.wheatland.com](http://www.wheatland.com)

Wheatland Steel Pipe is made by specialists who understand that it's the small details that make the difference between average products and superior products. At the Wheatland Plant, most department heads and foremen have been employed in some phase of pipe manufacturing for 25 or more years.

This kind of specialization, experience and knowledge pays off...in workable, threadable, uniform pipe. Delivered clean. Delivered promptly.

Wheatland specializes in manufacturing welded steel pipe in 1/2 through 4 nominal sizes. Available inventory in 1/8 to 12 pipe sizes produced to various ASTM standards is maintained to meet your pipe requirements.

Care, pride and personal concern are bonus features that go into every inch of Wheatland Pipe. Don't settle for less.

***Make sure it's quality. Make sure it's Wheatland.***

**Standard Pipe Schedule 40 ASTM A 53 Grades A and B**

NPS Designator	DN Designator	Outside Diameter		Inside Diameter		Wall Thickness		Nominal Weight (Mass) per unit Length			
		(Inches)	(mm)	(Inches)	(mm)	(Inches)	(mm)	Plain End (lb/ft)	Plain End (kg/m)	Threads & Coupling (lb/ft)	Threads & Coupling (kg/m)
1/8	6	0.405	10.3	0.269	6.8	0.068	1.73	0.24	0.37	0.25	0.37
1/4	8	0.540	13.7	0.364	9.2	0.088	2.24	0.43	0.63	0.43	0.63
3/8	10	0.675	17.1	0.493	12.5	0.091	2.31	0.57	0.84	0.57	0.84
1/2	15	0.840	21.3	0.622	15.8	0.109	2.77	0.85	1.27	0.86	1.27
3/4	20	1.050	26.7	0.824	20.9	0.113	2.87	1.13	1.69	1.14	1.69
1	25	1.315	33.4	1.049	26.6	0.133	3.38	1.68	2.50	1.69	2.50
1-1/4	32	1.660	42.2	1.380	35.1	0.140	3.56	2.27	3.39	2.28	3.40
1-1/2	40	1.900	48.3	1.610	40.9	0.145	3.68	2.72	4.05	2.74	4.04
2	50	2.375	60.3	2.067	52.5	0.154	3.91	3.66	5.44	3.68	5.46
2-1/2	65	2.875	73.0	2.469	62.7	0.203	5.16	5.80	8.63	5.85	8.67
3	80	3.500	88.9	3.068	77.9	0.216	5.49	7.58	11.29	7.68	11.35
3-1/2	90	4.000	101.6	3.548	90.1	0.226	5.74	9.12	13.57	9.27	13.71
4	100	4.500	114.3	4.026	102.3	0.237	6.02	10.80	16.07	10.92	16.23
5	125	5.563	141.3	5.047	158.2	0.258	6.55	14.63	21.77	14.90	22.07
6	150	6.625	168.3	6.065	154.1	0.280	7.11	18.99	28.26	19.34	28.58
8	200	8.625	219.1	7.981	202.7	0.322	8.18	28.58	42.55	29.35	43.73
10	250	10.750	273.0	10.020	254.5	0.365	9.27	40.52	60.29	41.49	63.36
Standard Pipe											
12'	300	12.750	323.8	12.000	304.8	0.375	9.52	9.61	3.78	51.28	76.21

Note<sup>1</sup> NPS 12 dimensions are for standard wall pipe, not schedule 40.

### Product Type and Specification:

Standard welded pipe is produced in 1/2 to 6 trade sizes. Wheatland pipe is produced to ASTM A 53 Grades A and B, A 501, and A 589 Type II, API 5L and Federal Specification WW-P404. All pipe threads conform to ANSI B1.20.1. Merchant couplings comply with ASTM A 865.

Specifications and descriptions are accurate as known at time of publication and subject to change without notice.

**Wheatland ASTM A 53 Grades A & B Schedule 40 Pipe**



## Extra Heavy Pipe Schedule 80 ASTM A 53 Grade A

NPS Designator	DN Designator	Outside Diameter		Inside Diameter		Wall Thickness		Nominal Weight (Mass) per unit Length			
		(Inches)	(mm)	(Inches)	(mm)	(Inches)	(mm)	Plain End (lb/ft)	Plain End (kg/m)	Threads & Coupling (lb/ft)	Threads & Coupling (kg/m)
1/8	6	0.405	10.3	0.215	5.5	0.095	2.41	0.31	0.47	0.32	0.46
1/4	8	0.540	13.7	0.302	7.7	0.119	3.02	0.54	0.80	0.54	0.80
3/8	10	0.675	17.1	0.423	10.7	0.126	3.20	0.74	1.10	0.74	1.10
1/2	15	0.840	21.3	0.549	13.9	0.147	3.73	1.09	1.62	1.09	1.62
3/4	20	1.050	26.7	0.742	18.8	0.154	3.91	1.48	2.20	1.48	2.21
1	25	1.315	33.4	0.957	24.3	0.179	4.55	2.17	3.24	2.19	3.25
1-1/4	32	1.660	42.2	1.278	32.5	0.191	4.85	3.00	4.47	3.03	4.49
1-1/2	40	1.900	48.3	1.500	38.1	0.200	5.08	3.63	5.41	3.65	5.39
2	50	2.375	60.3	1.939	49.3	0.218	5.54	5.03	7.48	5.08	7.55
2-1/2	65	2.875	73.0	2.323	59.0	0.276	7.01	7.67	11.41	7.75	11.52
3	80	3.500	88.9	2.900	73.7	0.300	7.62	10.26	15.27	10.35	15.39
3-1/2	90	4.000	101.6	3.364	85.4	0.318	8.08	12.52	18.63	12.67	18.82
4	100	4.500	114.3	3.826	97.2	0.337	8.56	15.00	22.32	15.20	22.60
5	125	5.563	141.3	4.813	122.3	0.375	9.52	20.80	30.94	21.04	31.42
6	150	6.625	168.3	5.761	146.3	0.432	10.97	28.60	42.56	28.88	43.05
8	200	8.625	219.1	7.625	193.7	0.500	12.70	43.43	64.64	44.00	65.41

Permissible Variations for ASTM A 53 Grades A and B Pipe			
	O.D.	Over	Under
Outside Diameter	NPS 1/8 to 1-1/2 DN 6 to 40	1/64" (0.4mm)	1/64" (0.4mm)
	NPS 2 and up DN 50 and up	1%	1%
Wall Thickness at Any Point		-----	12.5%



**ASTM A 53 Grades A and B:** Black and Galvanized Pipe is manufactured for ordinary use in steam, water, gas, and air lines. UL Listed and FM Approved, sizes 1" through 6" nominal, for use in Fire Sprinkler Pipe Applications.

### Mechanical Properties

**Grade A:** Yield 30,000 [205 Mpa] psi minimum Tensile: 48,000 psi [330 Mpa] minimum

**Grade B:** Yield 35,000 [240 Mpa] psi minimum Tensile: 60,000 psi [415 Mpa] minimum

For additional information or to order, contact our pipe department at 800.257.8182,  
Fax: 724.346.7260, e-mail info@wheatland.com

Wheatland ASTM A 53 Grade A Schedule 80 Pipe



## 232213 - LOW PRESSURE STEAM AND CONDENSATE

WARD MANUFACTURING

P.O. Box 9  
117 Gulick Street  
Blossburg, PA 16912-0009

(570) 638-2131

January 11, 2013

To whom it may concern:

I hereby certify that our products listed below comply with the current specification. The products listed below are made with pride in Blossburg, Pennsylvania, USA.

### 2.2 & 2.3 FITTINGS

#### CL 150 Malleable Iron Threaded Fittings

Fed. Spec. WW - P - 521		
ASME	B16.3	(Dimensions)
ASTM	A-197	(Chemical & Physical Properties)
ASTM	A-153	(For Galvanized Product)
ANSI/ASME	B1.20.1	(Tapered Pipe Threads)

#### CL 300 Malleable Iron Threaded Fittings

ASME	B16.3	(Dimensions)
ASTM	A-197	(Chemical & Physical Properties)
ASTM	A-153	(For Galvanized Product)
ANSI/ASME	B1.20.1	(Tapered Pipe Threads)

#### Unions, Union Fittings, Flange Unions & Companion Flanges

2.5 UNIONS >>>>	CL 150 Malleable Iron to Brass Seat, Iron to Iron Unions	
	Fed. Spec. WW - U - 531	ASME B16.39
	CL 250 Malleable Iron to Brass Seat, Unions	
	Fed. Spec. WW - U - 531	ASME B16.39
	CL 300 Malleable Iron to Brass Seat, Iron to Iron Unions	
	MIL - U - 18250	ASME B16.39
	CL 125 - CL 250 Cast Iron Flanges	ASME B16.1
	ASTM	A-126 (Chemical & Physical Properties)
	ASTM	A-153 (For Galvanized Product)
	ANSI/ASME	B1.20.1 (Tapered Pipe Threads)

#### Bushings and Plugs

Fed. Spec. WW - P - 471		
ASME	B16.14	(Dimensions)
ANSI/ASME	B1.20.1	(Tapered Pipe Threads) Supersedes B-2-1
ASTM	A-197 or	(Chemical & Physical Properties)
	A-126	
ASTM	A-153	(For Galvanized Product)

#### CL 125 Cast Iron Threaded Fittings

Fed. Spec. WW - P - 501		
ASME	B16.4	(Dimensions)
ASTM	A-126	(Chemical & Physical Properties)
ASTM	A-153	(For Galvanized Product)
ANSI/ASME	B1.20.1	(Tapered Pipe Threads)

#### Top Beam & C-Clamps

ASTM	A-197	(Chemical & Physical Properties)
ASTM	A-153	(For Galvanized Product)
UL	203	(Test Parameters)



**Drainage Fittings**

ASME	B16.12
ASTM	A-126
ASTM	A-153
ANSI/ASME	B1.20.1

(Dimensions)  
(Chemical & Physical Properties)  
(For Galvanized Product)  
(Tapered Pipe Threads)

**Cast Iron Flanges**

ASME	B16.1
ASTM	A-126
ASTM	A-153
ANSI/ASME	B1.20.1

(Dimensions)  
(Chemical & Physical Properties)  
(For Galvanized Product)  
(Tapered Pipe Threads)

**WARDLOX Plain-End Fittings**

ASTM	A-126
ASTM	D2000
ANSI/ASME	B1.20.1

(Chemical & Physical Properties, Housing)  
(Gaskets, Temperature Range)  
(Tapered Pipe Threads)

**TEE-LOX Mechanical Branch Connectors**

ASTM	A-126
ASTM	D2000
ANSI/ASME	B1.20.1

(Chemical & Physical Properties, Housing)  
(Gaskets, Temperature Range)  
(Tapered Pipe Threads)

**Full Standard Merchant Couplings**

ASTM	A-865
ASTM	A-53
ANSI/ASME	B1.20.1

(Dimensions)  
(Chemical & Physical Properties)  
(Tapered Pipe Threads)

**Half Standard Merchant Couplings**

ASTM	A-865
ASTM	A-53
ANSI/ASME	B1.20.1

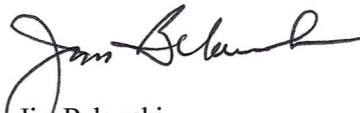
(Dimensions)  
(Chemical & Physical Properties)  
(Tapered Pipe Threads)

**2.3 & 2.3     Welded Steel Pipe Nipples**

NIPPLES SCH 40	ASTM	A-733
ON STEAM	ASTM	A-53
AND SCH 80	ANSI/ASME	B1.20.1
ON CONDENSE		

(Dimensions)  
(Chemical & Physical Properties)  
(Pipe Threads)

Sincerely,

  
Jim Belawski  
Manager of Quality Assurance

## 2.2 & 2.3 - 2 - WELDED FITTINGS



Even with all the advances in technology today, the wholly welded piping system has for decades remained the best choice for use in high pressure and high temperature application. Many piping jobs in schools, industrial plants, refineries and factories have benefited from the inherent advantages of a completely welded system. It becomes a closed container joining pipes, valves, fittings, and flanges. A welded joint actually becomes part of the pipe, minimizing leak potential. This provides greater margins of safety, especially under conditions of high internal pressures. Additionally, welding fittings form a continuous metal structure with the pipe, adding forged-in strength to any piping system. Furthermore, smooth forged fittings simplify insulation and take up less space.

### ASTM A 234

#### Scope

This standard covers wrought carbon steel fittings of seamless and welded construction which are manufactured to the dimensional specifications of ASME B16.9 and B16.28. These fittings are primarily for use in pressure piping and in pressure vessel fabrication for service at moderate and elevated temperatures.

#### Materials

The starting material for fittings shall consist of killed steel, forgings, bars, plates, seamless or fusion-welded tubular products with filler metal added and shall conform to the the chemical requirements of ASTM A 234. Unless otherwise specified, carbon steel plates may be either coarse grain or fine grain practice.

#### Manufacture

Forging or shaping operations are performed by hammering, pressing, piercing, extruding, upsetting, rolling, bending, machining, or by a combination of two or more of these operations. The forming process shall be applied so that it will not produce injurious imperfections in the fittings.

#### Heat Treatment

Hot-formed WPB fittings, upon which the final forming operation is completed at a temperature above 1150°F and below 1800°F, need not be heat treated.

Cold-Formed WPB fittings, upon which the final forming operation is completed at a temperature below 1150°F, shall be normalized, or shall be stress relieved at 1100°F to 1275°F.

### Fitting Summary Data Sheet

#### Chemical requirements (in %):

<u>Carbon</u>	<u>Manganese</u>	<u>Phosphorus (max)</u>	<u>Sulfur (max)</u>
.30 max	.29-1.06	.050	.058

<u>Silicon</u>	<u>Chromium</u>	<u>Molybdenum</u>	<u>Nickel</u>	<u>Copper</u>
.10 min	.40 max	.15 max	.40 max	.40 max

<u>Vanadium</u>	<u>Columbium</u>
.08 max	.02 max

#### Mechanical requirements:

Tensile Strength	60,000-85,000 psi
Yield Strength (min)	35,000 psi
Elongation	- Longitudinal: 22%
	- Transverse: 14%

#### Dimensions

Butt-welding fittings and butt-welding short radius elbows and returns purchased in accordance with this specification shall conform to the dimensions and tolerances given in the latest revision of ANSI B16.9 and B16.28, respectively.

#### Certification

When requested by the purchaser, the manufacturer shall provide a certificate of compliance to this specification.

If requested to provide test reports, the manufacturer shall also provide the following where applicable:

- \* Chemical analysis results. When the amount of an element is less than .02%, the analysis for that element is reported as "<0.02%."
- \* Tensile property results, report the yield strength and ultimate strength in ksi [or MPa] and elongation in percent,
- \* Hardness acceptable in accordance with Section 10 of ASTM A-234,
- \* Seamless or Welded,
- \* Type of Heat Treatment, if any,
- \* Starting material, specifically pipe, plate, etc.,
- \* Statement regarding radiographic or ultrasonic examination.
- \* Any supplemental testing required by the purchase order.

#### Product Marking

All fittings shall have the prescribed information stamped or otherwise suitable marked on each fitting in accordance with ASTM A 234/MSS SP-25. A Weldbend fitting is marked as follows:  
Weldbend's Name, Nominal Pipe Size, Pipe Wall Thickness Designation, Material Grade (WPB/WPC) and Heat Identification Number.

Note: All information contained in this document, and for a complete description of all requirements, refer to ASTM A 105. Sheets are subject to change without notice.

## 2.5 - B - WELD FLANGES



Even with all the advances in technology today, the wholly welded piping system has for decades remained the best choice for use in high pressure and high temperature application. Many piping jobs in schools, industrial plants, refineries, and factories have benefited from the inherent advantages of a completely welded system. It becomes a closed container joining pipes, valves, fittings, and flanges. A welded joint actually becomes part of the pipe, minimizing leak potential. This provides greater margins of safety, especially under conditions of high internal pressures. Additionally, welding fittings form a continuous metal structure with the pipe, adding forged-in strength to any piping system. Furthermore, smooth forged flanges simplify insulation and take up less space.

### ASTM A 105

#### Scope

This standard covers forged carbon steel piping components for ambient- and higher-temperature service in pressure systems. Flanges are ordered either to dimensions specified by the purchaser or to dimensional specifications such as ASME 16.5 and API 6A. Forgings made to ASTM A 105 are normally limited to a maximum weight of 10,000 lb.

#### Materials

Weldbend flanges are made by hammering, pressing, rolling and/or machining cast or forged bars, billets or slabs. These adhere to the extent described in the following sections.

#### Manufacture

ASTM A 105 covers the requirements for forged steel components as finished products only.

The requirements for raw materials are covered by the standards specified in Section 2: Referenced Documents of ASTM A 105.

#### Heat Treatment

Heat treatment is not a mandatory requirement of this specification except for the following piping components:

- \* Flanges above Class 300,
- \* Flanges of special design where the design pressure at the design temperature exceeds the pressure-temperature ratings of Class 300, Group 1.1,
- \* Flanges of special design where the design pressure or design temperature is not known.

Heat treatment, when required by the above, shall be annealing, normalizing, normalizing and tempering, or quenching and tempering in accordance with ASTM A 961.

### Flange Summary Data Sheet

#### Chemical requirements (in %):

<u>Carbon</u>	<u>Manganese</u>	<u>Phosphorus (max)</u>	<u>Sulfur (max)</u>
.35 max	.60-1.05	.035	.040

<u>Silicon</u>	<u>Copper</u>	<u>Nickel</u>	<u>Chromium</u>
.10-.35	.40 max	.40 max	.30 max

<u>Molybdenum</u>	<u>Vanadium</u>	<u>Columbium</u>
.12 max	.08 max	.02 max

#### Mechanical requirements:

Tensile Strength (min)	70,000 psi
Yield Strength (min)	36,000 psi
Basic minimum elongation	30%
for walls 5/16 in. and over	
in thickness, strip tests.	
Reduction of area (min)	30%
Hardness, HB (max)	187

#### Dimensions

Weldbend flanges are manufactured in accordance with ASME B 16.5 (24" NPS and smaller) and ASME B 16.47 (26" - 60" NPS).

#### Certification

For forgings made to specified dimensions agreed upon by the purchaser, and for forgings made to dimensional standards, the application of identification marks, as required by ASTM A 961, shall be the certification that the forgings have been furnished in accordance with the requirements of this standard. The specification designation included on test reports shall include the year of issue and revision letter, if any.

Test Reports: When test reports are required, Weldbend will also provide the following, if applicable:

- \*Type of heat treatment,
- \*Tensile property results, i.e., yield strength and ultimate strength in ksi, elongation and reduction in area, in percent,
- \*Chemical analysis results,
- \*Hardness results, and,
- \*Any supplementary testing required by the purchase order.

#### Product Marking

All flanges shall have the prescribed information stamped or otherwise suitable marked on each flange in accordance with the Standard/MSS SP-25. A Weldbend flange is marked as follows:

Weldbend's Name, Nominal Pipe Size, A105/SA105, Bore Designation, Heat Identification Number and manufacture date.

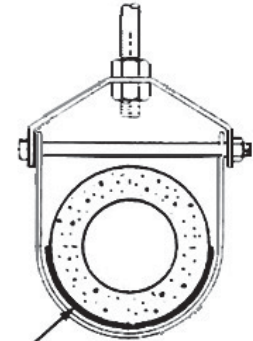
Note: All information contained in this document, and for a complete description of all requirements, refer to ASTM A 105. Sheets are subject to change without notice.

FIG. 220

CLEVIS HANGER WITH WELDED SHIELD

**MATERIAL:** Carbon steel or  
**FINISH:** electro galvanized.  
**SERVICE:** For vapor sealed lines.  
**ORDERING:** Specify pipe size, figure number, insulation thickness and finish.

PIPE SIZE	HANGER SIZING GUIDE					
	THICKNESS OF PIPE INSULATION					
	½"	1"	1½"	2"	2½"	3"
½	1½	2½	3½	5	6	7
¾	2	3	3½	5	6	7
1	2	3	4	5	6	7
1¼	2½	3½	4	5	6	7
1½	2½	3½	5	6	7	8
2	3	4	5	6	7	8
2½	3½	5	6	7	8	10
3	4	5	6	7	8	10
3½	5	6	7	8	10	10
4	5	6	7	8	10	10
5	6	7	8	10	10	12
6	7	8	10	10	12	12
8	10	10	12	12	14	16
10	12	12	14	16	16	18
12	14	16	16	18	18	20
14	16	16	18	18	20	20
16	18	18	20	20	24	24

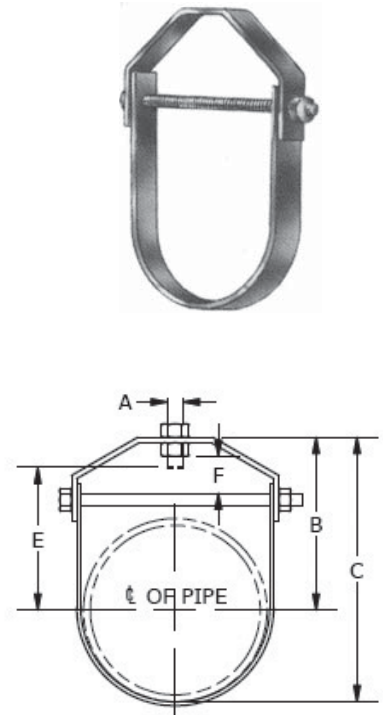


WITH WELDED SHIELD

**FIG. CT200****COPPER TUBING CLEVIS HANGER**

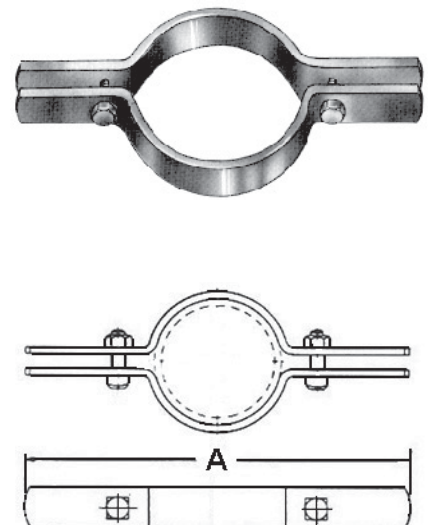
**MATERIAL:** Carbon steel.  
**FINISH:** Copper plated.  
**SERVICE:** For the suspension of stationary copper tubing lines.  
**ORDERING:** Specify tubing size and figure number.  
**APPROVALS:** FS WW-H-171E TYPE 12.

TUBING SIZE	MATERIAL SIZE		A	B	C	E	F	WEIGHT EACH, LBS.
	UPPER	LOWER						
1/2	18ga. x 7/8	18ga. x 7/8	3/8	1 7/8	2 3/16	1 1/2	1/2	.12
3/4	18ga. x 7/8	18ga. x 7/8	3/8	1 3/4	2 1/8	1 3/8	1/2	.12
1	18ga. x 7/8	18ga. x 7/8	3/8	1 13/16	2 5/16	1 7/16	1/2	.14
1 1/4	18ga. x 7/8	18ga. x 7/8	3/8	2 1/8	2 3/4	1 11/16	3/4	.17
1 1/2	18ga. x 7/8	18ga. x 7/8	3/8	2 1/2	3 1/4	2 1/8	15/16	.20
2	14ga. x 7/8	16ga. x 7/8	3/8	2 5/16	4	2 9/16	1 1/16	.38
2 1/2	12ga. x 1 3/16	14ga. x 1 3/16	1/2	4 7/8	5 3/4	3 7/8	2 1/16	.71
3	12ga. x 1 3/16	14ga. x 1 3/16	1/2	4 1/2	6 1/8	3 15/16	2	.76
3 1/2	12ga. x 1 3/16	14ga. x 1 3/16	1/2	5 9/16	7 7/8	5	2 5/8	.82
4	11ga. x 1 3/16	14ga. x 1 3/16	1/2	5 7/8	7 7/8	5 1/4	2 9/16	1.02
5	8ga. x 1 1/4	8ga. x 1 1/4	5/8	5 7/8	8 3/4	5 3/8	1 5/8	1.68
6	8ga. x 1 1/4	8ga. x 1 1/4	5/8	6 1/16	9	5 3/8	1 1/2	1.84

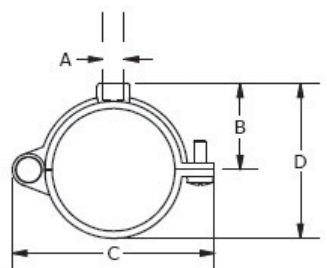
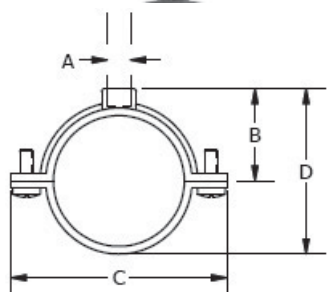
**FIG. CT420****COPPER TUBING RISER CLAMP**

**MATERIAL:** Carbon steel.  
**FINISH:** Copper plated.  
**SERVICE:** For support of tubing risers.  
**ORDERING:** Specify tubing size and figure number.  
**APPROVALS:** MSS SP-58 & SP-69 TYPE 8  
 FS WW-H-171E TYPE 8

NOMINAL TUBING SIZE	A	MATERIAL SIZE	REC. LOAD LBS.	WEIGHT EACH, LBS.
1/2	6 3/4	1/8 x 1	225	.69
3/4	7 1/16	1/8 x 1	225	.73
1	9 1/4	1/8 x 1	250	.75
1 1/4	9 5/8	1/8 x 1	250	.77
1 1/2	10 1/8	1/8 x 1	500	.80
2	10 3/4	1/8 x 1 1/4	500	1.05
2 1/2	11 1/4	3/16 x 1 1/4	500	1.68
3	11 1/2	3/16 x 1 1/4	500	1.78
3 1/2	12 1/4	3/16 x 1 1/4	500	1.91
4	12 3/4	3/16 x 1 1/4	500	2.05
5	14	1/4 x 1 1/2	815	3.46
6	15 1/2	1/4 x 1 1/2	815	3.86



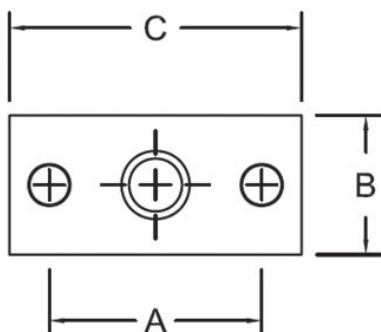


**FIG. CT100****COPPER TUBING SPLIT RING HANGER**

- MATERIAL:** Malleable iron.
- FINISH:** Copper epoxy coated (COPPER-GARD).
- ORDERING:** Specify tubing size and figure number.
- SERVICE:** For suspension of non-insulated stationary tubing lines.
- APPROVALS:** MSS SP-58 & SP-69 TYPE 12  
FS WW-H-171E TYPE 25

TUBE SIZE	MAX. REC. LOAD, LBS.	A ROD SIZE	B	C	D	WEIGHT PER 100, LBS.
1/4*	180	3/8	9/16	1 3/4	7/8	7.3
3/8*	180	3/8	5/8	1 3/4	1 1/16	8.0
1/2	180	3/8	11/16	1 7/8	1 1/8	8.7
3/4	180	3/8	13/16	2 1/4	1 3/8	9.6
1	180	3/8	15/16	2 1/2	1 5/8	12.8
1 1/4	180	3/8	1 1/16	2 7/8	1 7/8	14.1
1 1/2	180	3/8	1 3/16	3	2 3/16	17.9
2	180	3/8	1 7/16	3 1/2	2 11/16	22.9
2 1/2*	300	1/2	1 7/8	4 15/16	2 7/16	44.9
3*	300	1/2	2 1/8	5 1/2	4 1/16	66.3
4*	300	1/2	2 5/8	6 5/8	5 1/16	75.3

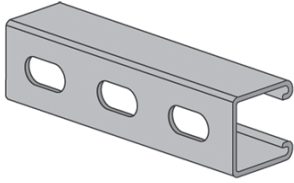
\*Sizes 1/4", 3/8", 2 1/2", 3" and 4" are hinged style

**FIG. CT105****COPPER HANGER FLANGE**

- MATERIAL:** Malleable iron.
- FINISH:** Copper epoxy coated (COPPER-GARD).
- SERVICE:** For suspension of non-insulated stationary tubing lines.
- ORDERING:** Specify tap size and figure number.

ROD SIZE	A	B	C	WEIGHT PER 100, LBS.
3/8	1 15/16	1 5/16	2 3/4	17
1/2	1 15/16	1 5/16	2 3/4	17

FIG. H132

**STRUT**

**MATERIAL:** Carbon steel  
**FINISH:** Pre-galvanized (ASTM-A653) or epoxy coated green.  
**ORDERING:** Specify size, figure number, length and finish.

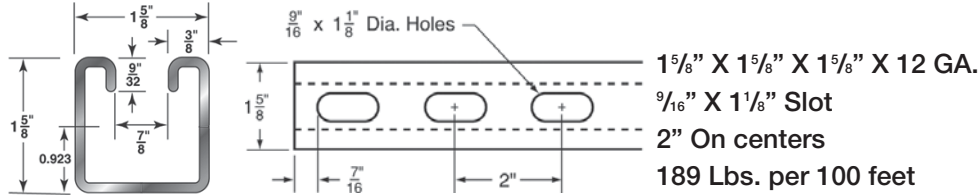
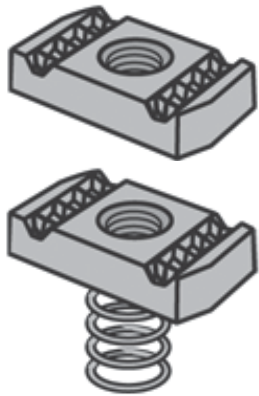


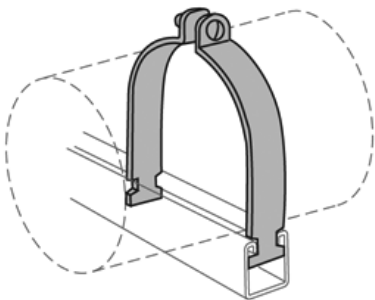
FIG. SN

**STRUT NUT**

**MATERIAL:** Carbon steel  
**FINISH:** Electro-galvanized.  
**ORDERING:** Specify size with or without spring and figure number.

ROD SIZE	WITHOUT SPRING		WITH SPRING	
	STD. PKG.	WEIGHT EACH, LBS.	STD. PKG.	WEIGHT EACH, LBS.
1/4	100	.067	100	.076
3/8	100	.094	100	.102
1/2	100	.09	100	.094
5/8	100	.13	50	.15
3/4	100	.13	50	.15

FIG. SPC

**STRUT PIPE CLAMP**

**MATERIAL:** Carbon steel  
**FINISH:** Electro-galvanized.  
**ORDERING:** Specify pipe/tube size and figure number.

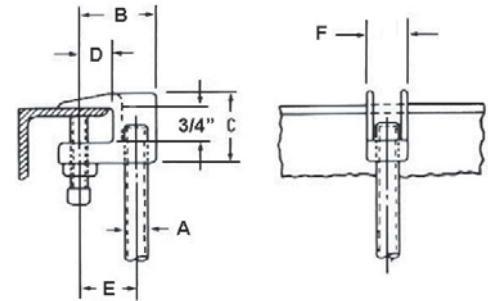
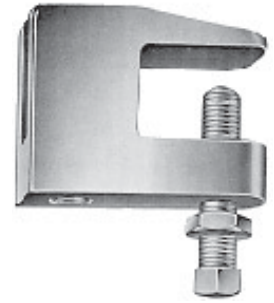
PIPE/TUBE SIZE	STRUT PIPE CLAMP		STRUT TUBE CLAMP	
	STD. PKG.	WEIGHT EACH, LBS.	STD. PKG.	WEIGHT EACH, LBS.
3/8	100	.106	100	.084
1/2	100	.108	100	.091
3/4	100	.138	100	.102
1	100	.156	100	.15
1 1/4	100	.191	100	.17
1 1/2	50	.286	100	.182
2	50	.336	50	.316
2 1/2	50	.372	50	.346
3	50	.446	50	.386
3 1/2	25	.576	50	.54
4	25	.628	25	.606
5	25	.732	25	.69
6	25	.976	25	.91
8	25	1.24		

**NOTE:** Tubing sizes only available up to 4".

**FIG. 635****JUNIOR TOP BEAM CLAMP**

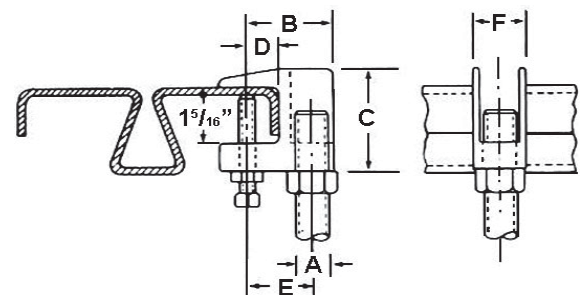
**MATERIAL:** Malleable Iron.  
**FINISH:** electro-galvanized.  
**SERVICE:** For use under roof installations with bar joist type construction where the thickness of the joist does not exceed  $\frac{5}{8}$ ".  
**ORDERING:** Specify size, figure number, and finish.  
**APPROVALS:** MSS SP-58 & SP-69 TYPE 19  
 FM ( $\frac{3}{8}$ " &  $\frac{1}{2}$ " rod)  
 UL

ROD SIZE A	SIZE PIPE	MAX RECOMMENDED LOAD, LBS.	WEIGHT PER 100, LBS.	B	C	D	E	F
$\frac{3}{8}$	$\frac{1}{2}$ to 2	350	30	$1\frac{1}{2}$	$1\frac{7}{16}$	$\frac{3}{4}$	$1\frac{3}{16}$	$\frac{3}{4}$
$\frac{1}{2}$	$2\frac{1}{2}$ to $3\frac{1}{2}$	470	39	$1\frac{5}{8}$	$1\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{4}$	$\frac{7}{8}$
$\frac{5}{8}$	4 to 5	550	40	$1\frac{3}{4}$	$1\frac{1}{2}$	$\frac{3}{4}$	$1\frac{3}{32}$	1
$\frac{3}{4}$	6	700	67	$2\frac{1}{4}$	$1\frac{3}{4}$	$1\frac{1}{16}$	$1\frac{5}{16}$	$1\frac{1}{4}$
$\frac{7}{8}$	8	1000	66	$2\frac{1}{4}$	$1\frac{3}{4}$	$1\frac{1}{16}$	$1\frac{5}{16}$	$1\frac{1}{4}$

**FIG. 640****TOP BEAM CLAMP**

**MATERIAL:** Malleable Iron.  
**FINISH:** electro-galvanized.  
**SERVICE:** For use under roof installations with bar joist type construction where the thickness of the joist does not exceed  $1\frac{1}{4}$ ".  
**ORDERING:** Specify size, figure number and finish.

ROD SIZE A	SIZE PIPE	MAX RECOMMENDED LOAD, LBS.	WEIGHT PER 100, LBS.	B	C	D	E	F
$\frac{3}{8}$	$\frac{1}{2}$ to 2	400	38	$1\frac{7}{16}$	2	$\frac{3}{4}$	$1\frac{3}{16}$	$\frac{3}{4}$
$\frac{1}{2}$	$2\frac{1}{2}$ to $3\frac{1}{2}$	500	49	$1\frac{5}{8}$	$2\frac{1}{16}$	$\frac{3}{4}$	$1\frac{1}{4}$	$\frac{7}{8}$
$\frac{5}{8}$	4 to 5	850	66	$1\frac{3}{4}$	$2\frac{1}{4}$	$\frac{3}{4}$	$1\frac{1}{4}$	1
$\frac{3}{4}$	6	900	83	$1\frac{7}{8}$	$2\frac{3}{8}$	$\frac{3}{4}$	$1\frac{3}{8}$	$1\frac{3}{16}$



**Double****PRODUCT INFORMATION****Double** *Shield Expansion Anchor***PRODUCT DESCRIPTION**

The Double is a dual expansion machine bolt anchor particularly suited for materials of questionable strength. It can be used in solid concrete, block, brick, and stone. Job site tests are recommended when used in base materials of questionable strength.

**FEATURES AND BENEFITS**

- Performs in base material of questionable strength
- Internally threaded anchor for easy removability and service work
- Corrosion resistant body

**APPROVALS AND LISTINGS**

Federal GSA Specification – Meets the descriptive and proof load requirements of CID A-A 1923A, Type 3

**GUIDE SPECIFICATIONS**

**CSI Divisions:** 03151-Concrete Anchoring, 04081-Masonry Anchorage and 05090-Metal Fastenings. Expansion anchors shall be Double as supplied by Powers Fasteners, Inc., Brewster, NY.

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<b>Installation and Material Specifications</b> .....	1
<b>Performance Data</b> .....	2
<b>Design Criteria</b> .....	3
<b>Ordering Information</b> .....	4

**Double****THREAD VERSION**

UNC Thread

**ANCHOR MATERIALS**

Zamac Alloy

**ROD/ANCHOR SIZE RANGE (TYP.)**

1/4" to 3/4" diameter

**SUITABLE BASE MATERIALS**

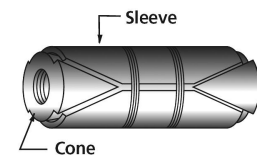
Normal-weight Concrete  
Hollow Concrete Masonry (CMU)  
Brick Masonry

**INSTALLATION AND MATERIAL SPECIFICATIONS****Installation Specifications**

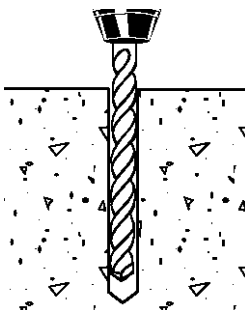
Dimension	Rod/Anchor Diameter, <i>d</i>					
	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"
ANSI Drill Bit Size, <i>d<sub>bit</sub></i> (in.)	1/2	5/8	3/4	7/8	1	1 1/4
Max. Tightening Torque, <i>T<sub>max</sub></i> (ft.-lbs.)	5	7	10	20	30	60
Sleeve Length (in.)	1	1 3/16	1 9/16	2	2 1/4	3 1/4
Thread Size (UNC)	1/4-20	5/16-18	3/8-16	1/2-13	5/8-11	3/4-10
Thread Length In Cone (in.)	1/2	1/2	5/8	3/4	7/8	1 1/8
Overall Anchor Length (in.)	1 3/8	1 5/8	2	2 1/2	2 3/4	3 15/16

**Material Specifications**

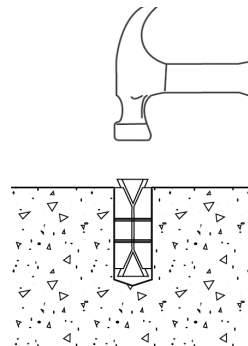
Anchor Component	Component Material
Anchor Shield	Zamac Alloy
Cone	Zamac Alloy

**Installation Guidelines**

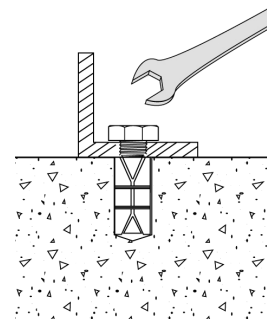
Drill a hole into the base material to the minimum depth required. The tolerances of the drill bit used should meet the requirements of ANSI Standard B212.15. Do not expand the anchor prior to installation. Do not over drill the hole unless the application calls for a subset anchor.



Insert anchor into the hole, threaded cone end first until the outer sleeve is flush with the surface of the base material.



Position fixture, then insert screw or bolt and tighten. For maximum expansion, the upper cone should protrude slightly before setting. The bolt must engage a minimum of 2/3 of the anchor threads.



**PERFORMANCE DATA**

**Ultimate Load Capacities for Double Expansion Anchor in Normal-Weight Concrete<sup>1,2</sup>**

Rod/Anchor Diameter  <i>d</i> in. (mm)	Minimum Embedment Depth  <i>h<sub>v</sub></i> in. (mm)	Minimum Concrete Compressive Strength ( <i>f'<sub>c</sub></i> )					
		2,000 psi (13.8 MPa)		4,000 psi (27.6 MPa)		6,000 psi (41.4 MPa)	
		Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
1/4 (6.4)	1 1/4 (31.8)	710 (3.2)	1,110 (5.0)	900 (4.0)	1,135 (5.2)	1,220 (5.5)	1,335 (6.0)
5/16 (7.9)	1 1/2 (38.1)	1,130 (5.1)	1,735 (7.8)	1,500 (6.7)	2,020 (9.1)	2,160 (9.7)	2,155 (9.7)
3/8 (9.5)	1 3/4 (44.5)	1,365 (6.1)	2,690 (12.1)	2,000 (9.0)	3,000 (13.5)	3,085 (13.9)	4,030 (18.1)
1/2 (12.7)	2 1/4 (57.2)	2,590 (11.7)	3,740 (16.8)	3,550 (16.0)	4,310 (19.4)	4,645 (20.9)	6,930 (31.2)
5/8 (15.9)	2 1/2 (63.5)	4,290 (19.3)	9,640 (43.4)	6,150 (27.7)	10,270 (46.2)	6,890 (81.0)	11,580 (52.2)
3/4 (19.1)	3 1/2 (88.9)	6,000 (27.0)	10,920 (49.2)	8,150 (36.7)	13,330 (60.0)	11,510 (51.8)	14,480 (65.2)

1. Tabulated load values are for anchors installed in concrete. Concrete compressive strength must be at the specified minimum at the time of installation.

2. Ultimate load capacities must be reduced by a minimum safety factor of 4.0 or greater to determine allowable working load. Consideration of safety factors of 20 or higher may be necessary depending upon the application such as life safety, overhead and in sustained tensile loading applications.

**Allowable Load Capacities for Double Expansion Anchor in Normal-Weight Concrete<sup>1,2,3</sup>**

Rod/Anchor Diameter  <i>d</i> in. (mm)	Minimum Embedment Depth  <i>h<sub>v</sub></i> in. (mm)	Minimum Concrete Compressive Strength ( <i>f'<sub>c</sub></i> )					
		2,000 psi (13.8 MPa)		4,000 psi (27.6 MPa)		6,000 psi (41.4 MPa)	
		Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
1/4 (6.4)	1 1/4 (31.8)	180 (0.8)	280 (1.3)	225 (1.0)	285 (1.3)	305 (1.4)	335 (1.5)
5/16 (7.9)	1 1/2 (38.1)	285 (1.3)	435 (2.0)	375 (1.7)	505 (2.3)	540 (2.4)	540 (2.4)
3/8 (9.5)	1 3/4 (44.5)	340 (1.5)	675 (3.0)	500 (2.3)	750 (3.4)	770 (3.5)	1,010 (4.5)
1/2 (12.7)	2 1/4 (57.2)	650 (2.9)	935 (4.2)	890 (4.0)	1,080 (4.9)	1,160 (5.2)	1,735 (7.8)
5/8 (15.9)	2 1/2 (63.5)	1,075 (4.8)	2,410 (10.9)	1,540 (6.9)	2,570 (11.6)	1,725 (20.3)	2,895 (13.1)
3/4 (19.1)	3 1/2 (88.9)	1,500 (6.8)	2,730 (12.3)	2,040 (9.2)	3,335 (15.0)	2,880 (13.0)	3,620 (16.3)

1. Allowable load capacities listed are calculated using and applied safety factor of 4.0. Consideration of safety factors of 20 or higher may be necessary depending upon the application such as life safety, overhead and in sustained tensile loading applications.

2. Linear interpolation may be used to determine allowable loads for intermediate compressive strengths.

3. Allowable load capacities are multiplied by reduction factors found in the Design Criteria section when anchor spacing or edge distances are less than critical distances.



## PERFORMANCE DATA

### Ultimate and Allowable Load Capacities for Double Expansion Anchor in Hollow Concrete Masonry<sup>1,2,3</sup>

Rod/Anchor Diameter  <i>d</i> in. (mm)	Minimum Embedment Depth  <i>h<sub>v</sub></i> in. (mm)	<i>f'<sub>m</sub></i> ≥ 1,500 psi (10.4 MPa)			
		Ultimate Load		Allowable Load	
		Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
1/4 (6.4)	1 1/4 (31.8)	885 (4.0)	1,350 (6.1)	175 (0.8)	270 (1.2)
5/16 (7.9)	1 1/2 (38.1)	1,295 (5.8)	1,635 (7.4)	260 (1.2)	325 (1.5)
3/8 (9.5)	1 1/2 (38.1)	1,575 (7.1)	2,160 (9.7)	315 (1.4)	430 (1.9)
1/2 (12.7)	1 1/2 (38.1)	2,710 (12.2)	3,130 (14.1)	540 (2.4)	625 (2.8)

1. Tabulated load values are for anchors installed in minimum 8-inch wide, minimum Grade N, Type II, lightweight, medium-weight or normal-weight concrete masonry units conforming to ASTM C 90. Mortar must be minimum Type N. Masonry cells may be grouted. Masonry compressive strength must be at the specified minimum at the time of installation (*f'<sub>m</sub>* ≥ 1,500 psi).
2. Allowable load capacities listed are calculated using and applied safety factor of 5.0. Consideration of safety factors of 20 or higher may be necessary depending upon the application such as life safety, and in sustained tensile loading applications.
3. Anchors with diameters of 3/8" and 1/2" installed in hollow concrete masonry units are limited to one anchor per unit cell.

### Ultimate and Allowable Load Capacities for Double Shell Expansion Anchor in Clay Brick Masonry<sup>1,2</sup>

Rod/Anchor Diameter  <i>d</i> in. (mm)	Minimum Embedment Depth  <i>h<sub>v</sub></i> in. (mm)	Structural Brick Masonry <i>f'<sub>m</sub></i> ≥ 1,500 psi (10.4 MPa)			
		Ultimate Load		Allowable Load	
		Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
1/4 (6.4)	1 1/4 (31.8)	1,175 (5.3)	1,585 (7.1)	235 (1.1)	315 (1.4)
5/16 (7.9)	1 1/2 (38.1)	1,585 (7.1)	2,040 (9.2)	315 (1.4)	410 (1.8)
3/8 (9.5)	1 3/4 (44.5)	1,830 (8.2)	3,590 (16.2)	365 (1.6)	720 (3.2)
1/2 (12.7)	2 1/4 (57.2)	3,420 (15.4)	5,185 (23.3)	685 (3.1)	1,035 (4.7)
5/8 (15.9)	2 1/2 (63.5)	4,460 (19.8)	6,055 (27.2)	890 (4.0)	1,210 (5.4)
3/4 (19.1)	3 1/2 (88.9)	6,000 (26.7)	7,935 (35.7)	1,200 (5.3)	1,585 (7.1)

1. Tabulated load values are for anchors installed in multiple wythe, minimum Grade SW, solid clay brick masonry walls conforming to ASTM C 62. Mortar must be minimum Type N. Masonry compressive strength must be at the specified minimum at the time of installation (*f'<sub>m</sub>* ≥ 1,500 psi).
2. Allowable load capacities listed are calculated using and applied safety factor of 5.0. Consideration of safety factors of 20 or higher may be necessary depending upon the application such as life safety, and in sustained tensile loading applications.

## DESIGN CRITERIA (ALLOWABLE STRESS DESIGN)

### Combined Loading

For anchors loaded in both shear and tension, the combination of loads should be proportioned as follows:

$$\left( \frac{N_u}{N_n} \right) + \left( \frac{V_u}{V_n} \right) \leq 1$$

Where: *N<sub>u</sub>* = Applied Service Tension Load  
*N<sub>n</sub>* = Allowable Tension Load  
*V<sub>u</sub>* = Applied Service Shear Load  
*V<sub>n</sub>* = Allowable Shear Load

### Load Adjustment Factors for Spacing and Edge Distances<sup>1</sup>

Anchor Installed in Normal-Weight Concrete					
Anchor Dimension	Load Type	Critical Distance (Full Anchor Capacity)	Critical Load Factor	Minimum Distance (Reduced Capacity)	Minimum Load Factor
Spacing ( <i>s</i> )	Tension and Shear	<i>s<sub>cr</sub></i> = 10 <i>d</i>	<i>F<sub>NS</sub></i> = <i>F<sub>VS</sub></i> = 1.0	<i>s<sub>min</sub></i> = 5 <i>d</i>	<i>F<sub>NS</sub></i> = <i>F<sub>VC</sub></i> = 0.50
Edge Distance ( <i>c</i> )	Tension	<i>c<sub>cr</sub></i> = 12 <i>d</i>	<i>F<sub>NC</sub></i> = 1.0	<i>c<sub>min</sub></i> = 5 <i>d</i>	<i>F<sub>NC</sub></i> = 0.80
	Shear	<i>c<sub>cr</sub></i> = 12 <i>d</i>	<i>F<sub>VC</sub></i> = 1.0	<i>c<sub>min</sub></i> = 5 <i>d</i>	<i>F<sub>VC</sub></i> = 0.50

1. Allowable load values found in the performance data tables are multiplied by reduction factors when anchor spacing or edge distances are less than critical distances. Linear interpolation is allowed for intermediate anchor spacing and edge distances between critical and minimum distances. When an anchor is affected by both reduced spacing and edge distance, the spacing and edge reduction factors must be combined (multiplied). Multiple reduction factors for anchor spacing and edge distance may be required depending on the anchor group configuration.

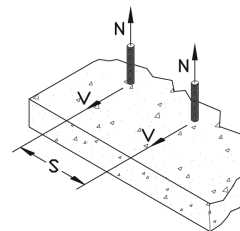
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## DESIGN CRITERIA (ALLOWABLE STRESS DESIGN)

### Load Adjustment Factors for Normal-Weight Concrete

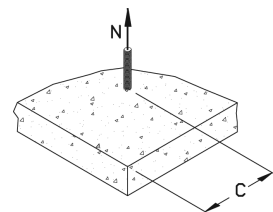
Spacing, Tension ( $F_{Nc}$ ) & Shear ( $F_{Vc}$ )						
Dia. (in.)	1/4	5/16	3/8	1/2	5/8	3/4
$s_{cr}$ (in.)	2 1/2	3 1/8	3 3/4	5	6 1/4	7 1/2
$s_{min}$ (in.)	1 1/4	1 9/16	1 7/8	2 1/2	3 1/8	3 3/4
Spacing, $s$ (inches)	1 1/4	0.50				
	1 9/16	0.63	0.50			
	1 7/8	0.75	0.60	0.50		
	2 1/2	1.00	0.80	0.67	0.50	
	3 1/8		1.00	0.83	0.63	0.50
	3 3/4			1.00	0.75	0.60
	5				1.00	0.80
	6 1/4					0.67
	7 1/2					0.83

Notes: For anchors loaded in tension and shear, the critical spacing ( $s_{cr}$ ) is equal to 10 anchor diameters ( $10d$ ) at which the anchor achieves 100% of load. Minimum spacing ( $s_{min}$ ) is equal to 5 anchor diameters ( $5d$ ) at which the anchor achieves 50% of load.



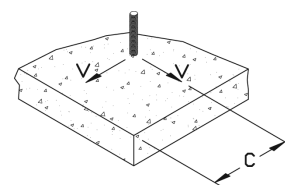
Edge Distance, Tension ( $F_{Nc}$ )						
Dia. (in.)	1/4	5/16	3/8	1/2	5/8	3/4
$c_{cr}$ (in.)	3	3 3/4	4 1/2	6	7 1/2	9
$c_{min}$ (in.)	2	2 1/2	3	4	5	6
Edge Distance, $c$ (inches)	2	0.80				
	2 1/2	0.90	0.80			
	3	1.00	0.88	0.80		
	3 3/4		1.00	0.90		
	4			0.93	0.80	
	4 1/2			1.00	0.85	
	5				0.90	0.80
	6				1.00	0.88
	7 1/2					1.00

Notes: For anchors loaded in tension, the critical edge distance ( $c_{cr}$ ) is equal to 12 anchor diameters ( $12d$ ) at which the anchor achieves 100% of load. Minimum edge distance ( $c_{min}$ ) is equal to 8 anchor diameters ( $8d$ ) at which the anchor achieves 80% of load.



Edge Distance, Shear ( $F_{Vc}$ )						
Dia. (in.)	1/4	5/16	3/8	1/2	5/8	3/4
$c_{cr}$ (in.)	3	3 3/4	4 1/2	6	7 1/2	9
$c_{min}$ (in.)	2	2 1/2	3	4	5	6
Edge Distance, $c$ (inches)	2	0.50				
	2 1/2	0.75	0.50			
	3	1.00	0.70	0.50		
	3 3/4		1.00	0.75		
	4			0.83	0.50	
	4 1/2			1.00	0.63	
	5				0.75	0.50
	6				1.00	0.70
	7 1/2					1.00

Notes: For anchors loaded in shear, the critical edge distance ( $c_{cr}$ ) is equal to 12 anchor diameters ( $12d$ ) at which the anchor achieves 100% of load. Minimum edge distance ( $c_{min}$ ) is equal to 8 anchor diameters ( $8d$ ) at which the anchor achieves 50% of load.



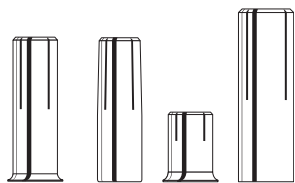
## ORDERING INFORMATION

### Double Expansion Anchor

Catalog Number	Rod/Anchor Diameter	Drill Diameter	Overall Length	Minimum Hole Depth	Standard Box	Standard Carton	Wt./100
9510	1/4"	1/2"	1 3/8"	1 1/4"	50	500	4
9515	5/16"	5/8"	1 5/8"	1 1/2"	50	500	7 1/2
9520	3/8"	3/4"	2"	1 3/4"	50	250	12 1/2
9525	1/2"	7/8"	2 1/2"	2 1/4"	25	250	18
9530	5/8"	1"	2 3/4"	2 1/2"	25	100	25 1/2
9535	3/4"	1 1/4"	3 15/16"	3 1/2"	10	50	54 1/2



## Multi-Set II®



### SPECIFIED FOR ANCHORAGE INTO CONCRETE

Drop-In, shell-type anchors feature an internally threaded, all-steel shell with expansion cone insert and flush

embedment lip. "Anchors are manufactured from zinc-plated carbon steel, 18-8 stainless steel and 316 stainless steel.

Anchors should be installed with carbide tipped hammer drill bits made in accordance to ANSI B212.15-1994 specifications.

Anchors should be tested to ASTM E488 criteria and listed by ICC (formerly ICBO). Anchors should also be listed by the following agencies as required by the local building code: UL, FM, City of Los Angeles, California State Fire Marshal and Cal Trans.

## APPROVALS/LISTINGS

Meets or exceeds U.S. Government G.S.A. Specification A-A-55614 Type 1  
 (Formerly GSA: FF-S-325 Group VIII)

Underwriters Laboratories

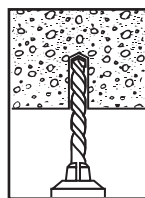
Factory Mutual

City of Los Angeles – #RR2748

California State Fire Marshal

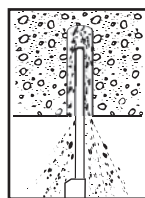
Caltrans

## INSTALLATION STEPS

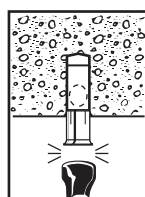


To set anchor flush with surface:

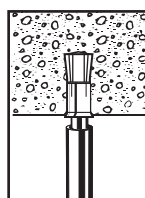
1. Drill hole to required embedment (see Table on page 73).



2. Clean hole with pressurized air.



3. Drive anchor flush with surface of concrete.



4. Expand anchor with setting tool provided (see chart). Anchor is properly expanded when shoulder of setting tool is flush with top of anchor.

To set anchor below surface:

Drill hole deeper than anchor length. Thread bolt into anchor. Hammer anchor into hole until bolt head is at desired depth. Remove bolt and set anchor with setting tool.

## Multi-Set II Drop-In Anchors

### Ultimate Tension and Shear Values (Lbs/kN) in Concrete\*

BOLT DIA. In. (mm)	ANCHOR DIA. In. (mm)	MIN. EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	TENSION Lbs. (kN)			SHEAR Lbs. (kN)
				f'c = 2000 PSI (13.8 MPa)	f'c = 4000 PSI (27.6 MPa)	f'c = 6000 PSI (41.4 MPa)	f'c > 2000 PSI (13.8 MPa)
1/4 (6.4)	3/8 (9.5)	1 (25.4)	RM, RL or CL-Carbon or SRM-18-8 S.S. or SSRM-316 S.S.	1,680 (7.5)	2,360 (10.5)	2,980 (13.3)	1,080 (4.8)
3/8 (9.5)	1/2 (12.7)	1-5/8 (41.3)		2,980 (13.3)	3,800 (16.9)	6,240 (27.8)	3,160 (14.1)
1/2 (12.7)	5/8 (15.9)	2 (50.8)		3,300 (14.7)	5,840 (26.0)	8,300 (36.9)	4,580 (20.4)
5/8 (15.9)	7/8 (22.2)	2-1/2 (63.5)		5,500 (24.5)	8,640 (38.4)	11,020 (49.0)	7,440 (33.1)
3/4 (19.1)	1 (25.4)	3-3/16 (81.0)		8,280 (36.8)	9,480 (42.2)	12,260 (54.5)	10,480 (46.6)

\* Allowable values are based upon a 4 to 1 safety factor. Divide by 4 for allowable load values.

\* For continuous extreme low temperature applications, use stainless steel.

### Combined Tension and Shear Loading—for Multi-Set Anchors

Allowable loads for anchors subjected to combined shear and tension forces are determined by the following equation:

$$(P_s/P_t)^{2/3} + (V_s/V_t)^{2/3} \leq 1$$

P<sub>s</sub> = Applied tension load

V<sub>s</sub> = Applied shear load

P<sub>t</sub> = Allowable tension load

V<sub>t</sub> = Allowable shear load

## Multi-Set II Drop-In Anchors

## Ultimate Tension and Shear Values (Lbs/kN) in Lightweight Concrete\*

BOLT DIA. In. (mm)	ANCHOR DIA. In. (mm)	MINIMUM EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	LIGHTWEIGHT CONCRETE f'c = 3000 PSI (20.7 MPa)		LOWER FLUTE OF STEEL DECK WITH LIGHTWEIGHT CONCRETE FILL f'c = 3000 PSI (20.7 MPa)	
				TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
3/8 (9.5)	1/2 (12.7)	1-5/8 (39.7)	RM, RL or CL-Carbon or SRM-18-8 S.S. or SSRM-316 S.S.	2,035 (9.1)	1,895 (8.4)	3,340 (14.9)	4,420 (19.6)
1/2 (12.7)	5/8 (15.9)	2 (50.8)		2,740 (12.2)	2,750 (12.2)	3,200 (14.2)	4,940 (22.0)
5/8 (15.9)	7/8 (22.2)	2-1/2 (63.5)		4,240 (18.9)	4,465 (19.9)	5,960 (26.5)	5,840 (26.0)
3/4 (19.1)	1 (25.4)	3-3/16 (81.0)		5,330 (23.7)	6,290 (28.0)	8,180 (36.4)	9,120 (40.6)

\* Allowable values are based upon a 4 to 1 safety factor. Divide by 4 for allowable load values.

## Multi-Set II Drop-In Anchors

## Recommended Edge and Spacing Distance Requirements\*

BOLT DIA. In. (mm)	DRILL BIT SIZE In. (mm)	EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	EDGE DISTANCE REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	MIN. EDGE DISTANCE AT WHICH LOAD FACTOR APPLIED =.80 FOR TENSION =.70 FOR SHEAR In. (mm)	SPACING REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	MIN. ALLOWABLE SPACING BETWEEN ANCHORS LOAD FACTOR APPLIED =.80 FOR TENSION =.55 FOR SHEAR In. (mm)
1/4 (6.4)	3/8 (9.5)	1 (25.4)	RM, RL or CL-Carbon or SRM-18-8 S.S. or SSRM-316 S.S.	1-3/4 (44.5)	7/8 (22.2)	3-1/2 (88.9)	1-3/4 (44.5)
3/8 (9.5)	1/2 (12.7)	1-5/8 (41.3)		2-7/8 (73.0)	1-7/16 (36.5)	5-11/16 (144.5)	2-7/8 (73.0)
1/2 (12.7)	5/8 (15.9)	2 (50.8)		3-1/2 (88.9)	1-3/4 (44.5)	7 (177.8)	3-1/2 (88.9)
5/8 (15.9)	7/8 (22.2)	2-1/2 (63.5)		4-3/8 (111.1)	2-3/16 (55.6)	8-3/4 (222.3)	4-3/8 (111.1)
3/4 (19.1)	1 (25.4)	3-3/16 (81.0)		5-5/8 (142.9)	2-13/16 (71.4)	11-3/16 (284.2)	5-5/8 (142.9)

\* Spacing and edge distances shall be divided by 0.75 when anchors are placed in structural lightweight concrete. Linear interpolation may be used for intermediate spacing and edge distances.

## Multi-Set II Drop-In Anchors

## Ultimate Tension and Shear Values (Lbs/kN) for RX-series (3/4" and 1" Embedment)\*

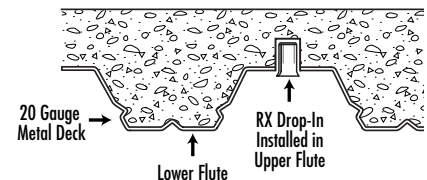
BOLT DIA. In. (mm)	DRILL BIT SIZE In. (mm)	EMBEDMENT In. (mm)	2500 PSI (17.2 MPa) CONCRETE		4000 PSI (27.6 MPa) CONCRETE		HOLLOW CORE	
			TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
3/8 (9.5)	1/2 (12.7)	3/4 (19.1)	1,571 (7.0)	2,295 (10.2)	1,987 (8.8)	2,903 (12.9)	1,908 (8.5)	2,401 (10.7)
1/2 (12.7)	5/8 (15.9)	1 (25.4)	2,113 (9.4)	2,585 (11.5)	2,673 (11.9)	3,270 (14.5)	2,462 (11.0)	2,401 (10.7)

\* The tabulated values are for RX anchors installed at a minimum of 12 diameters on center and minimum edge distance of 6 diameters for 100 percent anchor efficiency. Spacing and edge distance may be reduced to 6 diameters spacing and 3 diameter edge distance provided the values are reduced 50 percent. Linear Interpolation may be used for intermediate spacings and edge margins.

\* Allowable values are based upon a 4 to 1 safety factor. Divide by 4 for allowable load values.

## Multi-Set II Drop-In Anchors

## Anchoring Overhead in 3000 PSI Lightweight Concrete On Metal Deck



ANCHOR	DRILL HOLE DIAMETER In. (mm)	EMBEDMENT In. (mm)	3000PSI (20.7 MPa) CONCRETE			
			ULTIMATE TENSION LOAD Lbs. (kN)		ALLOWABLE WORKING LOAD Lbs. (kN)	
RX-38 Drop-In	1/2 (12.7)	3/4 (19.1)	Upper Flute	1,410 (6.3)	353 (1.6)	
			Lower Flute	1,206 (5.4)	301 (1.3)	

\* Allowable values are based upon a 4 to 1 safety factor. Divide by 4 for allowable load values.

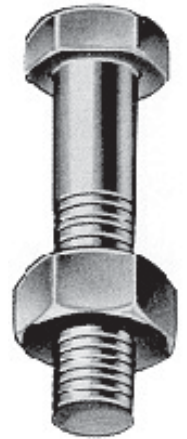
# BOLTS

**FIG. 780**

## HEX HEAD MACHINE BOLT

**MATERIAL:** Carbon steel or  
**FINISH:** electro galvanized.  
**SERVICE:** For use as a fastening device.  
**ORDERING:** Specify size, figure number and finish. Length of bolt is measured from under the head to the extreme point. Sizes as shown are carried in stock, other sizes are also available.

DIAMETER OF BOLT	WEIGHT PER HUNDRED, LBS.														
	LENGTH OF BOLT IN INCHES														
	1½	1¾	2	2¼	2½	2¾	3	3¼	3½	3¾	4	4½	5	5½	6
¾	9	10	11	—	—	—	—	—	—	—	—	—	—	—	—
½	18	20	21	22	24	25	27	—	—	—	—	—	—	—	—
⅜	31	33	35	37	39	41	43	46	48	50	52	56	61	65	69
¼	49	52	55	58	61	64	67	70	73	76	80	86	92	98	105
⅞	—	—	—	—	89	93	98	102	106	110	115	123	131	140	148
1	—	—	—	—	—	128	134	139	145	150	156	167	178	189	200
1⅛	—	—	—	—	—	—	—	—	193	—	207	221	235	249	263
1¼	—	—	—	—	—	—	—	—	—	—	—	—	302	320	337



**FIG. 785**

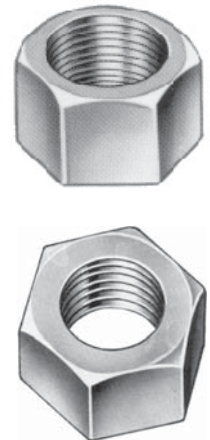
## STANDARD HEX NUTS

**FIG. 790**

## HEAVY DUTY HEX NUTS

**MATERIAL:** Carbon steel or 3  
**FINISH:** E , electro galvanized.  
**ORDERING:** Specify rod size, figure number and finish.

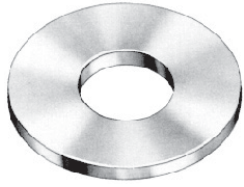
ROD SIZE	WEIGHT PER 100, LBS.	
	FIG. 785	FIG. 790
¼	0.74	1.2
⅜	1.60	3.2
½	3.75	6.6
⅝	7.33	12
¾	11.9	19
⅞	19.0	30
1	28.3	43
1⅛	40.3	59
1¼	54.3	79
1⅜	73.0	102
1½	94.3	131





**FIG. 795**

## ROUND STEEL WASHERS



**MATERIAL:** Carbon steel or  
**FINISH:** electro  
**ORDERING:** Specify rod size, figure number and finish.

SIZE OF BOLT	OUTSIDE DIAMETER	DIAMETER OF HOLE	WEIGHT PER 100, LBS.
$\frac{1}{4}$	$\frac{3}{4}$	$\frac{5}{16}$	0.67
$\frac{3}{8}$	1	$\frac{7}{16}$	1.50
$\frac{1}{2}$	$1\frac{3}{8}$	$\frac{9}{16}$	3.90
$\frac{5}{8}$	$1\frac{3}{4}$	$\frac{11}{16}$	7.80
$\frac{3}{4}$	2	$\frac{13}{16}$	11.00
$\frac{7}{8}$	$2\frac{1}{4}$	$\frac{15}{16}$	15.00
1	$2\frac{1}{2}$	$1\frac{1}{16}$	19.00
$1\frac{1}{8}$	$2\frac{3}{4}$	$1\frac{1}{4}$	22.00
$1\frac{1}{4}$	3	$1\frac{3}{8}$	26.00
$1\frac{1}{2}$	$3\frac{1}{2}$	$1\frac{5}{8}$	38.00

**FIG. 800**

## LOCK WASHER



**MATERIAL:** Carbon steel  
**FINISH:** electro-galvanized.  
**ORDERING:** Specify size, figure number and finish.

ROD SIZE	INSIDE DIAMETER	WIDTH OF STEEL	THICKNESS OF STEEL	WEIGHT PER 100, LBS.
$\frac{3}{8}$	$\frac{7}{16}$	.141	.094	7
$\frac{1}{2}$	$\frac{9}{16}$	.171	.125	15
$\frac{5}{8}$	$\frac{11}{16}$	.203	.156	26
$\frac{3}{4}$	$\frac{13}{16}$	.234	.188	43

**FIG. 805**

## STEEL WASHER PLATE



**MATERIAL:** Carbon steel  
**FINISH:** electro or galvanized.  
**SERVICE:** For use as a heavy duty washer to suspend hanger rods.  
**ORDERING:** Specify rod tapping size, figure number and finish.

ROD SIZE	WEIGHT PER 100, LBS.	SIZE OF STOCK
$\frac{3}{8}$	62	3 x 3 x $\frac{1}{4}$
$\frac{1}{2}$	62	3 x 3 x $\frac{1}{4}$
$\frac{5}{8}$	92	3 x 3 x $\frac{3}{8}$
$\frac{3}{4}$	164	4 x 4 x $\frac{3}{8}$
$\frac{7}{8}$	220	4 x 4 x $\frac{1}{2}$
1	220	4 x 4 x $\frac{1}{2}$

**FIG. 755****CONTINUOUS THREADED ROD**

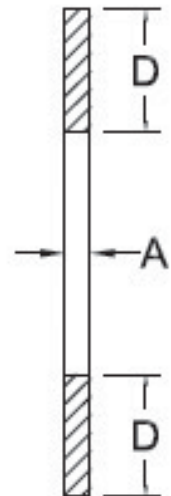
**MATERIAL:** Carbon steel  
**FINISH:** electro or galvanized.  
**SERVICE:** For use in applications for attaching hangers to structural attachments. Continuous threaded rod can be cut to required lengths. Sizes below are stocked in 6', 10' and 12' lengths. SAE national fine thread can be furnished to order.  
**ORDERING:** Specify rod diameter, figure number, length and finish.

ROD SIZE	WEIGHT PER 100, LBS.	MAX. REC. LOAD, LBS.
1/4	12	240
5/16	20	300
3/8	30	610
1/2	54	1130
5/8	85	1810
3/4	120	2710
7/8	170	3770
1	225	4960
1 1/8	280	6230
1 1/4	350	8000
1 3/8	450	9000
1 1/2	500	11630

**FIG. 760****HANGER ROD**

**MATERIAL:** Carbon steel or  
**FINISH:** electro galvanized.  
**SERVICE:** For use in applications for attaching hangers to structural attachments. Threaded on both ends and can be furnished in standard lengths of 8" - 240"  
**ORDERING:** Specify rod diameter, figure number, length, thread length and finish.

ROD SIZE A	STANDARD ROD THREAD LENGTH D, IN.	MAX. REC. LOAD, LBS. 650° F
1/4	2 1/2	240
3/8	2 1/2	610
1/2	2 1/2	1130
5/8	2 1/2	1810
3/4	3	2710
7/8	3 1/2	3770
1	4	4960



## Tapcon® Concrete and Masonry Anchors



### SPECIFIED FOR ANCHORAGE INTO CONCRETE, BRICK OR BLOCK

The "original masonry" anchor that cuts its own threads into concrete, brick, or block. Maximum performance is achieved because the Tapcon Anchor, the Condrive Installation Tool, and the carbide-tipped Tapcon Drill Bits are designed to work as a system. It is essential to use the Condrive tool and the correct drill bit to assure consistent anchor performance.

Now available in 410 stainless steel.

## APPROVALS/LISTINGS

ICC Evaluation Service, Inc. — #ESR-1671

ICC Evaluation Service, Inc. — #ESR-2202

Miami-Dade County — #07-0315.03

Florida Building Code



**Hex Head** style on Tapcon Anchors is available for majority of fixture anchoring needs

**Climaseal® Coating** is standard on all Tapcon anchors to provide extended corrosion resistance

**Now available in 410 Stainless Steel**



**Phillips Flat Head** style is available when flush seating is necessary in countersink applications

**Advanced Threadform** cuts into masonry materials for greater pullout values

**Lengths** of Tapcon Anchors range from 1-1/4" to 4" in 3/16" and up to 6" in 1/4" diameters.

**Nail-Type Point** guides the anchor into the pre-drilled hole. Excellent for wood to concrete applications

## INSTALLATION STEPS

Read instructions before using (installation)!



### WARNING:

If there are any questions concerning proper installation, applications or appropriate use of this product, please call our Technical Services Department at 1-800-899-7890. Failure to follow these instructions can result in serious personal injury.

1. **Select proper fastener – diameter / head style / length**
  - a) **Use selection chart to choose proper length.**
2. **Drill Hole – use selection chart to determine drill bit length and depth of hole**
  - a) **Choose appropriate drill bit based upon diameter of Tapcon Anchor.**
  - b) **Drill hole minimum 7" deeper than Tapcon Anchor to be embedded.**

Minimum anchor embedment: 1"

Maximum anchor embedment: 1-3/4"

### 3. Drive Anchor



### WARNING:

Failure to wear safety glasses with side shields can result in serious personal injury. Always wear ANSI compliant eye protection (ANSI Z87.1-2003).



### WARNING:

Using the wrong size drill bit will affect performance values and may cause failure.

### Head Styles

3/16" diameter has a 1/4" slotted hex washer head (HWH)  
 1/4" diameter has a 5/16" slotted hex washer head (HWH)



3/16" diameter uses a #2 phillips flat head (PFH)  
 1/4" diameter uses a #3 phillips flat head (PFH)



## PERFORMANCE TABLE

### Tapcon Anchors

### Ultimate Tension and Shear Values (Lbs/kN) in Concrete

ANCHOR DIA. In. (mm)	MIN. DEPTH OF EMBEDMENT In. (mm)	f'c = 2000 PSI (13.8 MPa)		f'c = 3000 PSI (20.7 MPa)		f'c = 4000 PSI (27.6 MPa)		f'c = 5000 PSI (34.5 MPa)	
		TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
3/16 (4.8)	1 (25.4)	600 (2.7)	720 (3.2)	625 (2.8)	720 (3.2)	650 (2.9)	720 (3.2)	800 (3.6)	860 (3.8)
	1-1/4 (31.8)	845 (3.7)	720 (3.2)	858 (3.8)	720 (3.2)	870 (3.9)	720 (3.2)	1,010 (4.5)	860 (3.8)
	1-1/2 (38.1)	1,090 (4.8)	860 (3.8)	1,090 (4.8)	860 (3.8)	1,090 (4.8)	860 (3.8)	1,220 (5.4)	860 (3.8)
	1-3/4 (44.5)	1,450 (6.5)	870 (3.9)	1,455 (6.5)	870 (3.9)	1,460 (6.5)	990 (4.4)	1,730 (7.7)	990 (4.4)
1/4 (6.4)	1 (25.4)	750 (3.3)	900 (4.0)	775 (3.4)	900 (4.0)	800 (3.6)	1,360 (6.1)	950 (4.2)	1,440 (6.4)
	1-1/4 (31.8)	1,050 (4.7)	900 (4.0)	1,160 (5.2)	900 (4.0)	1,270 (5.6)	1,360 (6.1)	1,515 (6.7)	1,440 (6.4)
	1-1/2 (38.1)	1,380 (6.1)	1,200 (5.3)	1,600 (7.2)	1,200 (5.3)	1,820 (8.1)	1,380 (6.1)	2,170 (9.7)	1,670 (7.4)
	1-3/4 (44.5)	2,020 (9.0)	1,670 (7.4)	2,200 (9.8)	1,670 (7.4)	2,380 (10.6)	1,670 (7.4)	2,770 (12.3)	1,670 (7.4)

Safe working loads for single installation under static loading should not exceed 25% of the ultimate load capacity.

## PERFORMANCE TABLE

### Tapcon Anchors

### Ultimate Tension and Shear Values (Lbs/kN) in Hollow Block

ANCHOR DIA. In. (mm)	ANCHOR EMBEDMENT In. (mm)	LIGHTWEIGHT BLOCK		MEDIUM WEIGHT BLOCK	
		TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
3/16 (4.8)	1 (25.4)	220 (1.0)	400 (1.8)	340 (1.5)	730 (3.2)
1/4 (6.4)	1 (25.4)	250 (1.1)	620 (2.8)	500 (2.2)	1,000 (4.4)

Safe working loads for single installation under static loading should not exceed 25% of the ultimate load capacity.

NOTE: 3/16" Tapcon requires 5/32" bit, 1/4" Tapcon requires 3/16" bit.

## PERFORMANCE TABLE

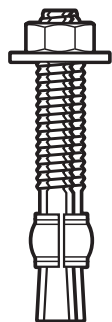
### Tapcon® Anchors

### Allowable Edge and Spacing Distances

PARAMETER	ANCHOR DIA. Inch	NORMAL WEIGHT CONCRETE			CONCRETE MASONRY UNITS (CMU)		
		FULL CAPACITY (Critical Distance Inches)	REDUCED CAPACITY (Minimal Distance Inches)	LOAD REDUCTION FACTOR	FULL CAPACITY (Critical Distance Inches)	REDUCED CAPACITY (Minimal Distance Inches)	LOAD REDUCTION FACTOR
Spacing Between Anchors - Tension	3/16	3	1-1/2	0.73	3	1-1/2	1.00
	1/4	4	2	0.66	4	2	0.84
Spacing Between Anchors - Shear	3/16	3	1-1/2	0.83	3	1-1/2	1.00
	1/4	4	2	0.82	4	2	0.81
Edge Distance - Tension	3/16	1-7/8	1	0.71	4	2	0.91
	1/4	2-1/2	1-1/4	0.78	4	2	0.88
Edge Distance - Shear	3/16	2-1/4	1-1/8	0.70	4	2	0.93
	1/4	3	1-1/2	0.59	4	2	0.80

For SI: 1 inch = 25.4 mm

## Trubolt Wedge



### SPECIFIED FOR ANCHORAGE INTO CONCRETE

Trubolt Wedge anchors feature a stainless steel expansion clip, threaded stud body, nut and washer. Anchor bodies are made of plated carbon steel, hot-dipped galvanized carbon steel, type 304 stainless steel or type 316 stainless steel as identified in the drawings or other notations.

Trubolt+ Wedge anchors consist of a high-strength threaded stud body, expansion clip, nut and washer. Anchor bodies are made of plated carbon steel. The expansion clip consists of a split cylindrical ring with undercutting grooves.

The exposed end of the anchor is stamped to identify anchor length. Stampings should be preserved during installation for any subsequent embedment verification.

Use carbide tipped hammer drill bits made in accordance with ANSI B212.15-1994 to install anchors.

Anchors are tested to ACI 355.2 and ICC-ES AC193. Anchors are listed by the following agencies as required by the local building code: ICC-ES, UL, FM, City of Los Angeles, California State Fire Marshal and Caltrans.

## APPROVALS/LISTINGS

### Trubolt®

Wedge Anchors

ICC Evaluation Service, Inc. # ESR-2251

- Category 1 performance rating
- 2006 IBC compliant
- Meets ACI 318 ductility requirements
- Tested in accordance with ACI 355.2 and ICC-ES AC193
- For use in seismic zones A & B
- 1/4", 3/8" & 1/2" diameter anchors listed in ESR-2251

Underwriters Laboratories

Factory Mutual

City of Los Angeles - #RR2748

California State Fire Marshal

Caltrans

Meets or exceeds U.S. Government G.S.A. Specification A-A-1923A Type 4 (formerly GSA: FF-S-325 Group II, Type 4, Class 1)

### Trubolt+®

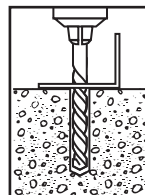
Seismic Wedge Anchors

ICC Evaluation Service, Inc. # ESR-2427

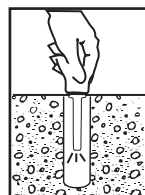
- Category 1 performance rating
- 2006 IBC and 2009 IBC compliant
- Meets ACI 318 ductility requirements
- Tested in accordance with ACI 355.2 and ICC-ES AC193
- Listed for use in seismic zones A, B, C, D, E, & F
- 3/8", 1/2", 5/8" & 3/4" diameter anchors listed in ESR-2427

City of Los Angeles - #RR25867

## INSTALLATION STEPS



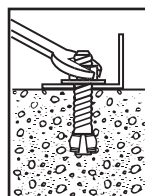
1. Select a carbide drill bit with a diameter equal to the anchor diameter. Drill hole to any depth exceeding the desired embedment. See chart for minimum recommended embedment.



2. Clean hole or continue drilling additional depth to accommodate drill fines.



3. Assemble washer and nut, leaving nut flush with end of anchor to protect threads. Drive anchor through material to be fastened until washer is flush to surface of material.

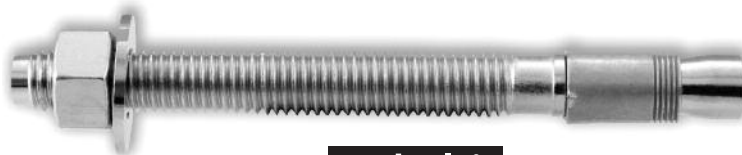


4. Expand anchor by tightening nut 3-5 turns past the hand tight position, or to the specified torque requirement.

## LENGTH INDICATION CODE \*

CODE	LENGTH OF ANCHOR		CODE	LENGTH OF ANCHOR	
A	1-1/2 < 2	(38.1 < 50.8)	K	6-1/2 < 7	(165.1 < 177.8)
B	2 < 2-1/2	(50.8 < 63.5)	L	7 < 7-1/2	(177.8 < 190.5)
C	2-1/2 < 3	(63.5 < 76.2)	M	7-1/2 < 8	(190.5 < 203.2)
D	3 < 3-1/2	(76.2 < 88.9)	N	8 < 8-1/2	(203.2 < 215.9)
E	3-1/2 < 4	(88.9 < 101.6)	O	8-1/2 < 9	(215.9 < 228.6)
F	4 < 4-1/2	(101.6 < 114.3)	P	9 < 9-1/2	(228.6 < 241.3)
G	4-1/2 < 5	(114.3 < 127.0)	Q	9-1/2 < 10	(241.3 < 254.0)
H	5 < 5-1/2	(127.0 < 139.7)	R	10 < 11	(254.0 < 279.4)
I	5-1/2 < 6	(139.7 < 152.4)	S	11 < 12	(279.4 < 304.8)
J	6 < 6-1/2	(152.4 < 165.1)	T	12 < 13	(304.8 < 330.2)

\*Located on top of anchor for easy inspection.



**Trubolt+®**  
Seismic Wedge Anchors



# APPENDIX C: Strength Design Performance values in accordance to 2006 and 2009 IBC

## ITW RED HEAD TRUBOLT+ WEDGE ANCHOR DESIGN INFORMATION TESTED TO ICC-ES AC 193

### AND ACI 355.2, IN ACCORDANCE WITH 2006 and 2009 IBC



#### TRUBOLT+ WEDGE ANCHOR DESIGN INFORMATION<sup>1</sup>

Characteristic	Symbol	Units	Nominal Anchor Diameter (inch) <sup>4</sup>									
			3/8"		1/2"		5/8"		3/4"			
Anchor category	1, 2 or 3	—	1		1		1		1			
Minimum effective embedment depth	$h_{ef}$	in	1-5/8		2		3-1/4		2-3/4	4-1/4	3-3/4	
Minimum concrete member thickness	$h_{min}$	in	4	5	4	6	6	8	6	6-1/4	7	8
Critical edge distance	$c_{ac}$	in	5	3	6	6	7-1/2	6	7-1/2	6-1/2	12	10
Data for Steel Strengths – Tension and Shear												
Minimum specified yield strength	$f_y$	psi	60,000		55,000		55,000		55,000		55,000	
Minimum specified ultimate strength	$f_{uta}$	psi	75,000		75,000		75,000		75,000		75,000	
Effective tensile stress area (neck)	$A_{se}$	in <sup>2</sup>	0.056		0.119		0.183		0.266		0.332	
Effective tensile stress area (thread)	$A_{se}$	in <sup>2</sup>	0.075		0.142		0.217		0.321		0.417	
Steel strength in tension	$N_{sa}$	lbf	4,200		8,925		13,725		19,950		28,175	
Steel strength in shear, uncracked or cracked concrete <sup>6</sup>	$V_{sa}$	lbf	1,830		5,175		8,955		14,970		21,975	
Steel strength in shear – seismic loads	$V_{eq}$	lbf	1,545		5,175		8,955		14,970		21,975	
Strength reduction factor $\phi$ for tension, steel failure modes <sup>2</sup>			0.75		0.75		0.75		0.75		0.75	
Strength reduction factor $\phi$ for shear, steel failure modes <sup>2</sup>			0.60		0.65		0.65		0.65		0.65	
Data for Concrete Breakout Concrete Pryout Strengths in Tension and Shear												
Effectiveness factor – uncracked concrete	$k_{uncr}$	—	24		24		24		24		24	
Effectiveness factor – cracked concrete	$k_{cr}$	—	17		17		17		17		17	
Modification factor for cracked and uncracked concrete <sup>3</sup>	$\Psi_{C,N}$	—	1.0		1.0		1.0		1.0		1.0	
Coefficient for pryout strength	$k_{cp}$	—	1.0		1.0		2.0		2.0		2.0	
Load-bearing length of anchor	$l_e$	in	1.625		2.0		3.25		2.75	4.25	3.75	
Strength reduction factor $\phi$ for tension, concrete failure modes, Condition B <sup>2</sup>			0.65		0.65		0.65		0.65		0.65	
Strength reduction factor $\phi$ for shear, concrete failure modes, Condition B <sup>2</sup>			0.70		0.70		0.70		0.70		0.70	
Data for Pullout Strengths												
Pullout strength, uncracked concrete	$N_{p,uncr}$	lbf	See Footnote <sup>5</sup>		See Footnote <sup>5</sup>		6,540		5,430	8,900	See Footnote <sup>5</sup>	
Pullout strength, cracked concrete	$N_{p,cr}$	lbf	See Footnote <sup>5</sup>		See Footnote <sup>5</sup>		See Footnote <sup>5</sup>		See Footnote <sup>5</sup>		See Footnote <sup>5</sup>	
Pullout strength for seismic loads	$N_{eq}$	lbf	See Footnote <sup>5</sup>		See Footnote <sup>5</sup>		See Footnote <sup>5</sup>		See Footnote <sup>5</sup>	6,715	See Footnote <sup>5</sup>	
Strength reduction factor $\phi$ for tension, pullout failure modes, Condition B <sup>2</sup>			See Footnote <sup>5</sup>		0.65		0.65		0.65		See Footnote <sup>5</sup>	
Additional Anchor Data												
Axial stiffness in service load range in uncracked concrete	$b_{uncr}$	lbf/in	100,000		250,000		250,000		250,000		250,000	
Axial stiffness in service load range in cracked concrete	$b_{cr}$	lbf/in	40,000		20,000		20,000		20,000		20,000	

For SI: 1 inch = 25.4 mm, 1 in<sup>2</sup> = 645.16mm<sup>2</sup>, 1 lbf = 4.45 N, 1 psi = 0.006895 MPa, 1 lbf • 102/in = 17,500 N/m.

<sup>1</sup> The 1/2", 5/8" and 3/4" diameter Trubolt+ Wedge Anchors are ductile steel elements as defined by ACI 318 D.1. The 3/8" diameter Trubolt+ is considered ductile under tension loading and brittle under shear loading.

<sup>2</sup> All values of  $\phi$  apply to the load combinations of IBC Section 1605.2, ACI 318 Section 9.2 or UBC Section 1612.2. If the load combinations of Appendix C or UBC Section 1909.2 are used, the appropriate value of  $\phi$  must be determined in accordance with ACI 318 D.4.5. For installations where reinforcement that complies with ACI 318 Appendix D requirements for Condition A is present, the appropriate  $\phi$  factor must be determined in accordance with ACI 318 D.4.4.

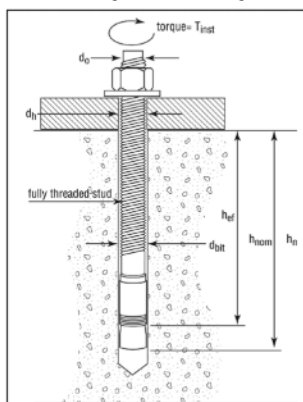
<sup>3</sup> For all design cases  $\Psi_{CN} = 1.0$ . The appropriate effectiveness factor for cracked concrete ( $k_{cr}$ ) or uncracked concrete ( $k_{uncr}$ ) must be used.

<sup>4</sup> The actual diameter for the 3/8" diameter anchor is 0.361" for the 5/8" diameter anchor is 0.615" and the 3/4" diameter anchor is 0.7482".

<sup>5</sup> Anchor pullout strength does not control anchor design. Determine steel and concrete capacity only.

<sup>6</sup> Steel strength in shear values are based on test results per ACI 355.2, Section 9.4 and must be used for design.

#### TRUBOLT+ WEDGE ANCHOR (INSTALLED)



#### TRUBOLT+ WEDGE INSTALLATION INFORMATION

Parameter	Notation	Units	Nominal Achor Diameter (inch)									
			3/8		1/2				5/8		3/4	
Anchor outer diameter	d <sub>o</sub>	inches	0.361		0.5				0.615		0.7482	
Nominal carbide bit diameter	d <sub>bit</sub>	inches	3/8		1/2				5/8		3/4	
Effective embedment depth	h <sub>ef</sub>	inches	1-5/8		2		3-1/4		2-3/4	4-1/4	3-3/4	
Minimum anchor embedment depth	h <sub>nom</sub>	inches	2		2-1/2		3-3/4		3-1/4	4-3/4	4-3/8	
Minimum hole depth <sup>1</sup>	h <sub>o</sub>	inches	2-1/4		2-3/4		4		3-1/2	5	4-5/8	
Minimum concrete member thickness <sup>1</sup>	h <sub>min</sub>	inches	4	5	4	6	6	8	6	6-1/4	7	8
Critical edge distance <sup>1</sup>	c <sub>ac</sub>	In.	5	3	6	6	7-1/2	6	7-1/2	6-1/2	12	10
Minimum anchor spacing <sup>1</sup>	s <sub>min</sub>	In.	3-1/2	2-1/2	6	5-3/4	4	5-3/4	8	6	6	6
Minimum edge distance <sup>1</sup>	c <sub>min</sub>	In.	3		6				7-1/2	5	7-1/2	7-1/2
Minimum overall anchor length	l	inches	2-1/2		3-3/4		4-1/2		4-1/4	6	5-1/2	
Installation torque	T <sub>inst</sub>	ft-lb	30		45				90		110	
Minimum diameter of hole in fastened part	d <sub>h</sub>	inches	1/2		5/8				3/4		7/8	

For SI: 1 inch = 25.4 mm, 1 ft-lb = 1.356 N-m.



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# APPENDIX C: Strength Design Performance values in accordance to 2006 and 2009 IBC

## TRUBOLT+ WEDGE ANCHOR ALLOWABLE STRESS DESIGN (ASD) VALUES FOR ILLUSTRATIVE PURPOSES

Anchor Notation	Anchor Embedment Depth (inches), $h_{nom}$	Effective Embedment Depth (inches), $h_{ef}$	Allowable Tension Load (lbs)
3/8	2	1-5/8	1,090
1/2	2-1/2	2	1,490
	3-3/4	3-1/4	2,870
5/8	3-1/4	2-3/4	2,385
	4-3/4	4-1/4	3,910
3/4	4-3/8	3-3/4	3,825

For SI: 1 inch = 25.4 mm, 1 ft-lb = 4.45N.

Design Assumptions:

1 Single anchor with static shear load only.

2 Load combinations from 2006 IBC, Sections 1605.2.1 and 1605.3.1 (no seismic loading).

3 Thirty percent dead load and 70 percent live load, controlling load combination 1.2D + 1.6L.

4 Calculation of weighted average: 1.2D + 1.6L = 1.2 (0.3) + 1.6 (0.7) = 1.48

5 Values do not include edge distance or spacing reductions.

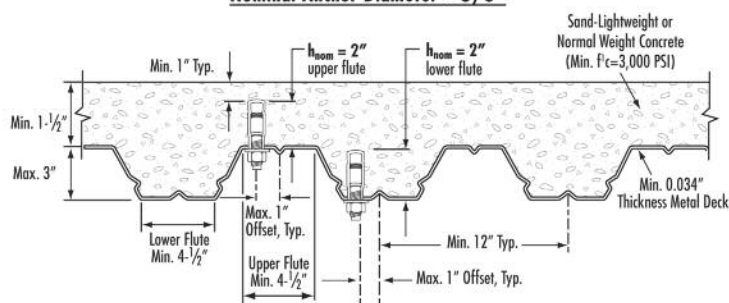
## ITW RED HEAD TRUBOLT+ WEDGE ANCHOR DESIGN INFORMATION FOR INSTALLATION IN THE SOFFIT OF CONCRETE FILL ON METAL DECK FLOOR AND ROOF ASSEMBLIES

### TRUBOLT+ WEDGE ANCHOR DESIGN INFORMATION

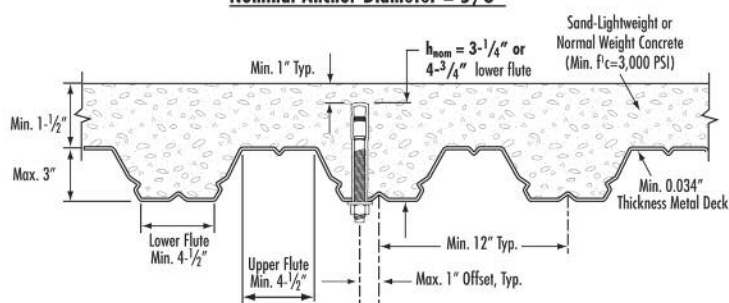
Characteristic	Symbol	Units	Nominal Anchor Diameter				
			3/8"	1/2"	5/8"		
			Upper /Lower	Upper /Lower	Lower Only	Lower Only	Lower Only
			$h_{ef} = 1-5/8"$	$h_{ef} = 2"$	$h_{ef} = 3-1/4"$	$h_{ef} = 2-3/4"$	$h_{ef} = 4-1/4"$
Pullout strength, uncracked concrete over metal deck	$N_{p, deck, uncr}$	lbf	2,170	2,515	5,285	3,365	6,005
Pullout strength, cracked concrete over metal deck	$N_{p, deck, cr}$	lbf	1,650	1,780	4,025	2,405	5,025
Reduction factor for pullout strength in tension, Condition B	$\phi$	---	0.65				
Shear strength, uncracked concrete over metal deck	$V_{p, deck, uncr}$	lbf	1,640	2,200	3,790	2,890	6,560
Reduction factor for steel strength in shear	$\phi$	---	0.60	0.65			
Anchor embedment depth	$h_{nom}$	in	2.0	2.5	3.75	3.25	4.75

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N

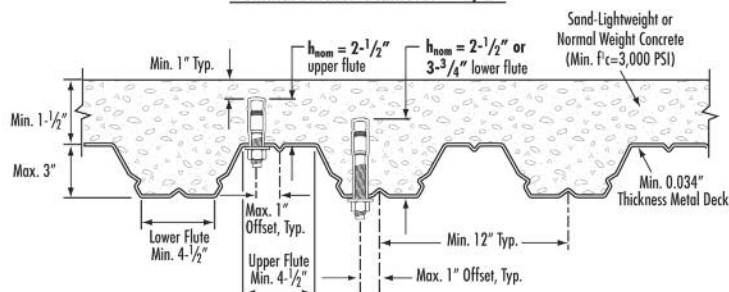
#### Nominal Anchor Diameter = 3/8"



#### Nominal Anchor Diameter = 5/8"



#### Nominal Anchor Diameter = 1/2"



ITW Red Head

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# APPENDIX B: Strength Design Performance values in accordance to 2006 IBC

## ITW RED HEAD TRUBOLT WEDGE ANCHOR

### DESIGN INFORMATION TESTED TO ICC-ES AC193 AND ACI 355.2, IN ACCORDANCE WITH 2006 IBC

**Trubolt®**  
Wedge Anchors

#### TRUBOLT WEDGE ANCHOR DESIGN INFORMATION<sup>1,2,3</sup>

DESIGN INFORMATION	Symbol	Units	Nominal Anchor Diameter									
			1/4		3/8		1/2		5/8		3/4	
Anchor O.D.	$d_o$	in	0.250		0.375		0.500		0.625		0.750	
Effective embedment	$h_{ef}$	in	1-1/2	2	1-3/4	2-5/8	1-7/8	3-3/8	2-1/2	4	3-1/2	4-3/4
Minimum member thickness	$h_{min}$	in	4	4	4	5	5	6	5	8	6	8
Critical edge distance	$c_{ac}$	in	2-5/8	3	2-5/8	5-1/4	3-3/4	6-3/4	5	8	7	9
Minimum edge distance	$c_{min}$	in	1-3/4	1-1/2	2-1/4	2	3-3/4	3-3/4	4-1/4	3-1/4	3-3/4	3-1/2
Minimum anchor spacing	$s_{min}$	in	1-3/4	1-1/2	2-1/4	2	3-3/4	3-3/4	4-1/4	3-1/4	3-3/4	3-1/2
Min. Specified Yield Strength	$f_y$	lb/in <sup>2</sup>	55,000									
Min. Specified Ultimate Strength	$f_{uta}$	lb/in <sup>2</sup>	75,000									
Effective tensile stress area	$A_{se}$	in <sup>2</sup>	0.032		0.078		0.142		0.226		0.334	
Steel strength in tension	$N_s$	lb	2,385		5,815		10,645		16,950		25,050	
Steel strength in shear	$V_s$	lb	1,430		2,975	3,490	4,450	6,385	6,045	10,170	10,990	15,030
Pullout strength, uncracked concrete	$N_{p,uncr}$	lb	1,392	1,706	2,198	3,469	2,400	4,168	4,155	6,638	8,031	10,561
Anchor Category (All anchors are ductile)			1									
Effectiveness factor $k_{uncr}$ , uncracked concrete			24									
Axial stiffness in service load range	$\beta$	lb/in	14,651	9,385	17,515	26,424	32,483	26,136	42,899	21,749	43,576	28,697
Coefficient for variation for axial stiffness in service load range			34	47	28	45	17	33	55	22	63	28
Strength reduction factor $\phi$ for tension, steel failure modes			0.75									
Strength reduction factor $\phi$ for shear, steel failure modes			0.65									
Strength reduction factor $\phi$ for tension, concrete failure modes, Condition B			0.65									
Strength reduction factor $\phi$ for shear, concrete failure modes, Condition B			0.70									

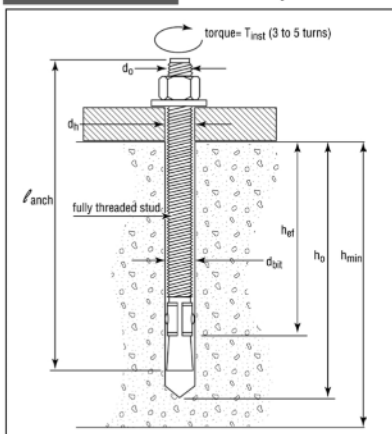
<sup>1</sup> Trubolt+ Anchor Design Strengths must be determined in accordance with ACI 318-05 Appendix D and this table

<sup>2</sup> The Trubolt+ Wedge Anchor is a ductile steel element as defined by ACI 318 D.1

<sup>3</sup> 1/4", 3/8", & 1/2" diameter data is listed in ICC-ES ESR-2251.

**Trubolt®**  
Wedge Anchors

#### TRUBOLT WEDGE ANCHOR (INSTALLED)



#### TRUBOLT WEDGE INSTALLATION INFORMATION

	Symbol	Units	Nominal Anchor Diameter (in.)									
			1/4		3/8		1/2		5/8		3/4	
Anchor outer diameter	$d_o$	in	0.25		0.375		0.5		0.625		0.750	
Nominal carbide bit diameter	$d_{bit}$	in	1/4		3/8		1/2		5/8		3/4	
Effective embedment depth	$h_{ef}$	in	1-1/2	2	1-3/4	2-5/8	1-7/8	3-3/8	2-1/2	4	3-1/2	4-3/4
Min hole depth	$h_o$	in	2	2-1/2	2-1/2	3-3/8	2-3/4	4-1/4	3-3/4	5-1/4	4-3/4	6
Min slab thickness	$h_{min}$	in	4		4	5	5	6	5	8	6	8
Installation torque	$T_{inst}$	ft-lb	4		25		55		90		110	
Min hole diameter in fixture	$d_h$	in	5/16		7/16		9/16		11/16		13/16	



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# APPENDIX B: Strength Design Performance values in accordance to 2006 IBC

**Trubolt®**  
Wedge Anchors

## TRUBOLT WEDGE PULLOUT STRENGTH ( $N_p, unc$ ) (POUNDS) <sup>1</sup>

Nominal Anchor Diameter (in.)	Effective Embedment Depth (in.)	Concrete Compressive Strength			
		$f'_c = 2,500$ psi	$f'_c = 3,000$ psi	$f'_c = 4,000$ psi	$f'_c = 6,500$ psi
1/4	1-1/2	1,392	1,525	1,610	1,822
	2	1,706	1,869	1,947	2,151
3/8	1-3/4	2,198	2,408	2,621	3,153
	2-5/8	3,469	3,800	3,936	4,275
1/2	1-7/8	2,400	2,629	3,172	4,520
	3-3/8	4,168	4,520	4,520	4,520
5/8	2-1/2	4,155	4,155	4,376	5,578
	4	6,638	6,900	7,968	10,157
3/4	3-1/2	8,031	8,322	9,610	12,251
	4-3/4	10,561	10,561	10,561	12,251

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 psi = 0.006895 Mpa

<sup>1</sup> Values are for single anchors with no edge distance or spacing reduction.

## TRUBOLT WEDGE ANCHOR ALLOWABLE STATIC TENSION (ASD), NORMAL-WEIGHT UNCRACKED CONCRETE <sup>1-6</sup>

Nominal Anchor Diameter (in.)	Effective Embedment Depth (in.)	Concrete Compressive Strength			
		$f'_c = 2,500$ psi	$f'_c = 3,000$ psi	$f'_c = 4,000$ psi	$f'_c = 6,500$ psi
1/4	1-1/2	611	670	707	800
	2	749	821	855	945
3/8	1-3/4	965	1,058	1,151	1,385
	2-5/8	1,524	1,669	1,729	1,878
1/2	1-7/8	1,054	1,155	1,393	1,985
	3-3/8	1,831	1,985	1,985	1,985
5/8	2-1/2	1,825	1,825	1,922	2,450
	4	2,915	3,030	3,499	4,461
3/4	3-1/2	3,527	3,655	4,221	5,381
	4-3/4	4,638	4,638	4,638	5,381

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 psi = 0.006895 Mpa

Design Assumptions:

- <sup>1</sup> Single anchor with static tension load only.
- <sup>2</sup> Concrete determined to remain uncracked for the life of the anchorage.
- <sup>3</sup> Load combinations from 2006 IBC, Sections 1605.2.1 and 1605.3.1 (no seismic loading).
- <sup>4</sup> Thirty percent dead load and 70 percent live load, controlling load combination  $1.2D + 1.6L$ .
- <sup>5</sup> Calculation of weighted average:  $1.2D + 1.6L = 1.2(0.3) + 1.6(0.7) = 1.48$
- <sup>6</sup> Values do not include edge distance or spacing reductions.

## TRUBOLT WEDGE ANCHOR ALLOWABLE STATIC SHEAR (ASD), STEEL (POUNDS)<sup>1-5</sup>

Nominal Anchor Diameter (in.)	Effective Embedment Depth (in.)	Allowable Steel Capacity, Static Shear
1/4	1-1/2	628
	2	
3/8	1-3/4	1,307
	2-5/8	1,533
1/2	1-7/8	1,954
	3-3/8	2,804
5/8	2-1/2	2,655
	4	4,467
3/4	3-1/2	4,827
	4-3/4	6,601

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 psi = 0.006895 Mpa

Design Assumptions:

- <sup>1</sup> Single anchor with static shear load only.
- <sup>3</sup> Load combinations from 2006 IBC, Sections 1605.2.1 and 1605.3.1 (no seismic loading).
- <sup>4</sup> Thirty percent dead load and 70 percent live load, controlling load combination  $1.2D + 1.6L$ .
- <sup>5</sup> Calculation of weighted average:  $1.2D + 1.6L = 1.2(0.3) + 1.6(0.7) = 1.48$
- <sup>5</sup> Values do not include edge distance or spacing reductions.



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## PERFORMANCE TABLE

### Trubolt Wedge Anchors

### Ultimate Tension and Shear Values (Lbs/kN) in Concrete\*

ANCHOR DIA. In. (mm)	INSTALLATION TORQUE Ft. Lbs. (Nm)	EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	f'c = 2000 PSI (13.8 MPa)		f'c = 4000 PSI (27.6 MPa)		f'c = 6000 PSI (41.4 MPa)	
				TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
1/4 (6.4)	4 (5.4)	1-1/8 (28.6) 1-15/16 (49.2) 2-1/8 (54.0)		1,180 (5.2) 2,100 (9.3) 2,260 (10.1)	1,400 (6.2) 1,680 (7.5) 1,680 (7.5)	1,780 (7.9) 3,300 (14.7) 3,300 (14.7)	1,400 (6.2) 1,680 (7.5) 1,680 (7.5)	1,900 (8.5) 3,300 (14.7) 3,300 (14.7)	1,400 (6.2) 1,680 (7.5) 1,680 (7.5)
3/8 (9.5)	25 (33.9)	1-1/2 (38.1) 3 (76.2) 4 (101.6)		1,680 (7.5) 3,480 (15.5) 4,800 (21.4)	2,320 (10.3) 4,000 (17.8) 4,000 (17.8)	2,240 (10.0) 5,940 (26.4) 5,940 (26.4)	2,620 (11.7) 4,140 (18.4) 4,140 (18.4)	2,840 (12.6) 6,120 (27.2) 6,120 (27.2)	3,160 (14.1) 4,500 (20.0) 4,500 (20.0)
1/2 (12.7)	55 (74.6)	2-1/4 (57.2) 4-1/8 (104.8) 6 (152.4)	WS-Carbon or WS-G	4,660 (20.7) 4,660 (20.7) 5,340 (23.8)	4,760 (21.2) 7,240 (32.2) 7,240 (32.2)	5,100 (22.7) 9,640 (42.9) 9,640 (42.9)	4,760 (21.2) 7,240 (32.2) 7,240 (32.2)	7,040 (31.3) 10,820 (48.1) 10,820 (48.1)	7,040 (31.3) 8,160 (36.3) 8,160 (36.3)
5/8 (15.9)	90 (122.0)	2-3/4 (69.9) 5-1/8 (130.2) 7-1/2 (190.5)	Hot-Dipped Galvanized or WW-304 S.S.	6,580 (29.3) 6,580 (29.3) 7,060 (31.4)	7,120 (31.7) 9,600 (42.7) 9,600 (42.7)	7,180 (31.9) 14,920 (66.4) 15,020 (66.8)	7,120 (31.7) 11,900 (52.9) 11,900 (52.9)	9,720 (43.2) 16,380 (72.9) 16,380 (72.9)	9,616 (42.8) 12,520 (55.7) 12,520 (55.7)
3/4 (19.1)	110 (149.2)	3-1/4 (82.6) 6-5/8 (168.3) 10 (254.0)	or SWW-316 S.S.	7,120 (31.7) 10,980 (48.8) 10,980 (48.8)	10,120 (45.0) 20,320 (90.4) 20,320 (90.4)	10,840 (48.2) 17,700 (78.7) 17,880 (79.5)	13,720 (61.0) 23,740 (105.6) 23,740 (105.6)	13,300 (59.2) 20,260 (90.1) 23,580 (104.9)	15,980 (71.1) 23,740 (105.6) 23,740 (105.6)
7/8 (22.2)	250 (339.0)	3-3/4 (95.3) 6-1/4 (158.8) 8 (203.2)		9,520 (42.3) 14,660 (65.2) 14,660 (65.2)	13,160 (58.5) 20,880 (92.9) 20,880 (92.9)	14,740 (65.6) 20,940 (93.1) 20,940 (93.1)	16,580 (73.8) 28,800 (128.1) 28,800 (128.1)	17,420 (77.5) 24,360 (108.4) 24,360 (108.4)	19,160 (85.2) 28,800 (128.1) 28,800 (128.1)
1 (25.4)	300 (406.7)	4-1/2 (114.3) 7-3/8 (187.3) 9-1/2 (241.3)		13,940 (62.0) 14,600 (64.9) 18,700 (83.2)	16,080 (71.5) 28,680 (127.6) 28,680 (127.6)	20,180 (89.8) 23,980 (106.7) 26,540 (118.1)	22,820 (101.5) 37,940 (168.8) 37,940 (168.8)	21,180 (94.2) 33,260 (148.0) 33,260 (148.0)	24,480 (108.9) 38,080 (169.4) 38,080 (169.4)

\* Allowable values are based upon a 4 to 1 safety factor. Divide by 4 for allowable load values.

\* For Tie-Wire Wedge Anchor, TW-1400, use tension data from 1/4" diameter with 1-1/8" embedment.

\* For continuous extreme low temperature applications, use stainless steel.

### Trubolt Wedge Anchors

### Ultimate Tension and Shear Values (Lbs/kN) in Lightweight Concrete\*

ANCHOR DIA. In. (mm)	INSTALLATION TORQUE Ft. Lbs. (Nm)	EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	LIGHTWEIGHT CONCRETE f'c = 3000 PSI (20.7 MPa)		LOWER FLUTE OF STEEL DECK WITH LIGHTWEIGHT CONCRETE FILL f'c = 3000 PSI (20.7 MPa)	
				TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
3/8 (9.5)	25 (33.9)	1-1/2 (38.1) 3 (76.2)	WS-Carbon or WS-G	1,175 (5.2) 2,825 (12.6)	1,480 (6.6) 2,440 (10.9)	1,900 (8.5) 2,840 (12.6)	3,160 (14.1) 4,000 (17.8)
1/2 (12.7)	55 (74.6)	2-1/4 (57.2) 3 (76.2) 4 (101.6)	Hot-Dipped Galvanized or WW-304 S.S.	2,925 (13.0) 3,470 (15.4) 4,290 (19.1)	2,855 (12.7) 3,450 (15.3) 3,450 (15.3)	3,400 (15.1) 4,480 (19.9) 4,800 (21.4)	5,380 (23.9) 6,620 (29.4) 6,440 (28.6)
5/8 (15.9)	90 (122.0)	3 (76.2) 5 (127.0)	or SWW-316 S.S.	4,375 (19.5) 6,350 (28.2)	4,360 (19.4) 6,335 (28.2)	4,720 (21.0) 6,580 (29.3)	5,500 (24.5) 9,140 (40.7)
3/4 (19.1)	110 (149.2)	3-1/4 (82.6) 5-1/4 (133.4)		5,390 (24.0) 7,295 (32.5)	7,150 (31.8) 10,750 (47.8)	5,840 (26.0) 7,040 (31.3)	8,880 (39.5) ---

\* Allowable values are based upon a 4 to 1 safety factor. Divide by 4 for allowable load values.

## PERFORMANCE TABLE

### Trubolt Wedge Anchors

### Recommended Edge and Spacing Distance Requirements for Shear Loads\*

ANCHOR DIA. In. (mm)	EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	EDGE DISTANCE REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	MIN. EDGE DISTANCE AT WHICH THE LOAD FACTOR APPLIED = .60 In. (mm)	MIN. EDGE DISTANCE AT WHICH THE LOAD FACTOR APPLIED = .20 In. (mm)	SPACING REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	MIN. ALLOWABLE SPACING BETWEEN ANCHORS In. (mm) LOAD FACTOR APPLIED = .40
1/4 (6.4)	1-1/8 (28.6) 1-15/16 (49.2)	WS-Carbon or WS-G Hot-Dipped Galvanized or WW-304 S.S. or SWW-316 S.S.	2 (50.8) 1-15/16 (49.2)	1-5/16 (33.3) 1 (25.4)	--- ---	3-15/16 (100.0) 3-7/8 (98.4)	2 (50.8) 1-15/16 (49.2)
3/8 (9.5)	1-1/2 (38.1) 3 (76.2)		2-5/8 (66.7) 3-3/4 (95.3)	1-3/4 (44.5) 3 (76.2)	--- 1-1/2 (38.1)	5-1/4 (133.4) 6 (152.4)	2-5/8 (66.7) 3 (76.2)
1/2 (12.7)	2-1/4 (57.2) 4-1/8 (104.8)		3-15/16 (100.0) 5-3/16 (131.8)	2-9/16 (65.1) 3-1/8 (79.4)	--- 1-9/16 (39.7)	7-7/8 (200.0) 6-3/16 (157.2)	3-15/16 (100.0) 3-1/8 (79.4)
5/8 (15.9)	2-3/4 (69.9) 5-1/8 (130.2)		4-13/16 (122.2) 6-7/16 (163.5)	3-1/8 (79.4) 3-7/8 (98.4)	--- 1-15/16 (49.2)	9-5/8 (244.5) 7-11/16 (195.3)	4-13/16 (122.2) 3-7/8 (98.4)
3/4 (19.1)	3-1/4 (82.6) 6-5/8 (168.3)		5-11/16 (144.5) 6-5/16 (160.3)	3-3/4 (95.3) 5 (127.0)	--- 2-1/2 (63.5)	11-3/8 (288.9) 9-15/16 (252.4)	5-11/16 (144.5) 5 (127.0)
7/8 (22.2)	3-3/4 (95.3) 6-1/4 (158.8)		6-9/16 (166.7) 8-1/2 (215.9)	4-5/16 (109.5) 6-1/4 (158.8)	--- 3-1/8 (79.4)	13-1/8 (333.4) 12-1/2 (317.5)	6-9/16 (166.7) 6-1/4 (158.8)
1 (25.4)	4-1/4 (108.0) 7-3/8 (187.3)		7-7/8 (200.0) 10-1/16 (255.6)	5-1/8 (130.2) 7-3/8 (187.3)	--- 3-11/16 (93.7)	15-3/4 (400.1) 14-3/4 (374.7)	7-7/8 (200.0) 7-3/8 (187.3)

\* Spacing and edge distances shall be divided by 0.75 when anchors are placed in structural lightweight concrete. Linear interpolation may be used for intermediate spacing and edge distances.

### Trubolt Wedge Anchors

### Recommended Edge and Spacing Distance Requirements for Tension Loads\*

ANCHOR DIA. In. (mm)	EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	EDGE DISTANCE REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	MIN. ALLOWABLE EDGE DISTANCE AT WHICH THE LOAD FACTOR APPLIED = .65 In. (mm)	SPACING REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	MIN. ALLOWABLE SPACING AT WHICH THE LOAD FACTOR APPLIED = .70 In. (mm)
1/4 (6.4)	1-1/8 (28.6) 1-15/16 (49.2) 2-1/8 (54.0)	WS-Carbon or WS-G Hot-Dipped Galvanized or WW-304 S.S. or SWW-316 S.S.	2 (50.8) 1-15/16 (49.2) 1-5/8 (41.3)	1 (25.4) 1 (25.4) 13/16 (20.6)	3-15/16 (100.0) 3-7/8 (98.4) 3-3/16 (81.0)	2 (50.8) 1-15/16 (49.2) 1-5/8 (41.3)
3/8 (9.5)	1-1/2 (38.1) 3 (76.2) 4 (101.6)		2-5/8 (66.7) 3 (76.2) 3 (76.2)	1-5/16 (33.3) 1-1/2 (38.1) 1-1/2 (38.1)	5-1/4 (133.4) 6 (152.4) 6 (152.4)	2-5/8 (66.7) 3 (76.2) 3 (76.2)
1/2 (12.7)	2-1/4 (57.2) 4-1/8 (104.8) 6 (152.4)		3-15/16 (100.0) 3-1/8 (79.4) 4-1/2 (114.3)	2 (50.8) 1-9/16 (39.7) 2-1/4 (57.2)	7-7/8 (200.0) 6-3/16 (157.2) 9 (228.6)	3-15/16 (100.0) 3-1/8 (79.4) 4-1/2 (114.3)
5/8 (15.9)	2-3/4 (69.9) 5-1/8 (130.2) 7-1/2 (190.5)		4-13/16 (122.2) 3-7/8 (98.4) 5-5/8 (142.9)	2-7/16 (61.9) 1-15/16 (49.2) 2-13/16 (71.4)	9-5/8 (244.5) 7-1/16 (195.3) 11-1/4 (285.8)	4-13/16 (122.2) 3-7/8 (98.4) 5-5/8 (142.9)
3/4 (19.1)	3-1/4 (82.6) 6-5/8 (168.3) 10 (254.0)		5-11/16 (144.5) 5 (127.0) 7-1/2 (190.5)	2-7/8 (73.0) 2-1/2 (63.5) 3-3/4 (95.3)	11-3/8 (288.9) 9-15/16 (252.4) 15 (381.0)	5-11/16 (144.5) 5 (127.0) 7-1/2 (190.5)
7/8 (22.2)	3-3/4 (95.3) 6-1/4 (158.8) 8 (203.2)		6-9/16 (166.7) 6-1/4 (158.8) 6 (152.4)	3-5/16 (84.1) 3-1/8 (79.4) 3 (76.2)	13-1/8 (333.4) 12-1/2 (317.5) 12 (304.8)	6-9/16 (166.7) 6-1/4 (158.8) 6 (152.4)
1 (25.4)	4-1/2 (114.3) 7-3/8 (187.3) 9-1/2 (241.3)		7-7/8 (200.0) 7-3/8 (187.3) 7-1/8 (181.0)	3-15/16 (100.0) 3-11/16 (93.7) 3-9/16 (90.5)	15-3/4 (400.1) 14-3/4 (374.7) 14-1/4 (362.0)	7-7/8 (200.0) 7-3/8 (187.3) 7-1/8 (181.0)

\* Spacing and edge distances shall be divided by 0.75 when anchors are placed in structural lightweight concrete. Linear interpolation may be used for intermediate spacing and edge distances.

### Combined Tension and Shear Loading—for Trubolt Anchors

Allowable loads for anchors subjected to combined shear and tension forces are determined by the following equation:

$$(P_s/P_t)^{5/3} + (V_s/V_t)^{5/3} \leq 1$$

$P_s$  = Applied tension load     $V_s$  = Applied shear load     $P_t$  = Allowable tension load     $V_t$  = Allowable shear load



### 2.6 - B - STEAM GATE VALVE 1/2 TO 2" THREADED



Job Name:	
Job Location:	
Engineer:	
Contractor:	
Tag:	
PO#:	
Rep:	
Wholesale Dist.:	

#### DESCRIPTION

The **Apollo® Model 111T Bronze Gate Valve** provides a cost effective "made in the USA" alternative to globally sourced multi-turn valves. These valves are cast, machined, assembled, and tested in South Carolina. The Apollo® gate valve is ideal for steam and liquid service and can reliably be installed in most plumbing and heating systems including building service piping and OEM applications.

#### FEATURES

- Guided Solid Bronze Disc Wedge
- Adjustable Graphite Stem Packing
- NPT Connection
- Rising Stem
- Union Bonnet
- Dezincification Resistant Bronze Construction
- Rugged Malleable Iron Hand Wheel
- Factory tested to MSS SP-80
- **100% Cast, Machined and Assembled in the USA**
- **ARRA Compliant**

#### PERFORMANCE RATING

- Saturated Steam: 300 psi (20.7 Bar)
- Cold Working Pressure: 1000 psi @100°F (68.9 Bar @ 38°C)
- Temperature Range\*: -20°F to 422°F (-29°C to 216°C)

\* *Valves should be in open position to allow complete drainage during freezing conditions.*

#### APPROVALS

- MSS SP-80 - Bronze Gate, Globe, Angle & Check Valves - Type 2
- ASME B1.20.1 - Pipe Threads, General Purpose (Inch)
- CRN OC14667.5

#### STANDARD MATERIALS LIST

<b>BODY</b>	Bronze, ASTM B61
<b>BONNET</b>	Bronze, ASTM B61
<b>STEM</b>	ASTM B21 UNS C46400
<b>UNION NUT</b>	Bronze, ASTM B61
<b>DISC WEDGE</b>	Bronze, ASTM B62
<b>PACKING</b>	Grafoil® (Asbestos Free)
<b>PACKING NUT</b>	Brass, ASTM B16
<b>HAND WHEEL</b>	Malleable Iron
<b>NAMEPLATE</b>	Aluminum

#### DIMENSIONS

MODEL NO.	PART NO.	SIZE (IN.)	HEIGHT OPEN (IN.)	LENGTH (IN.)	WEIGHT (LB.)	CV (GPM)
111T12	30-443-01	1/2"	4.97	2.31	1.4	12.5
111T34	30-444-01	3/4"	6.22	2.56	2.3	24.0
111T1	30-445-01	1"	6.94	2.89	3.5	72.3
111T114	30-446-01	1-1/4"	8.29	3.01	5.1	80
111T112	30-447-01	1-1/2"	9.28	3.05	6.8	119
111T2	30-448-01	2"	11.37	3.08	9.6	338


NSF 61/372  
Class 150/300

# HIGH PERFORMANCE BUTTERFLY VALVE

**LCS-6822 (Class 150)**
**LCS-7822 (Class 300)**

## APPLICATIONS

Ideally suited for commercial, industrial, and mechanical HVAC services. Use in other applications must be approved by the manufacturer

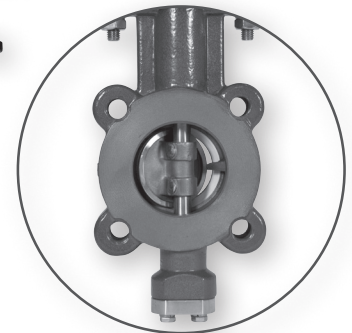
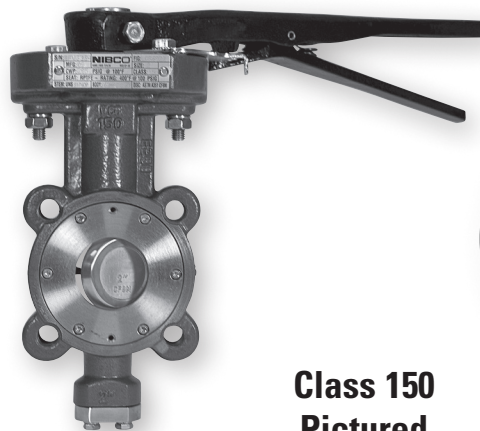
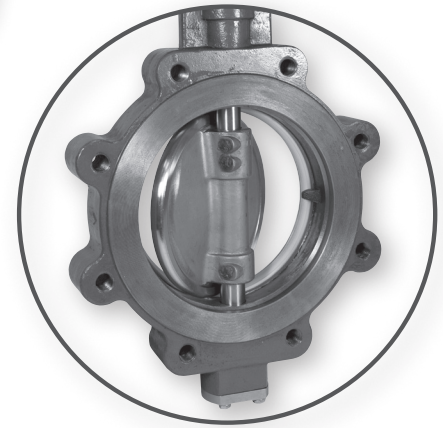
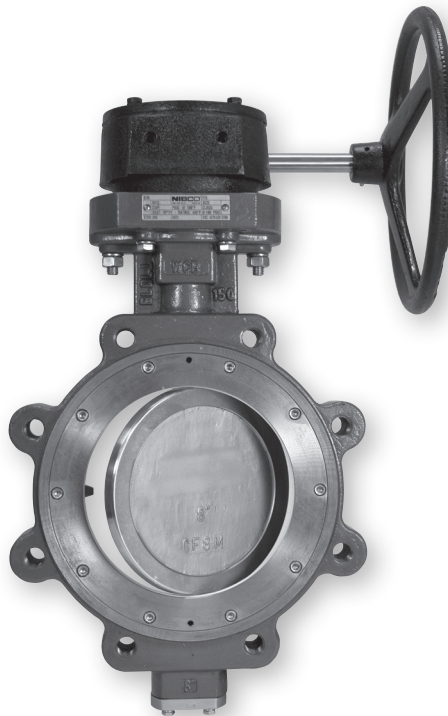
- Heating hot water
- Condenser water
- Glycol
- Chilled water
- Compressed air
- Steam rated - 2" - 12" 150 psi for on/off applications and 50 psi modulating
- Vacuum to 27" Hg
- Chemical process
- Isolation and throttling
- Domestic water

## MATERIALS & CONSTRUCTION

- Body constructed of carbon steel
- Stainless steel disc and stem
- Seats of reinforced PTFE for exceptional chemical and heat resistance
- Welded disc pins
- Silicon is not used in the manufacture of this valve

## DESIGN CRITERIA

- MSS SP-68 (Design)
- MSS SP-25 (Markings)
- API-609 Seat pressure/temperature ratings/blow-out proof stem
- ASME/ANSI B16.34A, body pressure/temperature ratings
- ASME/ANSI B16.5 flange dimensions
- ISO 5211, actuator mounting top works
- ANSI Class 150 and Class 300
- Dual offset design


**Class 150  
Pictured**

## FEATURES

- Powder coated epoxy finish
- One-piece stem
- Direct mount actuation
- Live loaded adjustable packing with unique flush-mounted packing gland
- Integrally cast disc-stop
- Dual offset design
- Blow-out proof stem
- Uni-directional dead end service (Arrow on body indicates flow direction)
- Maximum operating temperature 400°F at 100 psi
- 100% production tested per MSS SP-68

**WARNING:** This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

Visit our website for the most current information.

# High Performance Butterfly Valve Series 6822 & 7822

Carbon Steel Body • Stainless Steel Disc and Stem • ISO 5211 Actuation Mounting

**CLASS 150 - SIZES 2" THROUGH 30"**
**CLASS 300 - SIZES 2" THROUGH 24"**

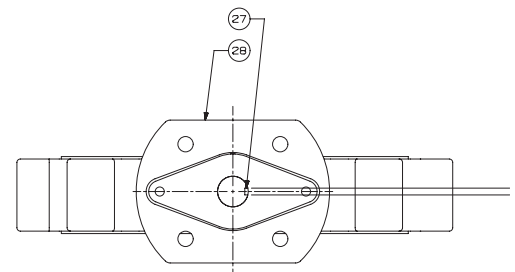
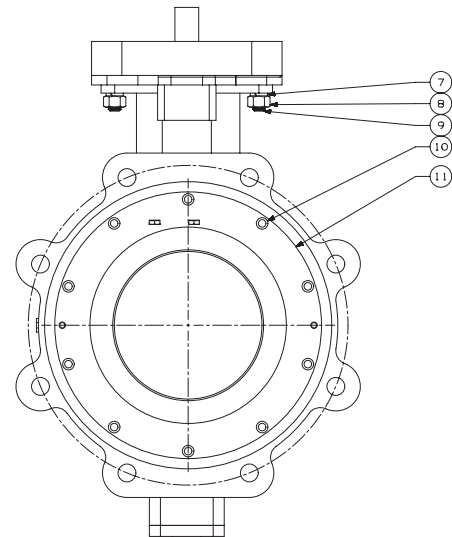
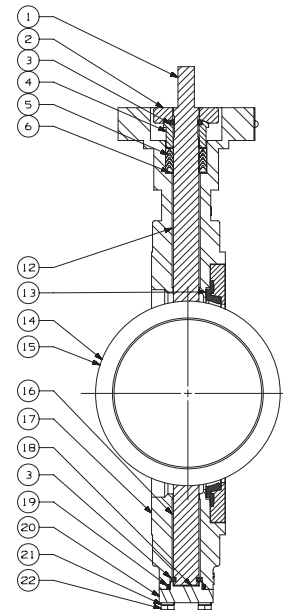
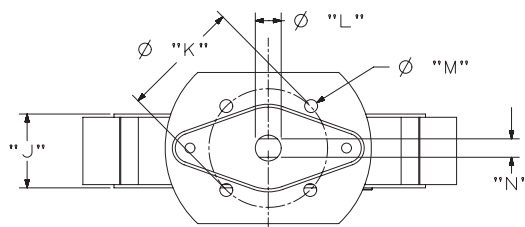
ANSI Class 150 &amp; 300



MATERIAL LIST	
PART	SPECIFICATION
1. Stem	Stainless Steel UNS ASTM A564 UNS S17400
2. Flange, Gland	Stainless Steel ASTM A351 Grade CF8M
3. Retainer, Stem (4)	Stainless Steel ASTM A276 UNS S31600
4. Gland, Packing	Stainless Steel ASTM A276 UNS S31600
5. Packing (set)	PTFE
6. Retainer, Packing	Stainless Steel ASTM A276 UNS S31600
7. Lockwasher (2)	Stainless Steel Type 304 18-8
8. Nut (2)	Stainless Steel Type 304 18-8
9. Stud (2)	Stainless Steel Type 304 18-8
10. Screw, SHCS	Stainless Steel Type 304 18-8
11. Retainer, Seat	Stainless Steel ASTM A276 UNS S31600
12. Bushing, Upper	Stainless Steel Type 304 PTFE Coated
13. Seat	PTFE 15% Glass Reinforced
14. Disc	Stainless Steel ASTM A351 Grade CF8M
15. Pin, Disc (2)	Stainless Steel ASTM A276 UNS S31600
16. Bushing, Lower	Stainless Steel TYPE 304 PTFE Coated
17. Body	Carbon Steel ASTM A216 GRADE WCB
18. Disc, Spacer	Stainless Steel ASTM A240 UNS S31600
19. Seal, Lower	PTFE
20. Cap, Body	Stainless Steel ASTM A351 Grade CF8M
21. Lockwasher (4)	Stainless Steel Type 304 18-8
22. Screw, Hex (4)	Stainless Steel Type 304 18-8
23. Handle Assembly	Malleable Iron (shown separately)
24. Plate, Throttle	Steel, Plated (shown separately)
25. Screw, Hex	Carbon Steel, Plated (shown separately)
26. Lockwasher	Carbon Steel, Plated (shown separately)
27. Key	Carbon Steel ASTM A108 Grade 1045
28. ID Plate	Stainless Steel

NOTE: For severe steam applications, contact NIBCO Technical Services.

NOTE: If valve is installed opposite the flow arrow for dead end service a downstream flange is required.

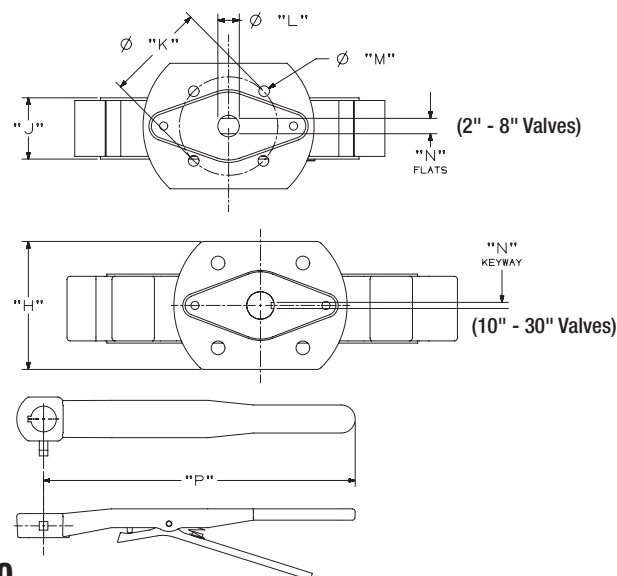
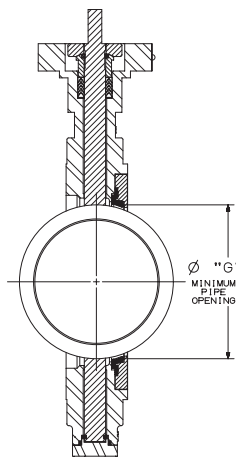
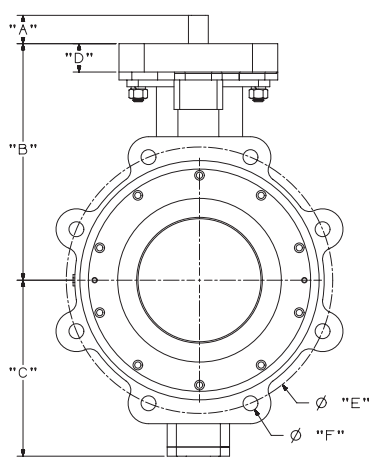

 10" - 30" Class 150 Valves  
 8" - 24" Class 300 Valves

 2" - 8" Class 150 Valves  
 2" - 6" Class 300 Valves

Visit our website for the most current information.


**WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

# High Performance Butterfly Valve Series 6822

SIZES 2" THROUGH 30"



## ANSI CLASS 150

### DIMENSIONS — WEIGHTS

Valve Size	Gear Operator Mounting	A		B		C		D		E		F Threads	G	
		In.	mm	In.	mm	In.	mm	In.	mm	In.	mm		In.	mm
2"	F07	1.25	31.75	5.78	146.8	3.94	100.1	1.25	31.8	4.75	120.65	4 X 5/8"-11 UNC	1.68	42.7
2½"	F07	1.25	31.75	6.49	164.8	4.06	103.1	1.25	31.8	5.50	139.70	4 X 5/8"-11 UNC	2.24	56.9
3"	F07	1.25	31.75	6.77	172.0	4.37	111.0	1.25	31.8	6.00	152.40	4 X 5/8"-11 UNC	2.72	69.1
4"	F07	1.25	31.75	6.98	177.3	4.80	121.9	1.25	31.8	7.50	190.50	8 X 5/8"-11 UNC	3.38	85.9
5"	F07	1.25	31.75	8.39	213.1	6.38	162.1	1.25	31.8	8.50	215.90	8 X 3/4"-10 UNC	4.48	113.8
6"	F07	1.25	31.75	8.71	221.2	5.97	151.6	1.25	31.8	9.50	241.30	8 X 3/4"-10 UNC	5.34	135.6
8"	F10	1.25	31.75	10.43	264.9	7.76	197.1	1.60	40.6	11.75	298.45	8 X 3/4"-10 UNC	7.28	184.9
10"	F12	2.00	50.80	11.81	300.0	8.61	218.7	1.00	25.4	14.25	361.95	12 X 7/8"-9 UNC	9.13	231.9
12"	F12	2.00	50.80	12.80	325.1	10.63	270.0	1.00	25.4	17.00	431.80	12 X 7/8"-9 UNC	10.68	271.3
14"	F12	2.25	57.15	16.03	407.2	11.68	296.7	1.00	25.4	18.75	476.25	12 X 1"-8 UNC	12.14	308.4
16"	F16	3.00	76.20	16.73	424.9	13.78	350.0	1.88	47.8	21.25	539.75	16 X 1"-8 UNC	13.98	355.1
18"	F16	3.00	76.20	17.72	450.1	14.76	374.9	1.88	47.8	22.75	577.85	16 X 1-1/8"-8 UN*	16.18	411.0
**20"	F16	3.00	76.20	18.94	481.1	16.43	417.3	2.00	50.8	25.00	635.00	20 X 1-1/8"-8 UN*	18.13	460.5
**24"	F16/F25	4.00	101.60	23.23	590.0	19.37	492.0	2.50	63.5	29.50	749.30	20 X 1-1/4"-8 UN*	21.17	537.7
**30"	F25	5.33	135.38	26.90	683.3	24.24	615.7	3.00	76.2	36.00	914.4	28 X 1-1/4"-8 UN*	26.87	682.5

\*SPECIAL PITCH CAP SCREW THREAD REQUIRED PER MSS SP-68 SPECIFICATIONS.

\*\*SHORT SCREWS REQUIRED FOR BLIND TAPPED HOLES NEAREST TO STEM FOR 20" AND LARGER VALVES. SEE INSTALLATION, OPERATION &amp; MAINTENANCE GUIDE II FOR SERIES 6822 &amp; 7822.

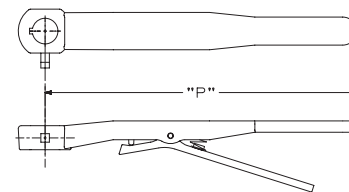
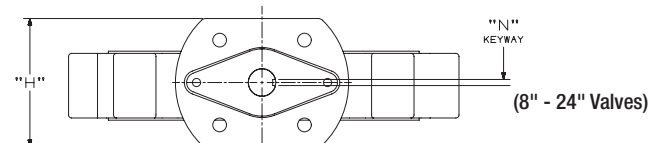
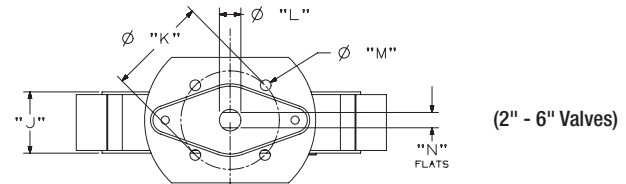
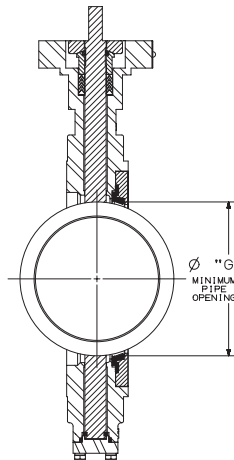
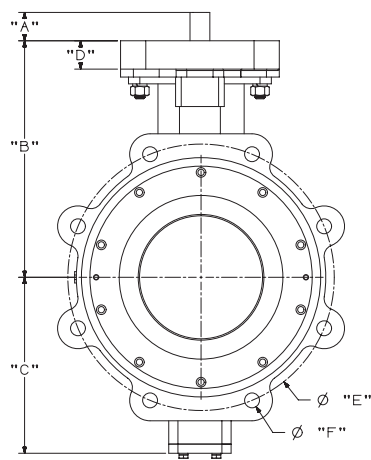
Valve Size	H		J		K		L		M		N		P		Valve Wt.		Operating Torque at 285 psi	
	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.	In.-Lbs.	N-m
2"	4.15	105.4	1.69	42.93	2.76	70.10	0.500	12.700	0.37	9.40	0.375	9.525	13.75	349.3	12.5	6	290	33
2½"	4.15	105.4	1.84	46.74	2.76	70.10	0.625	15.875	0.37	9.40	0.438	11.125	13.75	349.3	16	7	320	36
3"	4.15	105.4	1.88	47.75	2.76	70.10	0.625	15.875	0.37	9.40	0.438	11.125	13.75	349.3	18	8	350	40
4"	4.15	105.4	2.12	53.85	2.76	70.10	0.625	15.875	0.37	9.40	0.438	11.125	13.75	349.3	31	14	510	58
5"	4.15	105.4	2.25	57.15	2.76	70.10	0.750	19.050	0.37	9.40	0.500	12.700	13.75	349.3	38	17	725	82
6"	4.15	105.4	2.25	57.15	2.76	70.10	0.750	19.050	0.37	9.40	0.500	12.700	13.75	349.3	44	20	845	95
8"	5.12	130.0	2.50	63.50	4.02	102.11	0.875	22.225	0.44	11.18	0.625	15.875	—	—	68	31	1430	162
10"	5.25	133.4	2.83	71.88	4.92	124.97	1.125	28.575	0.56	14.22	1/4" X 1/4"	—	—	—	104	47	2400	271
12"	5.25	133.4	3.19	81.03	4.92	124.97	1.125	28.575	0.56	14.22	1/4" X 1/4"	—	—	—	148	67	3650	412
14"	5.25	133.4	3.62	91.95	4.92	124.97	1.375	34.925	0.56	14.22	5/16" X 5/16"	—	—	—	201	91	6000	678
16"	6.50	165.1	4.00	101.60	6.50	165.10	1.875	47.625	0.81	20.57	3/8" X 1/2"	—	—	—	309	140	8800	994
18"	6.50	165.1	4.50	114.30	6.50	165.10	1.875	47.625	0.81	20.57	3/8" X 1/2"	—	—	—	346	157	11500	1299
20"	6.50	165.1	5.00	127.00	6.50	165.10	2.125	53.975	0.81	20.57	1/2" X 1/2"	—	—	—	426	194	16500	1864
24"	11.02	279.9	6.06	153.92	6.50	165.10	2.555	64.897	0.81	20.57	3/4" X 1/2"	—	—	—	675	307	24600	2779
30"	11.25	285.8	7.51	190.75	10.00	254.00	3.142	79.807	0.69	15.53	.866 X .788	—	—	—	1026	466	37175	4200


**WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

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# High Performance Butterfly Valve Series 7822

SIZES 2" THROUGH 24"



## ANSI CLASS 300

### DIMENSIONS — WEIGHTS

Valve Size	Gear Operator Mounting	A		B		C		D		E		F Threads	G	
		In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.		In.	mm.
2"	F07	1.25	31.75	5.78	146.8	3.94	100.1	1.25	31.8	5.00	127.00	8 X 5/8"-11 UNC	1.68	42.7
2½"	F07	1.25	31.75	6.49	164.8	4.06	103.1	1.25	31.8	5.88	149.35	8 X 3/4"-10 UNC	2.24	56.9
3"	F07	1.25	31.75	6.77	172.0	4.37	111.0	1.25	31.8	6.62	168.15	8 X 3/4"-10 UNC	2.72	69.1
4"	F07	1.25	31.75	6.98	177.3	4.80	121.9	1.25	31.8	7.88	200.15	8 X 3/4"-10 UNC	3.38	85.9
5"	F07	1.25	31.75	8.39	213.1	6.38	162.1	1.25	31.8	9.25	234.95	8 X 3/4"-10 UNC	4.42	112.3
6"	F07	1.25	31.75	9.53	242.1	7.75	196.9	1.25	31.8	10.62	269.75	12 X 3/4"-10 UNC	4.07	103.4
8"	F10	2.00	50.80	11.42	290.1	8.91	226.3	2.00	50.8	13.00	330.20	12 X 7/8"-9 UNC	7.03	178.6
10"	F12	2.25	57.15	12.32	312.9	9.88	251.0	1.00	25.4	15.25	387.35	16 X 1"-8 UNC	9.11	231.4
12"	F12	3.00	76.20	13.90	353.1	11.00	279.4	1.00	25.4	17.75	450.85	16 X 1-1/8"-8 UN*	10.55	268.0
14"	F16	3.00	76.20	15.95	405.1	12.57	319.3	2.00	50.8	20.25	514.35	20 X 1-1/8"-8 UN*	11.99	304.5
16"	F16	3.00	76.20	18.31	465.1	15.83	402.1	2.00	50.8	22.50	571.50	20 X 1-1/4"-8 UN*	13.80	350.5
18"	F25	4.33	109.98	19.29	490.0	16.81	427.0	1.25	31.8	24.75	628.65	24 X 1-1/4"-8 UN*	15.81	401.6
**20"	F25	4.33	109.98	22.44	570.0	17.72	450.1	1.25	31.8	27.00	685.80	24 X 1-1/4"-8 UN*	17.50	444.5
**24"	F25	4.33	109.98	24.92	633.0	21.65	549.9	1.25	31.8	32.00	912.80	24 X 1-1/2"-8 UN*	21.50	546.1

\*SPECIAL PITCH CAP SCREW THREAD REQUIRED PER MSS SP-68 SPECIFICATIONS.

\*\*SHORT SCREWS REQUIRED FOR BLIND TAPPED HOLES NEAREST TO STEM FOR 20" AND LARGER VALVES. SEE INSTALLATION, OPERATION & MAINTENANCE GUIDE II FOR SERIES 6822 & 7822.

& MAINTENANCE GUIDE FOR HONDA SERIES 6622 & 7622.																	Operating Torque at 700 psi	
Valve Size	H		J		K		L		M		N		P		Valve		In.-Lbs.	N-m
	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.		
2"	4.15	105.4	1.69	42.93	2.76	70.10	0.500	12.700	0.37	9.40	0.375	9.525	13.75	349.3	14	6	390	44
2½"	4.15	105.4	1.84	46.74	2.76	70.10	0.625	15.875	0.37	9.40	0.438	11.125	13.75	349.3	21	10	425	48
3"	4.15	105.4	1.88	47.75	2.76	70.10	0.625	15.875	0.37	9.40	0.438	11.125	13.75	349.3	27	12	450	51
4"	4.15	105.4	2.12	53.85	2.76	70.10	0.625	15.875	0.37	9.40	0.438	11.125	13.75	349.3	49	22	725	82
5"	4.15	105.4	2.31	58.67	2.76	70.10	0.750	19.050	0.37	9.40	0.500	12.700	13.75	349.3	60	27	1000	113
6"	4.15	105.4	2.31	58.67	2.76	70.10	0.750	19.050	0.37	9.40	0.500	12.700	13.75	349.3	71	32	1250	141
8"	5.12	130.0	2.88	73.15	4.02	102.11	1.125	28.575	0.44	11.18	1/4" X 1/4"	—	—	—	121	55	2025	229
10"	5.25	133.4	3.25	82.55	4.92	124.97	1.375	34.925	0.56	14.22	5/16" X 5/16"	—	—	—	143	65	3775	426
12"	5.25	133.4	3.62	91.95	4.92	124.97	1.625	41.275	0.56	14.22	3/8" X 3/8"	—	—	—	216	98	5725	647
14"	6.50	165.1	4.62	117.35	6.50	165.10	1.875	47.625	0.81	20.57	1/2" X 3/8"	—	—	—	378	172	11500	1299
16"	6.50	165.1	5.25	133.35	6.50	165.10	1.875	47.625	0.81	20.57	1/2" X 3/8"	—	—	—	488	222	15338	1733
18"	11.02	279.9	5.88	149.35	10.0	254.00	2.555	64.897	0.75	19.05	3/4" X 1/2"	—	—	—	720	327	19516	2205
20"	11.02	279.9	6.30	160.02	10.0	254.00	2.555	64.897	0.75	19.05	3/4" X 1/2"	—	—	—	855	389	26022	2940
24"	11.02	279.9	7.12	180.85	10.0	254.00	2.555	64.897	0.75	19.05	3/4" X 1/2"	—	—	—	—	—	—	—

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**WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.



# High Performance Butterfly Valve Technical Data

## CLASS 150 HPBFV 6800 Series Flow Data

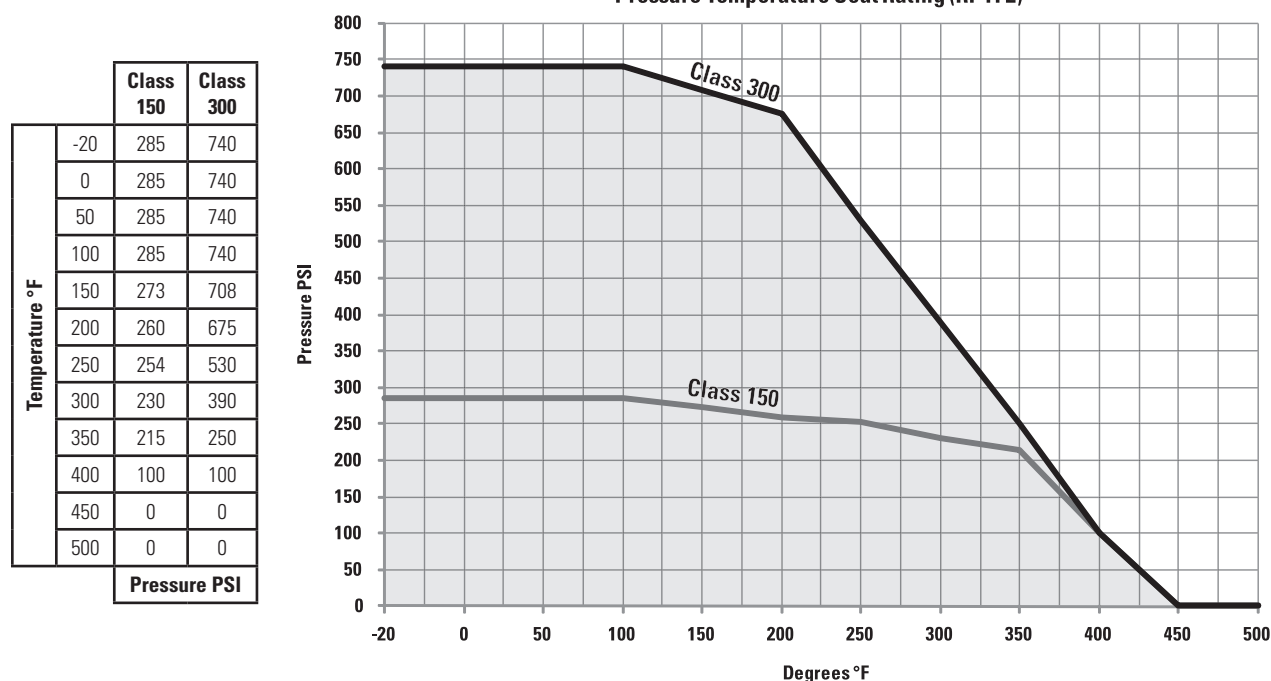
Valve Size	Cv Rating	DISC OPEN - Degrees								
		10°	20°	30°	40°	50°	60°	70°	80°	90°
2"	92	2	6	13	20	30	43	72	81	92
2½"	150	3	11	21	33	50	71	117	132	150
3"	260	5	18	36	57	86	122	203	230	260
4"	460	9	32	64	101	152	216	360	405	460
5"	760	15	53	106	167	251	357	595	670	760
6"	1150	23	81	161	253	380	540	879	1015	1150
8"	2100	42	147	295	462	695	987	1640	1850	2100
10"	3200	64	225	450	705	1056	1505	2496	2816	3200
12"	4700	94	330	660	1035	1551	2210	3666	4136	4700
14"	5800	116	406	815	1276	1915	2726	4525	5105	5800
16"	8000	160	560	1120	1760	2640	3760	6240	7040	8000
18"	10500	210	735	1470	2310	3465	4935	8190	9240	10500
20"	14000	280	980	1960	3080	4620	6580	10920	12320	14000
24"	21000	420	1470	2940	4620	6930	9870	16380	18480	21000
30"	33500	670	2345	4690	7370	11055	15745	26130	29480	33500

## CLASS 300 HPBFV 7800 Series Flow Data

Valve Size	Cv Rating	DISC OPEN - Degrees								
		10°	20°	30°	40°	50°	60°	70°	80°	90°
2"	92	2	6	13	20	30	43	72	81	92
2½"	150	3	11	21	33	50	71	117	132	150
3"	260	5	18	36	57	86	122	203	230	260
4"	460	9	32	65	101	152	216	360	405	460
5"	760	15	53	106	167	251	357	595	670	760
6"	1150	23	81	161	253	380	540	879	1015	1150
8"	1900	38	133	266	418	627	895	1485	1675	1900
10"	2800	56	196	392	616	925	1316	2185	2465	2800
12"	4100	82	287	575	905	1355	1930	3200	3610	4100
14"	5500	110	385	770	1210	1815	2585	4290	4840	5500
16"	7600	152	532	1065	1675	2510	3575	5930	6690	7600
18"	9900	198	695	1390	2180	3270	4655	7725	8715	9900
20"	13000	260	910	1820	2860	4290	6110	10140	11440	13000
24"	19500	390	1365	2730	4290	6435	9165	15210	17160	19500

Cv = Flow in U.S. Gallons per minute of 60°F water with a 1 psi pressure drop across valve

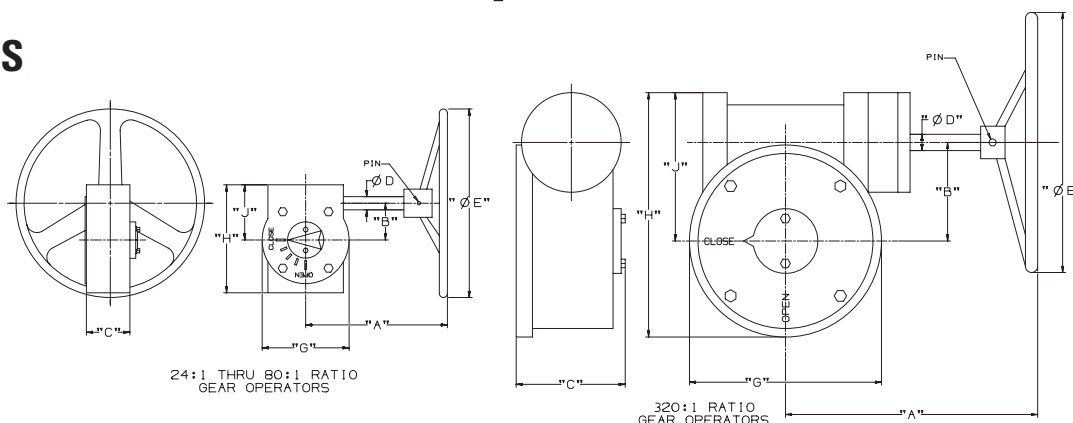
Pressure Temperature Seat Rating (RPTFE)





# High Performance Butterfly Valve Technical Data

## OPERATORS



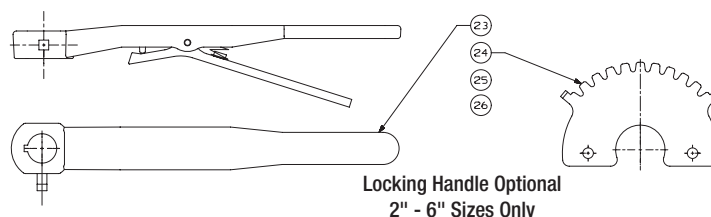
## GEAR OPERATOR DIMENSIONS

Valve Size		Gear Operator Figure Number	NIBCO Material Number	Ratio	Gear Operator Efficiency	Gear Operator Mounting	A		B		C		D	
Class 150	Class 300						In.	mm.	In.	mm.	In.	mm.	In.	mm.
2"	2"	G024:1-1-8	RG70001	24:1	15%	F07	5.77	146.6	1.73	43.9	2.65	67.3	0.625	15.88
2-1/2", 3", 4"	2-1/2", 3", 4"	G024:1-3-8 W/STSA-4	RG70002	24:1	15%	F07	5.77	146.6	1.73	43.9	2.65	67.3	0.625	15.88
5" 6"	5" 6"	G024:1-3-8 W/STSA-5	RG70003	24:1	15%	F07	5.77	146.6	1.73	43.9	2.65	67.3	0.625	15.88
8"	—	G030:1-1-12 W/STSA-6	RG70004	30:1	19%	F10	9.50	241.3	2.50	63.5	3.00	76.2	0.750	19.05
—	8"	G030:1-1-12	RG70005	30:1	19%	F10	9.50	241.3	2.50	63.5	3.00	76.2	0.750	19.05
10"	—	G030:1-2-12	RG70006	30:1	19%	F12	9.50	241.3	2.50	63.5	3.00	76.2	0.750	19.05
12"	—	G050:1-1-16	RG70007	50:1	20%	F12	9.00	228.6	3.00	76.2	3.00	76.2	0.750	19.05
14"	10"	G050:1-3-16	RG70008	50:1	20%	F12	9.00	228.6	3.00	76.2	3.00	76.2	0.750	19.05
—	12"	G080:1-2-16	RG70009	80:1	16%	F12	10.75	273.1	4.75	120.7	4.40	111.8	1.000	25.40
16"	14"	G080:1-1-16	RG70010	80:1	16%	F16	10.75	273.1	4.75	120.7	4.40	111.8	1.000	25.40
18"	—	G080:1-1-1-20	RG70011	80:1	16%	F16	10.75	273.1	4.75	120.7	4.40	111.8	1.000	25.40
—	16"	G0320:1-3-20	RG70020	320:1	15%	F16	15.51	394.0	6.06	153.9	6.46	164.1	1.190	30.23
20"	—	G0320:1-1-20	RG70012	320:1	15%	F16	15.51	394.0	6.06	153.9	6.46	164.1	1.190	30.23
24"	18" 20"	G0320:1-2-20	RG70013	320:1	15%	F25	15.51	394.0	6.06	153.9	6.46	164.1	1.190	30.23
30"	24"	G0320:1-4-20	RG70021	320:1	15%	F25	15.51	394.0	6.06	153.9	6.46	164.1	1.190	30.23

Valve Size		E		G		H		J		Weight		Mounting Screws	Handwheel Pin Size	Hand Wheel Figure No.
Class 150	Class 300	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg			
2"	2"	8	203	4.00	101.6	5.07	128.8	2.90	73.7	12	5.5	5/16"-18 UNC	Ø.190 X 1.63 LONG	RG70014
2-1/2", 3", 4"	2-1/2", 3", 4"	8	203	4.00	101.6	5.07	128.8	2.90	73.7	12	5.5	5/16"-18 UNC	Ø.190 X 1.63 LONG	RG70014
5" 6"	5" 6"	8	203	4.00	101.6	5.07	128.8	2.90	73.7	12	5.5	5/16"-18 UNC	Ø.190 X 1.63 LONG	RG70014
8"	—	12	305	6.00	152.4	6.90	175.3	3.90	99.1	26.5	12	3/8"-16 UNC	Ø.190 X 1.63 LONG	RG70015
—	8"	12	305	6.00	152.4	6.90	175.3	3.90	99.1	26.5	12	3/8"-16 UNC	Ø.190 X 1.63 LONG	RG70015
10"	—	12	305	6.00	152.4	6.90	175.3	3.90	99.1	26.5	12	1/2"-13 UNC	Ø.190 X 1.63 LONG	RG70015
12"	—	16	406	6.70	170.2	7.80	198.1	4.60	116.8	37.5	17	1/2"-13 UNC	Ø.190 X 1.63 LONG	RG70016
14"	10"	16	406	6.70	170.2	7.80	198.1	4.60	116.8	37.5	17	1/2"-13 UNC	Ø.190 X 1.63 LONG	RG70016
—	12"	16	406	10.25	260.4	11.50	292.1	6.25	158.8	72	33	1/2"-13 UNC	Ø.380 X 1.81 LONG	RG70017
16"	14"	16	406	10.25	260.4	11.50	292.1	6.25	158.8	72	33	3/4"-10 UNC	Ø.380 X 1.81 LONG	RG70017
18"	—	20	508	10.25	260.4	11.50	292.1	6.25	158.8	74	34	3/4"-10 UNC	Ø.380 X 2.50 LONG	RG70018
—	16"	20	508	11.81	300.0	17.00	431.8	11.10	281.9	200	91	3/4"-10 UNC	Ø.380 X 2.50 LONG	RG70019
20"	—	20	508	11.81	300.0	17.00	431.8	11.10	281.9	200	91	3/4"-10 UNC	Ø.380 X 2.50 LONG	RG70019
24"	18" 20"	20	508	11.81	300.0	17.00	431.8	11.10	281.9	200	91	5/8"-11 UNC	Ø.380 X 2.50 LONG	RG70019
30"	24"	20	508	11.81	300.0	17.00	431.8	11.10	281.9	200	91	5/8"-11 UNC	Ø.380 X 2.50 LONG	RG70019

## LEVER HANDLE

Item	Description	Material
23	Handle Assembly	Malleable Iron
24	Plate, Throttle	Steel, Plated
25	Screw, Hex	Carbon Steel, Plated
26	Lockwasher	Carbon Steel, Plated

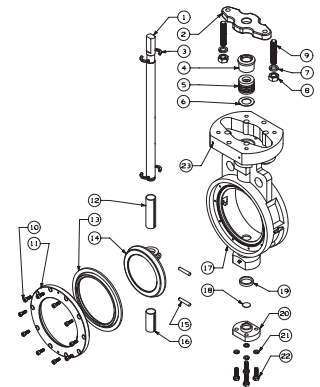


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# High Performance Butterfly Valve Technical Data

## MATERIAL LIST

PART	SPECIFICATION	PART	SPECIFICATION
1. Stem	Stainless Steel UNS ASTM A564 UNS S17400	12. Bushing, Upper	Stainless Steel Type 304 PTFE Coated
2. Flange, Gland	Stainless Steel ASTM A351 Grade CF8M	13. Seat	PTFE 15% Glass Reinforced
3. Retainer, Stem (2)	Stainless Steel ASTM A276 UNS S31600	14. Disc	Stainless Steel ASTM A351 Grade CF8M
4. Gland, Packing	Stainless Steel ASTM A276 UNS S31600	15. Pin, Disc (2)	Stainless Steel ASTM A276 UNS S31600
5. Packing	PTFE	16. Bushing, Lower	Stainless Steel Type 304 PTFE Coated
6. Retainer, Packing	Stainless Steel ASTM A276 UNS S31600	17. Body	Carbon Steel ASTM A216 Grade WCB
7. Lockwasher (2)	Stainless Steel Type 304 18-8	18. Disc, Spacer	Stainless Steel ASTM A240 UNS S31600
8. Nut (2)	Stainless Steel Type 304 18-8	19. Seal, Lower	PTFE
9. Stud (2)	Stainless Steel Type 304 18-8	20. Cap, Body	Stainless Steel ASTM A351 Grade CF8M
10. Screw, SHCS	Stainless Steel Type 304 18-8	21. Lockwasher (4)	Stainless Steel Type 304 18-8
11. Retainer, Seat	Stainless Steel ASTM A276 UNS S31600	22. Screw, Hex (4)	Stainless Steel Type 304 18-8



## NIBCO HPBFV REPLACEMENT PARTS

LCS6822 SERIES CLASS 150	GEAR OPERATOR KIT		HANDWHEEL		HANDWHEEL PIN		STEM BUSHING / KEY		LEVER HANDLE KIT	LEVER BUSHING	STEM SEAL KIT	RPTFE SEAT (only)
	RATIO	PART NO. NUMBER	SIZE	PART NO. NUMBER	SIZE	PART NO. NUMBER	SIZE	PART NO. NUMBER	PART NO. NUMBER	PART NO. NUMBER	PART NO. NUMBER	PART NO. NUMBER
2"	24:1	RG70001	8" OD X .625" BORE	RG70014	Ø.190" X 1.63" LONG	RG700130	Ø.500 X .375 FLATS	DIRECT	RG70031	RG70034	RG700110	RG700080
2½"	24:1	RG70002	8" OD X .625" BORE		Ø.190" X 1.63" LONG		Ø.625 X .438 FLATS	RG70022	RG70032	DIRECT	RG700111	RG700081
3"	24:1		8" OD X .625" BORE		Ø.190" X 1.63" LONG		Ø.625 X .438 FLATS					RG700082
4"	24:1		8" OD X .625" BORE		Ø.190" X 1.63" LONG		Ø.625 X .438 FLATS					RG700083
5"	24:1		RG70003		8" OD X .625" BORE		Ø.190" X 1.63" LONG	Ø.750 X .500 FLATS			RG70023	RG70033
6"	24:1	8" OD X .625" BORE		Ø.190" X 1.63" LONG	Ø.750 X .500 FLATS		RG700113	RG700085				
8"	30:1	RG70004	12" OD X .750" BORE	RG70015	Ø.190" X 1.63" LONG	RG700131	Ø.875 X .625 FLATS	RG70024		RG700114	RG700086	
10"	30:1	RG70006	12" OD X .750" BORE		Ø.190" X 1.63" LONG		.250" X .250" X 2" LG.	RG70025		RG700115	RG700087	
12"	50:1	RG70007	16" OD X .750" BORE	RG70016	Ø.190" X 1.63" LONG		.250" X .250" X 2" LG.		RG700116	RG700088		
14"	50:1	RG70008	16" OD X .750" BORE		Ø.190" X 1.63" LONG		.312" X .312" X 2-1/4" LG.	RG70026		RG700117	RG700089	
16"	80:1	RG70010	16" OD X 1.00" BORE	RG70017	Ø.380" X 1.81" LONG		.500" X .375" X 3" LG.	RG70028		RG700118	RG700090	
18"	80:1	RG70011	20" OD X 1.00" BORE	RG70018	Ø.380" X 2.50" LONG		.500" X .375" X 3" LG.				RG70029	
20"	320:1	RG70012	20" OD X 1.19" BORE	RG70019	Ø.380" X 2.50" LONG		.500" X .500" X 3" LG.	RG70030		RG700120	RG700092	
24"	320:1	RG70013	20" OD X 1.19" BORE		Ø.380" X 2.50" LONG		.750" X .500" X 4" LG.				RG70030	RG700093
30"	320:1	RG70021	20" OD X 1.19" BORE				Ø.380" X 2.50" LONG	.866" X .788" X 5" LG.	RG700032		RG700121	RG700094

LCS7822 SERIES CLASS 300	GEAR OPERATOR KIT		HANDWHEEL		HANDWHEEL PIN		STEM BUSHING / KEY		LEVER HANDLE KIT	LEVER BUSHING	STEM SEAL KIT	RPTFE SEAT (only)	
	RATIO	PART NO. NUMBER	SIZE	PART NO. NUMBER	SIZE	PART NO. NUMBER	SIZE	PART NO. NUMBER	PART NO. NUMBER	PART NO. NUMBER	PART NO. NUMBER		
2"	24:1	RG70001	8" OD X .625" BORE	RG70014	Ø.190" X 1.63" LONG	RG700130	Ø.500 X .375 FLATS	DIRECT	RG70031	RG70034	RG700110	RG700080	
2½"	24:1	RG70002	8" OD X .625" BORE		Ø.190" X 1.63" LONG		Ø.625 X .438 FLATS	RG70022	RG70032	DIRECT	RG700111	RG700081	
3"	24:1		8" OD X .625" BORE		Ø.190" X 1.63" LONG		Ø.625 X .438 FLATS					RG700082	
4"	24:1		8" OD X .625" BORE		Ø.190" X 1.63" LONG		Ø.625 X .438 FLATS					RG700083	
5"	24:1		RG70003		8" OD X .625" BORE		Ø.190" X 1.63" LONG	Ø.750 X .500 FLATS			RG70023	RG70033	DIRECT
6"	24:1	8" OD X .625" BORE		Ø.190" X 1.63" LONG	Ø.750 X .500 FLATS	RG700122	RG700085						
8"	30:1	RG70005	12" OD X .750" BORE	RG70015	Ø.190" X 1.63" LONG	RG70021	.250" X .250" X 2" LG.	RG70025			RG700123	RG700095	
10"	50:1	RG70008	16" OD X .750" BORE	RG70016	Ø.190" X 1.63" LONG		.312" X .312" X 2-¼" LG.	RG70026			RG700124	RG700096	
12"	80:1	RG70009	16" OD X 1.00" BORE	RG70017	Ø.380" X 1.81" LONG		.375" X .375" X 3" LG.	RG70027			RG700125	RG700097	
14"	80:1	RG70010	16" OD X 1.00" BORE		Ø.380" X 1.81" LONG		.500" X .375" X 3" LG.	RG70028			RG700126	RG700098	
16"	320:1	RG70020	20" OD X 1.19" BORE	RG70019	Ø.380" X 2.50" LONG		.500" X .375" X 3" LG.	RG70030				RG700127	RG700099
18"	320:1	RG70013	20" OD X 1.19" BORE		Ø.380" X 2.50" LONG		.750" X .500" X 4" LG.					RG700128	RG700100
20"	320:1		20" OD X 1.19" BORE		Ø.380" X 2.50" LONG		.750" X .500" X 4" LG.					RG700101	
24"	320:1		RG70021		20" OD X 1.19" BORE		Ø.380" X 2.50" LONG	.866" X .788" X 5" LG.	RG700032			RG700129	RG700102

### NOTES

- Replacement Gear Operators includes Handwheel, Handwheel Pin, 4 Cap Screws, 4 Lock Washers, Key and Stem Bushing (if required) for mounting to BFV.
- Stem Seal Kit includes Upper Packing Set, Packing Retainer, and Lower Body Cap Seal.
- Lever Handle Kit includes Handle, Throttle Plate, Lockwashers, Bolts, and Bushing (if required).

Visit our website for the most current information.

## 161T-LF Series

Class 125, Bronze Disc, NPT Swing Check

### LEAD FREE

### 2.8 CHECK VALVES 1/2 TO 2"



Job Name:	
Job Location:	
Engineer:	
Contractor:	
Tag:	
PO#:	
Rep:	
Wholesale Dist.:	

#### DESCRIPTION

The **lead free\* Apollo® Model 161T-LF (61YLF Series) Swing Check** provides a reliable, long lasting, "Made in the USA" alternative to globally sourced check valves for potable water service. These valves are cast, machined, assembled, and tested in South Carolina using proven ASTM quality materials. The Apollo® swing check may be installed in either horizontal or vertical orientation with upward flow.

#### FEATURES

- Dezincification Resistant Bronze Construction
- Renewable Bronze Seat Disc
- 100% Factory Tested per MSS SP-139
- NPT Connection
- **Cast, Machined and Assembled in the USA**
- ARRA Compliant

#### APPROVALS

- MSS SP-80 Design & Tested
- MSS SP-139, "Copper Alloy Gate, Globe, & Check Valves"
- NSF/ANSI 372 Lead Free, 3rd Party Certified
- ASME B1.20.1, "Pipe Threads, General Purpose (Inch)"
- CSA B51 CRN OC14667.

#### STANDARD MATERIALS LIST

<b>BODY</b>	ASTM B584-C89836 Bronze
<b>CAP</b>	ASTM B584-C89836 Bronze
<b>HANGER</b>	304 Stainless Steel or ASTM B584 C89836 Bronze
<b>PIN</b>	304 Stainless Steel
<b>SEAT</b>	C27451 Lead Free* Brass
<b>PLUG</b>	ASTM B16 Brass

#### PERFORMANCE RATING

- Cold Working Pressure:  
200 psi (13.8 Bar) at 100°F
- Saturated Steam: 125 psi (8.6 Bar) at 353°F
- Temperature Range: -20°F to 406°F

#### PRECAUTIONARY NOTE:

*Not recommended for applications which may induce pulsation or repetitive vibration. See Installation Manual for details.*

#### DIMENSIONS

MODEL NUMBER	PART NUMBER	SIZE (IN.)	HEIGHT (IN.)	LENGTH (IN.)	WEIGHT (LB.)	CV (GPM)
161T14LF	61YLF-191-01	1/4"	1.51	2.14	.64	2.6
161T38LF	61YLF-192-01	3/8"	1.51	2.14	.62	4.5
161T12LF	61YLF-193-01	1/2"	1.65	2.48	.73	7.0
161T34LF	61YLF-194-01	3/4"	1.9	2.94	1.1	12.0
161T1LF	61YLF-195-01	1"	2.26	3.57	1.7	28.6
161T14LF	61YLF-196-01	1-1/4"	2.99	4.50	3.4	39.0
161T12LF	61YLF-197-01	1-1/2"	2.99	4.50	3.1	56.0
161T2LF	61YLF-198-01	2"	3.74	5.25	5.5	152.0

*Warning: Do not use in reciprocating compressor service.*

*\*LEAD FREE: The wetted surfaces of this product shall contain no more than 0.25% lead by weighted average. Complies with Federal Public Law 111-380. ANSI 3rd party approved and listed.*

# "Apollo" INTERNATIONAL

## SUBMITTAL SHEET

### 910F Series

Class 125 Swing Check Valve

2.8 CHECK VALVES 21/2" TO 20"



### DESCRIPTION

The **Apollo International™** Model 910F Flanged Cast Iron Swing Check valve provides full flow capabilities. It provides reliable and economical protection against reverse flow. The Model 910F Swing Check valve can reliably be installed in most plumbing and heating systems (or building service piping).

### FEATURES

- Compatible with ANSI 125# & 150# Flanges
- Full Port
- Minimal Pressure Drop
- Flanged Connection
- Bolted Bonnet
- Integral Bronze Seat

### STANDARDS

- MSS SP-71, "Gray Iron Swing Check Valves Flanged and Threaded"
- ASME B16.10, "Face-to-Face and End-to-End Dimensions of Valves"

### PERFORMANCE RATING

- Saturated Steam:  
125 psi (8.6 Bar) to 353°F (178°C) (2"-12")  
100 psi (6.9 Bar) to 338°F (170°C) (14"-20")
- Cold Working Pressure:  
200 psi (13.8 Bar) at 100°F (2"-12")  
150 psi (10.3 Bar) at 100°F (14"-20")
- Temperature Range\*:  
-20°F to 406°F

\* Valves should be in open position to allow complete drainage during freezing conditions.

### STANDARD MATERIALS LIST

Part Name	Material
Bolts	Steel (ASTM A307 B)
Nameplate	Aluminum
Bonnet	Cast Iron (ASTM A126 CL B)
Body Gasket	Graphite
Nuts	Steel (ASTM A307 B)
Side Plug	Brass (ASTM B16)
Gasket	Graphite
Hanger Pin	Brass (ASTM B16)
Hanger	Ductile Iron (ASTM A536 65-45-12)
Disc Ring	Cast Bronze (2"-6") Cast Iron (8"-20")
Disc	Cast Iron (ASTM A126 CL B)
Washer	Steel (ASTM A307 B)
Split Pin	Stainless Steel (ASTM 420 S42000)
Seat Ring	Cast Bronze (2"-6") Cast Iron (8"-20")
Body	Cast Iron (ASTM A126 CL B)
Disc Nut	Steel (ASTM A307 B)
Stud Bolt	Steel (ASTM A307 B)

### ORDER INFORMATION

Size (in.)	Part Number
2"	6SC108B1
2-1/2"	6SC109B1
3"	6SC100B1
4"	6SC10AB1
5"	6SC10BB1
6"	6SC10CB1
8"	6SC10E01
10"	6SC10G01
12"	6SC10H01
14"	6SC10J01
16"	6SC10K01
18"	6SC10M01
20"	6SC10N01

Apollo Valves / **Conbraco Industries, Inc.**  
701 Matthews Mint-Hill Road, Matthews, NC 28105 USA  
[www.apollovalves.com](http://www.apollovalves.com) | (704) 841-6000

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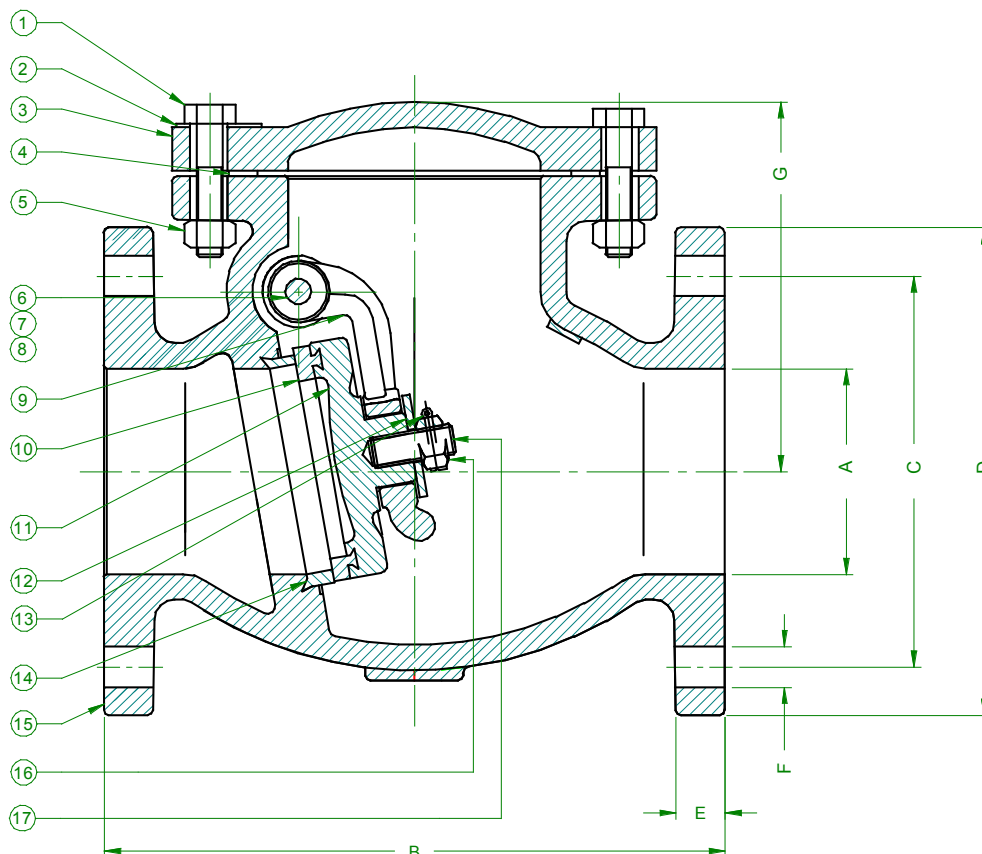


# "Apollo" INTERNATIONAL

## SUBMITTAL SHEET

### 910F Series

Class 125 Swing Check Valve



Size (in.)	Dimensions (in.)							Wt. (lbs.)	Cv (Typ)
	A	B	C	D	E	F	G		
2"	2.00	8.00	4.75	6.00	0.62	0.75	4.41	26	132
2.5"	2.50	8.50	5.50	7.00	0.69	0.75	5.24	39	192
3"	3.00	9.50	6.00	7.50	0.75	0.75	5.67	47	298
4"	4.00	11.50	7.50	9.00	0.94	0.75	6.61	82	526
5"	5.00	13.00	8.50	10.00	0.94	0.88	7.80	124	852
6"	6.00	14.00	9.50	11.00	1.00	0.88	8.54	160	1272
8"	8.00	19.50	11.75	13.50	1.12	0.88	10.28	271	2278
10"	10.00	24.50	14.25	16.00	1.19	1.00	11.30	437	3588
12"	12.00	27.50	17.00	19.00	1.25	1.00	12.56	644	5342
14"	14.00	31.00	18.75	21.00	1.38	1.14	17.50	950	6512
16"	16.00	36.00	21.25	23.50	1.44	1.14	23.45	1160	8626
18"	18.00	36.00	22.75	25.00	1.56	1.25	27.50	1720	11488
20"	20.00	40.00	25.00	27.50	1.69	1.25	29.25	2094	14304

$C_v = \text{GPM} @ 1 \text{ psi pressure drop, } 60^\circ\text{F water}$

\*Cv values are estimates only

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Proven Every Day // Proven Everywhere®



USDA approved for use in federally inspected meat and poultry plants.

# Slic-tite® Paste with PTFE

## Premium Thread Sealant

### FEATURES:

- Slic-tite® contains more PTFE than other national brands. The higher concentration of PTFE particles provides greater sealing power on all tapered pipe threads including those that are damaged.
- Brushes easily on wet or oily threads.
- Sticks to hot, oily threads, will not run off. Ideal for use on production lines using high speed pipe threading machines.
- The non-toxic, non-drying formula will not harden or crack in the pipe joint. Provides easy disassembly and break out.
- Seals to high pressures: 10,000 PSI for Liquids, 3,000 PSI for Gases.
- Sealing temperature range: -50° to 500°F (-46°C to 260°C).
- Meets Fed. Spec. TT-S-1732
- Slic-tite contains a product made from PTFE and other PTFE resins to assure high performance.

### TYPICAL APPLICATIONS:

- Slic-tite seals all types of pipe threads: steel, stainless steel, brass, aluminum, iron, and PVC, CPVC and ABS plastic.
- Recommended Services: water, natural gas, LP gases, steam, air, gasoline, kerosene, Refrigerants, ammonia, caustics, and acids. Contact factory for specific use recommendations. NOT RECOMMENDED FOR USE WITH OXYGEN SERVICE. Use OXY-TITE®.



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### RECOMMENDED INDUSTRIES:

- Plumbing
- AC/R
- Industrial Piping
- Chemical Processing Plants
- Manufacturing Plants
- Gas Utilities
- Fire Sprinkler Piping
- Irrigation Systems

### ORDERING INFORMATION

Part No.	Size	QTY/Case	Part No.	Size	QTY/Case
41209	1/4 pt. BIC	12	42013	1 qt. Flat Top	12
42009	1/4 pt. BIC	24	42049	1 qt. BIC	12
41219	1/2 pt. BIC	12	42014	1 gal.	4
42019	1/2 pt. BIC	24	42015	5 gal.	1
42012	1 pt. Flat Top	24	42069	55 gal.	1
42029	1 pt. BIC	24			

BIC = Brush in Cap

LP97R00010



Call, write or email for additional information

LA-CO Industries Inc.  
1201 Pratt Boulevard  
Elk Grove Village, Illinois 60007-5746  
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www.laco.com  
Email: customer\_service@laco.com  
Family owned and operated since 1934



# Fleetweld® 5P

Mild Steel, Cellulosic • AWS E6010

## Key Features

- ▶ Deep arc penetration
- ▶ Light slag with minimal arc interference
- ▶ Excellent vertical and overhead capability

## Typical Applications

- ▶ Steel with moderate surface contaminants
- ▶ Cross country and in-plant pipe welding
- ▶ Square edge butt welds
- ▶ Welding on galvanized and specially coated steels

## Conformances

AWS A5.1/A5.1M: 2004	E6010
ASME SFA-A5.1:	E6010
ABS:	E6010
Lloyd's Register:	3M
CWB/CSA W48-06:	E4310
TUV:	EN ISO 2560-A: E 42 3 C25

## Welding Positions

All

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	5 lb (2.3 kg) Plastic Tube 20 lb (9.1 kg) Master Carton	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Master Carton	50 lb (22.7kg) Easy Open Can
3/32 (2.4)	12 (300)	ED032402	ED032561	ED010211
1/8 (3.2)	14 (350)	ED032403	ED032562	ED010203
5/32 (4.0)	14 (350)		ED032563	ED010216
3/16 (4.8)	14 (350)			ED010207
7/32 (5.6)	14 (350)			ED010219
1/4 (6.4)	14 (350)			ED010200

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @-29°C (-20°F)
Requirements - AWS E6010	330 (48) min.	430 (60) min.	22 min.	27 (20) min.
Typical Results <sup>(3)</sup> - As-Welded	420-475 (61-69)	515-570 (75-83)	25-31	41-68 (30-50)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S
Requirements - AWS E6010	0.20 max.	1.20 max.	1.00 max.	Not Specified	Not Specified
Typical Results <sup>(3)</sup> - As-Welded	0.09-0.17	0.40-0.63	0.09-0.43	0.005-0.017	0.005-0.014
	%Ni	%Cr	%Mo	%V	
Requirements - AWS E6010	0.30 max.	0.20 max.	0.30 max.	0.08 max.	
Typical Results <sup>(3)</sup> - As-Welded	0.01-0.05	0.01-0.05	≤ 0.03	≤ 0.01	

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(4)</sup>	Current (Amps)					
	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)	7/32 in (5.6 mm)	1/4 in (6.4 mm)
DC+	40-80	70-130	90-165	140-225	200-275	220-325
DC-	50-85	75-135	100-175	–	–	–

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer below. <sup>(4)</sup>Preferred polarity is listed first.

*Material Safety Data Sheets (MSDS) and Certificates of Conformance are available on our website at [www.lincolnelectric.com](http://www.lincolnelectric.com)*

### TEST RESULTS

Test results for mechanical properties, deposit or electrode composition and diffusible hydrogen levels were obtained from a weld produced and tested according to prescribed standards, and should not be assumed to be the expected results in a particular application or weldment. Actual results will vary depending on many factors, including, but not limited to, weld procedure, plate chemistry and temperature, weldment design and fabrication methods. Users are cautioned to confirm by qualification testing, or other appropriate means, the suitability of any welding consumable and procedure before use in the intended application.

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# Excalibur® 7018 MR®

Mild Steel, Low Hydrogen • AWS E7018 H4R

## Key Features

- ▶ Improved coating integrity
- ▶ Extreme bendability
- ▶ 60% less moisture pickup vs. competition
- ▶ Reduction of arc starting porosity
- ▶ Clear puddle and a smooth arc

## Typical Applications

- ▶ Power generation
- ▶ Pressure piping
- ▶ Petrochemical
- ▶ Mild steel
- ▶ Pressure vessels

## Conformances

AWS A5.1/A5.1M: 2004	E7018 H4R
ASME SFA-A5.1:	E7018 H4R
ABS:	3Y H5
Lloyd's Register:	3YM H5
DNV Grade:	3 YH5
GL:	3YH5
BV Grade:	3YHHH
CWB/CSA W48-06:	E4918

## Welding Positions

All, except vertical down

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	1 lb (0.5 kg) Plastic Tube 6 lb (2.7 kg) Master Carton	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Master Carton	50 lb (22.7kg) Easy Open Can
3/32 (2.4)	14 (350)	ED032086	ED032588	ED028280
1/8 (3.2)	14 (350)	ED031468	ED032589	ED028281
5/32 (4.0)	14 (350)		ED032590	ED028282
3/16 (4.8)	14 (350)			ED028283
7/32 (5.6)	18 (450)			ED028917
1/4 (6.4)	18 (450)			ED028918

## MECHANICAL PROPERTIES<sup>(1)</sup>

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
Requirements - AWS E7018 H4R	400 (58) min.	490 (70) min.	22 min.	27 (20) min.
Typical Results <sup>(3)</sup> - As-Welded	430-510 (62-74)	510-605 (74-88)	25-37	121-332 (89-246)

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Mn	%Si	%P	%S	%Ni
Requirements - AWS E7018 H4R	0.15 max.	1.60 max.	0.75 max.	0.035 max.	0.035 max.	0.30 max.
Typical Results <sup>(3)</sup>	0.03-0.08	1.01-1.55	0.34-0.68	0.01-0.02	≤ 0.01	0.01-0.06
	%Cr	%Mo	%V	%Mn + Ni + Cr + Mo + V	Diffusible Hydrogen (mL/100g weld metal)	
Requirements - AWS E7018 H4R	0.20 max.	0.30 max.	0.08 max.	1.75 max.	4.0 max.	
Typical Results <sup>(3)</sup>	0.02-0.07	≤ 0.05	≤ 0.02	1.04-1.75	2-3	

## TYPICAL OPERATING PROCEDURES

	Current (Amps)					
Polarity <sup>(4)</sup>	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)	7/32 in (5.6 mm)	1/4 in (6.4 mm)
DC+	70-110	90-160	130-210	180-300	250-330	300-400
AC	80-120	100-160	140-210	200-300	270-370	325-420

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 18. <sup>(4)</sup>Preferred polarity is listed first.

\* Extreme bendability apply to 3/32, 1/8 and 5/32 in. diameters.

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**TEST RESULTS**

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