

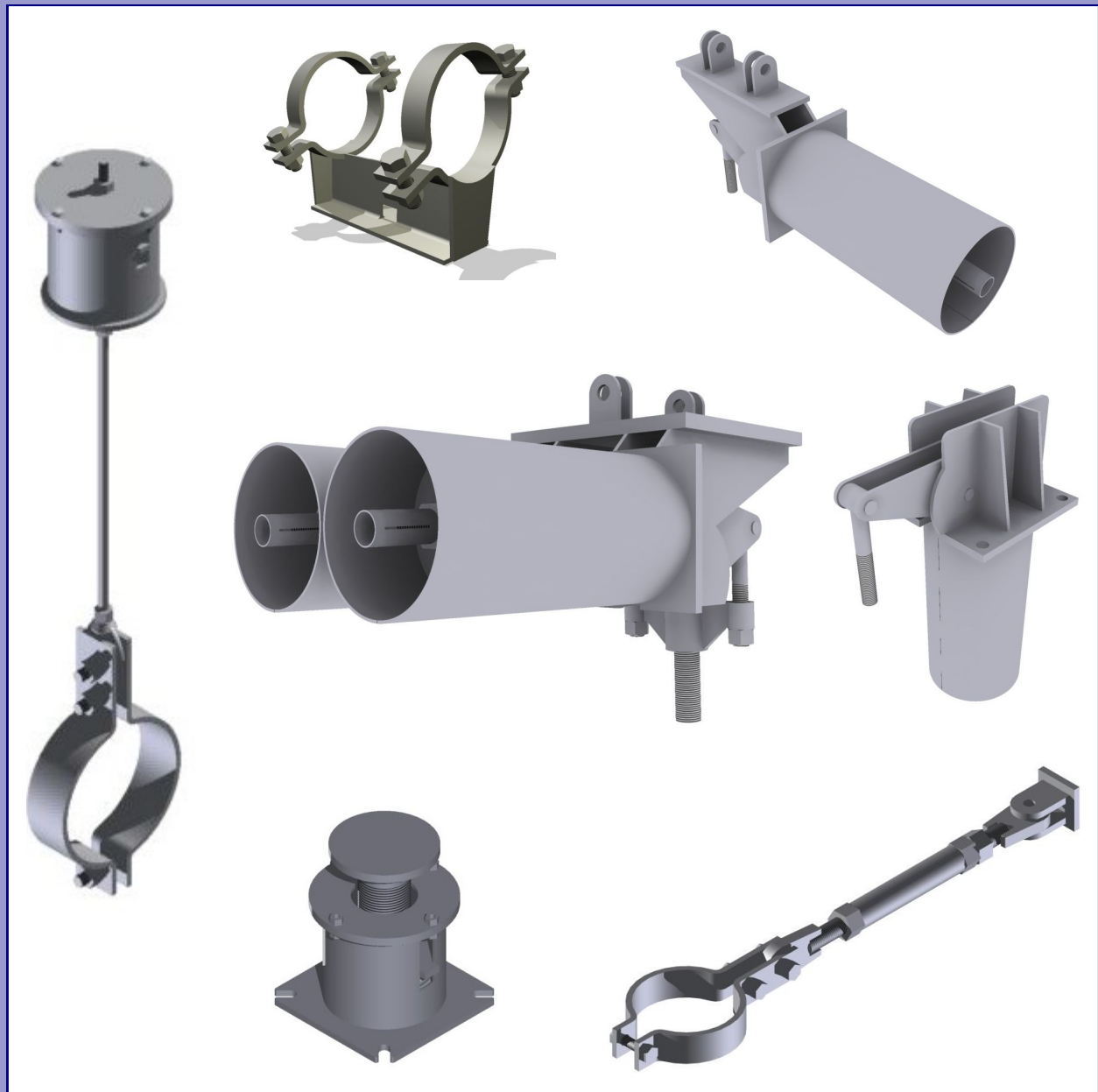
AAA TECHNOLOGY

& SPECIALTIES CO., INC.

PRODUCT CATALOG

TOTAL SOLUTION SERVICE

For the Industrial Piping Marketplace





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STRUTS

APPLICATION: Welded Sway Strut Assemblies are used in power plant and process plants of all types to restrain movement of piping in one direction while allowing for movement lateral to the axis of the sway strut. A Welded Sway Strut allows for adjustment of the length in the field at the time of installation. See the installation instructions below for assistance in determining the required sway strut fit-up length.

APPLICABLE CODES AND STANDARDS: Welded Sway Struts are manufactured in accordance with the requirements of the U.S. Government and the power and process industries. These include the Federal Specification WW-H-171E, Manufacturers Standardization Society MSS-SP-58, ASME B31.1, B31.3 and B31.5 piping codes.

FEATURES:

- Handles both compressive and tensile loads
- Requires minimal maintenance
- Provides up to 3 1/2" field adjustment (plus or minus) at time of installation
- Provides for + or - 5 ° combined angular rotation and misalignment
- Field adjustment accomplished by extending the rod connected to the paddle on one end of the strut until the unit is rigid and welding the rod to the extension piece

SELECTING THE CORRECT SIZE SWAY STRUT

1. Given the tension load, go to the dimensional table on the regular assembly data sheet. Select the sway strut that has a tension load rating equal to or slightly larger than the design tension load.
2. Given the compression load, go to the maximum rated compression loads table on the regular assembly data sheet. Select the sway strut that has a compression load rating equal to or slightly larger than the design compression load.
3. Determine the required C - C dimension. If the unit being specified is option 1, subtract the "A" dimension from the total length to determine the C - C length. If the unit being specified is option 2, subtract two times the "A" dimension from the total length to determine the C - C length. If the unit being specified is option 3, subtract the "A" dimension for the rear bracket and the "K" dimension for the clamp from the total length to determine the C - C length.
4. Given the desired C - C dimension, determine whether the short welded assembly or the regular length assembly is required. Note that if a short welded sway strut is selected, the C - C dimension must be equal to or greater than the minimum C - C and less than or equal to the maximum C - C. If a regular welded sway strut is selected, the C - C dimension must be equal to or greater than the minimum C - C and less than or equal to the length of the smallest maximum rated compression load shown in the charts.

CONSTRUCTION: A-36 Carbon Steel, Special materials available on request.

FINISHES AVAILABLE: Carbon Steel - Black, Painted or Hot Dip Galvanized. Stainless Steel - Plain (Special).

ORDERING: Specify figure number (Fig. 300), name (Welded Sway Strut Assembly), sway strut size (0 thru 11), "C-C" dimension, design tension load, design compression load, option number (1, 2 or 3), pipe diameter, if applicable, material, if other than carbon steel, and finish.

EXAMPLE: Fig. 300 Welded Sway Strut Assembly, Size 3, C-C = 8'-0", Tension Load = 10,000 lbs, Compression Load = 7,500 lbs, Option #3, 10" Pipe Dia., HDG.

INSTALLATION:

1. Weld rear bracket to the structure,
2. Install strut clamp around pipe for option 3 or weld rear bracket to other member for option 2,
3. Insert loose rod end into the extension piece,
4. Attach one rod end to the rear bracket and the other to the strut clamp,

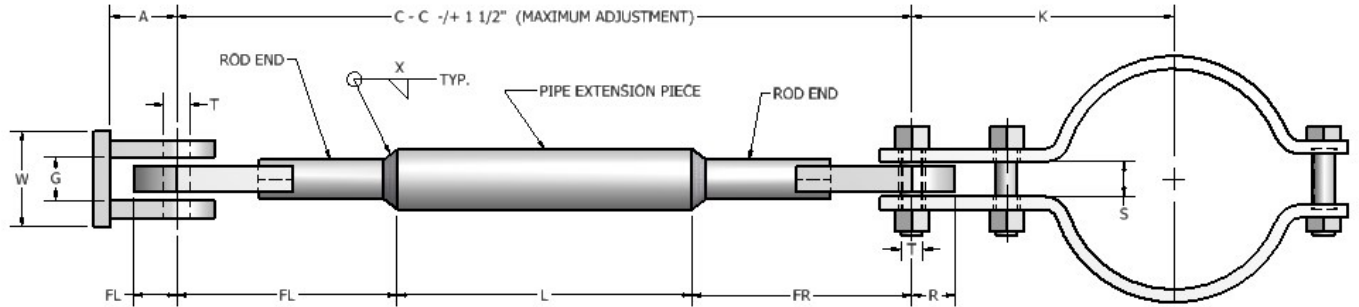
MAXIMUM RATED COMPRESSION LOAD (KIPS)*																			
SWAY STRUT SIZE	C-C																		
	@MIN LENGTH	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	13'-0"	14'-0"	
0	0.738	0.738	0.738	0.738	0.604														
1/2	1.434	1.434	1.434	1.434	1.434	1.434	1.434	1.434	1.361										
1	5.95	5.95	5.95	5.95	5.95	5.95	5.57	5.19	4.424	3.658	2.708								
2	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	8.77	7.791	5.783	4.45	3.71						
3	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	10.69	8.21	6.5	5.25	4.32				
4	19.35		19.35	19.35	19.35	19.35	19.35	19.35	19.35	19.35	19.35	15.56	12.41	10.06	8.26	6.91	5.86		
5	22.8		22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	18.24	14.59	11.84	9.745	8.145	6.845	

MAXIMUM RATED COMPRESSION LOAD (KIPS)*																			
SWAY STRUT SIZE	C-C																		
	@MIN LENGTH	9'-0"	10'-0"	11'-0"	12'-0"	13'-0"	14'-0"	15'-0"	16'-0"	17'-0"	18'-0"	19'-0"	20'-0"	21'-0"	22'-0"	23'-0"	24'-0"	25'-0"	
6	27.6	27.6	26.77	22.27	18.72	15.92	13.67	11.87	11.87										
7	40.85	36.49	30.49	25.59	20.99	17.59	14.89	12.69	10.89	9.391									
8	46.2	46.2	46.2	46.2	46.2	46.2	43.45	37.85	34.6	30.05	26.25	23.05	20.3	17.95					
9	64.4	64.4	61.52	54.92	48.32	42.12	36.52	31.42	34.6	23.62	20.62	18.12	16.02	14.02	12.62				
10	95.95	85.28	80.98	76.28	70.88	65.28	59.38	53.68	34.6	43.08	38.38	33.88	30.28	26.88	23.88	21.58	19.28	17.38	
11	138.7	124.4	120	115.2	109.8	104	98.03	91.43	34.6	77.83	71.23	64.83	59.03	53.43	48.43	43.63	39.23	35.23	



STRUTS

FIG. 301 SHORT WELDED SWAY STRUT ASSEMBLY



DIMENSIONAL DATA																	
SWAY STRUT SIZE	MAX. RATED TENSION LOAD (LBS)	ROD END				EXTENSION PIECE				REAR BRACKET				NOM. PIN/STUD DIA. T (IN)	WELD SIZE X (IN)	C - C LENGTH (IN)	
		DIA. (IN)	PADDLE RADIUS MAX. R (IN)	FL (IN)	FR (IN)	PIPE DIA. (IN)	LENGTH MIN. L (IN)		TAKE OUT A (IN)	H (IN)	W (IN)	GAP (G)	MIN			MAX	
							MIN	MAX									
0	738	1/2	3/4	1 7/8	3 3/8	1/2 XS	3 1/2	10 5/8	1 1/4	1 1/4	1 1/4	9/16	3/8	1/8	8 3/4	15 7/8	
1/2	1434	3/4	1	2 1/4	3 3/4	1 S160	3 1/2	10 7/8	1 3/4	1 1/2	1 1/4	21/32	1/2	1/4	9 1/2	16 7/8	
1	5950	1	1 3/8	2 5/8	4 1/8	1 1/4 S160	3 1/2	11 3/8	2 1/4	2	1 1/2	25/32	5/8	1/4	10 1/4	18 1/8	
2	9750	1 1/4	1 1/2	2 13/16	4 5/16	1 1/2 S160	3 1/2	12 1/8	2 1/2	2 1/4	2	29/32	3/4	9/32	10 5/8	19 1/4	
3	11900	1 1/2	1 1/2	2 15/16	4 7/16	2 XXS	3 1/2	13 7/8	2 3/4	2 5/8	2 1/4	1 1/32	1	7/16	10 7/8	21 1/4	
4	19350	1 3/4	2 1/4	5 15/16	7 7/16	2 1/2 XXS	3 1/2	14 5/8	3 1/2	3 3/4	3	1 19/32	1 1/4	9/16	16 7/8	28	
5	22800	2	2 1/4	5 3/4	7 1/4	2 1/2 S160	3 1/2	16 1/8	3 1/2	3 3/4	3	1 19/32	1 1/4	3/8	16 1/2	29 1/8	
6	27600	2 1/4	2 1/2	6 3/4	8 1/4	3 XXS	3 1/2	17 1/8	4 1/2	5	3 3/4	1 25/32	1 1/2	5/8	18 1/2	32 1/8	
7	40850	2 1/2	3	8 1/16	9 9/16	3 S160	3 1/2	18 3/8	5	7	7	2 7/32	1 3/4	7/16	21 1/8	36	
8	46200	3	3	8 5/16	9 13/16	4 XXS	3 1/2	19 7/8	5	7	7	2 7/32	1 3/4	21/32	21 5/8	38	
9	64400	3 1/2	3 1/4	8 9/16	10 1/16	4 S120	3 1/2	21 5/8	5 3/4	8	8	2 13/32	2	7/16	22 1/8	40 1/4	
10	95950	4 3/4	4 3/4	10 1/2	12	5 XS	3 1/2	25 3/4	7 1/2	10	10	3 7/16	2 3/4	3/8	26	48 1/4	
11	138700	5 3/4	6 5/16	14 1/16	15 9/16	6 XS	3 1/2	28 3/4	9 1/2	13	13	4 5/16	3 3/4	7/16	33 1/8	58 3/8	



STRUTS

APPLICATION: Welded Sway Strut Assemblies are used in power plant and process plants of all types to restrain movement of piping in one direction while allowing for movement lateral to the axis of the sway strut. A Welded Sway Strut allows for adjustment of the length in the field at the time of installation. See the installation instructions below for assistance in determining the required sway strut fit-up length.

APPLICABLE CODES AND STANDARDS: Welded Sway Struts are manufactured in accordance with the requirements of the U.S. Government and the power and process industries. These include the Federal Specification WW-H-171E, Manufacturers Standardization Society MSS-SP-58, ASME B31.1, B31.3 and B31.5 piping codes.

FEATURES:

- Handles both compressive and tensile loads
- Requires minimal maintenance
- Provides up to 3 1/2" field adjustment (plus or minus) at time of installation
- Provides for + or - 5 ° combined angular rotation and misalignment
- Field adjustment accomplished by extending the rod connected to the paddle on one end of the strut until the unit is rigid and welding the rod to the extension piece

SELECTING THE CORRECT SIZE SWAY STRUT

1. Given the tension load, go to the dimensional table on the regular assembly data sheet. Select the sway strut that has a tension load rating equal to or slightly larger than the design tension load.
2. Given the compression load, go to the maximum rated compression loads table on the regular assembly data sheet. Select the sway strut that has a compression load rating equal to or slightly larger than the design compression load.
3. Determine the required C - C dimension. If the unit being specified is option 1, subtract the "A" dimension from the total length to determine the C - C length. If the unit being specified is option 2, subtract two times the "A" dimension from the total length to determine the C - C length. If the unit being specified is option 3, subtract the "A" dimension for the rear bracket and the "K" dimension for the clamp from the total length to determine the C - C length.
4. Given the desired C - C dimension, determine whether the short welded assembly or the regular length assembly is required. Note that if a short welded sway strut is selected, the C - C dimension must be equal to or greater than the minimum C - C and less than or equal to the maximum C - C. If a regular welded sway strut is selected, the C - C dimension must be equal to or greater than the minimum C - C and less than or equal to the length of the smallest maximum rated compression load shown in the charts.

CONSTRUCTION: A-36 Carbon Steel, Special materials available on request.

FINISHES AVAILABLE: Carbon Steel - Black, Painted or Hot Dip Galvanized. Stainless Steel - Plain (Special).

ORDERING: Specify figure number (Fig. 301), name (Short Welded Sway Strut Assembly), sway strut size (0 thru 11), "C-C" dimension, design tension load, design compression load, option number (1, 2 or 3), pipe diameter, if applicable, material, if other than carbon steel, and finish.

EXAMPLE: Fig. 301 Short Welded Sway Strut Assembly, Size 3, C-C = 8'-0", Tension Load = 10,000 lbs, Compression Load = 7,500 lbs, Option #3, 10" Pipe Dia., HDG.

INSTALLATION:

1. Weld rear bracket to the structure,
2. Install strut clamp around pipe for option 3 or weld rear bracket to other member for option 2,
3. Insert loose rod end into the extension piece,
4. Attach one rod end to the rear bracket and the other to the strut clamp,
5. Align the strut so that the components between the pinned connections form a straight line and weld the loose rod end to the extension piece.

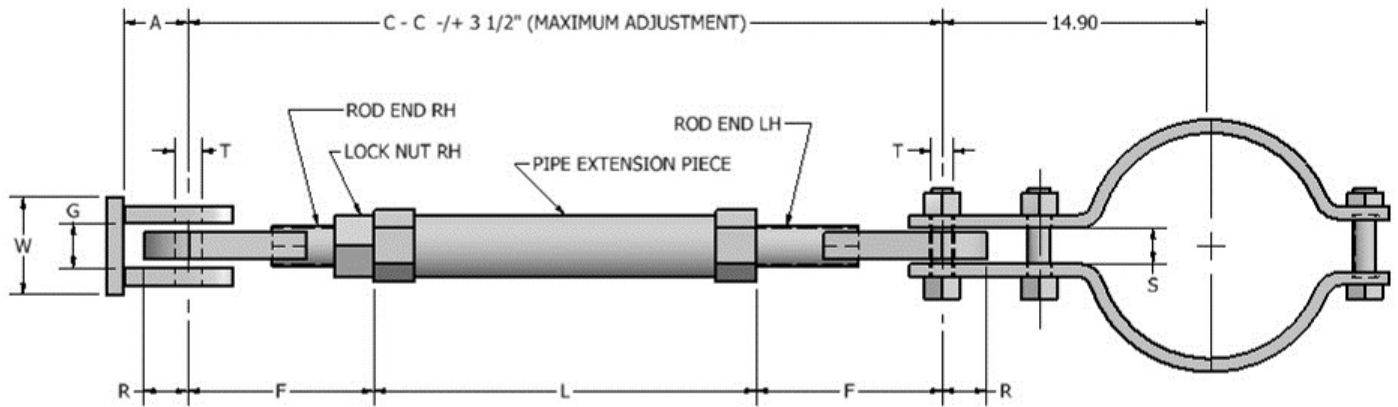
MAXIMUM RATED COMPRESSION LOAD (KIPS)*																		
SWAY STRUT SIZE	C-C																	
	@MIN LENGTH	2'-0"	2"-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	13'-0"	14'-0"
0	0.738	0.738	0.738	0.738	0.604													
1/2	1.434	1.434	1.434	1.434	1.434	1.434	1.434	1.434	1.361									
1	5.95	5.95	5.95	5.95	5.95	5.95	5.57	5.19	4.424	3.658	2.708							
2	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	8.77	7.791	5.783	4.45	3.71					
3	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	10.69	8.21	6.5	5.25	4.32			
4	19.35		19.35	19.35	19.35	19.35	19.35	19.35	19.35	19.35	19.35	15.56	12.41	10.06	8.26	6.91	5.86	
5	22.8		22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	18.24	14.59	11.84	9.745	8.145	6.845

MAXIMUM RATED COMPRESSION LOAD (KIPS)*																		
SWAY STRUT SIZE	C-C																	
	@MIN LENGTH	9'-0"	10'-0"	11'-0"	12'-0"	13'-0"	14'-0"	15'-0"	16'-0"	17'-0"	18'-0"	19'-0"	20'-0"	21'-0"	22'-0"	23'-0"	24'-0"	25'-0"
6	27.6	27.6	26.77	22.27	18.72	15.92	13.67	11.87	11.87									
7	40.85	36.49	30.49	25.59	20.99	17.59	14.89	12.69	10.89	9.391								
8	46.2	46.2	46.2	46.2	46.2	46.2	43.45	37.85	34.6	30.05	26.25	23.05	20.3	17.95				
9	64.4	64.4	61.52	54.92	48.32	42.12	36.52	31.42	34.6	23.62	20.62	18.12	16.02	14.02	12.62			
10	95.95	85.28	80.98	76.28	70.88	65.28	59.38	53.68	34.6	43.08	38.38	33.88	30.28	26.88	23.88	21.58	19.28	17.38
11	138.7	124.4	120	115.2	109.8	104	98.03	91.43	34.6	77.83	71.23	64.83	59.03	53.43	48.43	43.63	39.23	35.23



STRUTS

FIG. 305 THREADED SWAY STRUT ASSEMBLY



DIMENSIONAL DATA - FIG. 305 THREADED SWAY STRUT ASSEMBLY												
SWAY STRUT SIZE	MAX. RATED TENSION LOAD (LBS)	ROD END			EXTENSION PIECE		REAR BRACKET				NOM. PIN/STUD DIA. (IN)	C - C MIN. [See # 1] (IN)
		ROD END DIA. (IN)	PADDLE RADIUS MAX. (IN)	F (IN)	PIPE DIA. (IN)	LENGTH W MIN. (IN)	TAKE OUT A (IN)	D (IN)	Q (IN)	GAP (S)		
0	738	1/2	3/4	3 3/4	1/2 STD	8 3/4	1 1/4	1 1/4	1 1/4	9/16	3/8	16 1/4
1/2	1434	3/4	1	4 1/8	3/4 STD	9 1/4	1 3/4	1 1/2	1 1/4	21/32	1/2	17 1/2
1	5950	1	1 3/8	4 3/4	1 1/4 XS	9 1/4	2 1/4	2	1 1/2	25/32	5/8	18 3/4
2	9750	1 1/4	1 1/2	5 7/16	1 1/2 XS	9 5/8	2 1/2	2 1/4	2	29/32	3/4	20 1/2
3	11900	1 1/2	1 1/2	6 1/8	2 XS	10 1/2	2 3/4	2 5/8	2 1/4	1 1/32	1	22 3/4
4	19350	1 3/4	2 1/4	8 3/16	2 1/2 XS	11 1/8	3 1/2	3 3/4	3	1 19/32	1 1/4	27 1/2
5	22800	2	2 1/4	8 1/2	2 1/2 XS	11 1/2	3 1/2	3 3/4	3	1 19/32	1 1/4	28 1/2
6	27600	2 1/4	2 1/2	9 1/8	3 XS	13	4 1/2	5	3 3/4	1 25/32	1 1/2	31 1/4
7	40850	2 1/2	3	10 3/4	3 1/2 XS	13 1/2	5	7	7	2 7/32	1 3/4	35
8	46200	3	3	11	4 XS	14 1/2	5	7	7	2 7/32	1 3/4	36 1/2
9	64400	3 1/2	3 1/4	11 7/8	5 XS	15 3/4	5 3/4	8	8	2 13/32	2	39 1/2
10	95950	4 3/4	4 3/4	14 1/8	6 XS	18 1/2	7 1/2	10	10	3 7/16	2 3/4	46 3/4
11	145400	5 3/4	6 5/16	19 1/4	8 XS	20 1/2	9 1/2	13	13	4 5/16	3 3/4	59

#1 Shorter C-C dimension available with reduced adjustment.



STRUTS

APPLICATION: Threaded Sway Strut Assemblies are used in power plants and process plants of all types to restrain movement of piping in one direction while allowing for movement lateral to the axis of the sway strut. A Threaded Sway Strut allows for adjustment of the length in the field at the time of installation. See the installation instructions below for assistance in determining the required sway strut fit-up length.

APPLICABLE CODES AND STANDARDS: Threaded Sway Struts are manufactured in accordance with the requirements of the U.S. Government and the power and process industries. These include the Federal Specification WW-H-171E, Manufacturers Standardization Society MSS-SP-58, ASME B31.1, B31.3 and B31.5 piping codes.

FEATURES:

- Handles both compressive and tensile loads
- Requires minimal maintenance
- Provides up to 3 1/2" field adjustment (plus or minus) at time of installation
- Provides for + or - 5 ° combined angular rotation and misalignment
- Field adjustment accomplished by rotating the extension piece in one direction to shorten the assembly and in the other direction to lengthen the assembly. Once the desired length is achieved, the lock nut is to be locked to eliminate further length changes resulting from vibration, etc.

SELECTING THE CORRECT SIZE SWAY STRUT

1. Given the tension load, go to the dimensional table on the threaded sway strut assembly data sheet. Select the sway strut that has a tension load rating equal to or slightly larger than the design tension load.
2. Given the compression load, go to the maximum rated compression loads table on the threaded sway strut assembly data sheet. Select the sway strut that has a compression load rating equal to or slightly larger than the design compression load.
3. Determine the required C - C dimension. If the unit being specified is option 1, subtract the "A" dimension from the total length to determine the C - C length. If the unit being specified is option 3, subtract the "A" dimension for the rear bracket and the "K" dimension for the clamp from the total length to determine the C - C length.
4. Given the desired C - C dimension, verify that the C - C dimension for the selected sway strut is equal to or greater than the minimum C - C and less than or equal to the length of the smallest maximum rated compression load shown in the charts.

CONSTRUCTION: A-36 Carbon Steel, Special materials available on request.

FINISHES AVAILABLE: Carbon Steel - Black, Painted or Hot Dip Galvanized. Stainless Steel - Plain (Special).

ORDERING: Specify figure number (Fig. 305), name (Threaded Sway Strut Assembly), sway strut size (0 thru 11), "C-C" dimension, design tension load, design compression load, option number (1, 2 or 3), pipe diameter, if applicable, material, if other than carbon steel, and finish.

EXAMPLE: Fig. 305 Threaded Sway Strut Assembly, Size 2, C-C = 5'-0", Tension Load = 9,000 lbs, Compression Load = 7,500 lbs, Option #3, 6" Pipe Dia., HDG.

INSTALLATION:

1. Weld rear bracket to the structure,
2. Install strut clamp around pipe for option 3 or weld rear bracket to other member for option 2,
3. Insert rod ends into the extension piece and turn the rod ends equally until the C - C dimension equals the distance between the pin connections in the rear bracket(s) and/or the strut clamp,
4. Attach one rod end to the rear bracket and the other to the strut clamp or rear bracket, as applicable,
5. Align the strut so that the components between the pinned connections form a straight line and are tight. To achieve the tightened condition, rotate the extension piece until the strut components are snug.

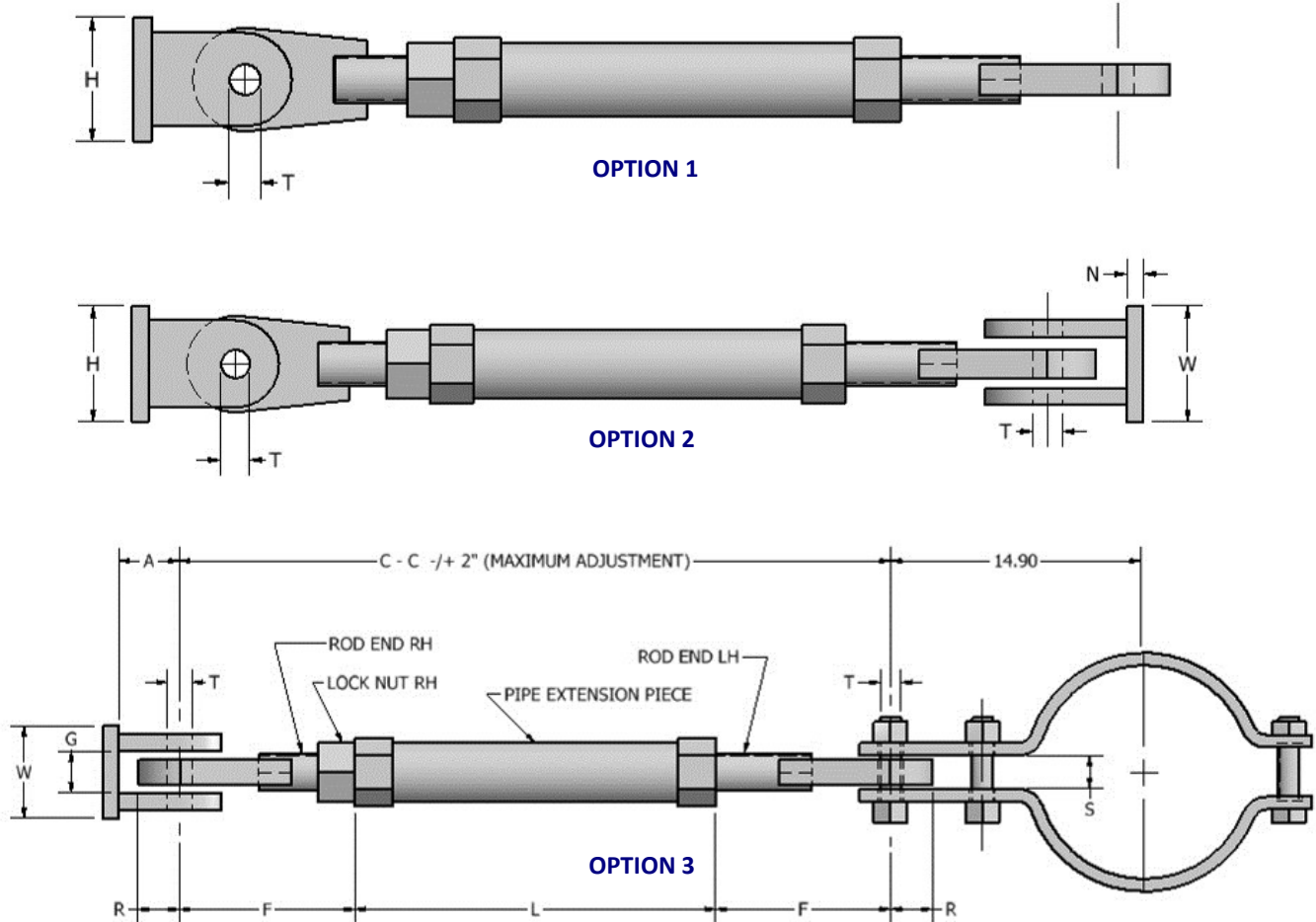
MAXIMUM RATED COMPRESSION LOAD (KIPS)																			
SWAY STRUT SIZE	C - C																		
	@MIN LENGTH	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	13'-0"	14'-0"	
0	0.738	0.738	0.631	0.477															
1/2	1.434	1.434	1.434	1.434	1.434	1.283	1.033												
1	5.95	5.95	5.95	5.95	5.55	5.151	4.39	3.628	3.121	2.615	1.966								
2	9.75	9.75	9.375	9.75	9.75	9.75	8.825	7.9	6.864	5.829	4.411	3.438	2.818						
3	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	10.14	7.965	6.375	5.105	4.105				
4	19.35		19.35	19.35	19.35	19.35	19.35	19.35	19.35	19.35	17.15	14.2	11.55	9.503	7.903	6.703	5.753	5.353	
5	22.8			22.8	22.8	22.8	22.8	22.8	22.8	22.8	21.32	17.47	14.02	11.32	9.271	7.671	6.421	5.421	

MAXIMUM RATED COMPRESSION LOAD (KIPS)																		
SWAY STRUT SIZE	C - C																	
	@MIN LENGTH	9'-0"	10'-0"	11'-0"	12'-0"	13'-0"	14'-0"	15'-0"	16'-0"	17'-0"	18'-0"	19'-0"	20'-0"	21'-0"	22'-0"	23'-0"	24'-0"	25'-0"
6	27.6	26.96	22.78	19.08	15.88	13.38	11.38	9.734	8.384	7.184								
7	40.65	38.76	34.06	29.46	25.26	21.46	18.36	15.76	13.66	11.96	10.46	9.16	8.06					
8	46.2	46.2	46.2	42.96	37.91	33.16	28.91	24.96	21.66	18.91	16.56	14.56	12.86	11.36	10.21	9.165		
9	64.4	64.4	64.4	64.4	64.4	63.34	57.54	51.84	46.44	41.54	36.94	32.74	29.04	25.94	23.24	20.84	18.74	16.74
10	95.95	95.95	95.95	95.95	95.95	95.95	95.95	90.3	83.6	76.9	70.2	63.9	58	52.7	47.6	42.9	38.7	35.1
11	145.4	145.4	145.4	145.4	145.4	145.4	145.4	145.4	145.4	145.4	145.4	137.6	129.6	121.6	113.6	105.8	98.47	91.27



STRUTS

FIG. 315 THREADED SWAY STRUT ASSEMBLY (ALTERNATE DESIGN)



SWAY STRUT SIZE	MAX. RATED TENSION LOAD (LBS)	ROD END			REAR BRACKET				NOM. PIN/STUD DIA. (IN)	EXTENSION PIECE			C - C	
		ROD END DIA. (IN)	PADDLE RADIUS (IN)	F (IN)	TAKE OUT A (IN)	H (IN)	W (IN)	N (IN)		PIPE DIA. (IN)	LENGTH L MIN. (IN)	LENGTH L MAX. (IN)	MIN. (IN)	MAX. (IN)
A	650	3/4	5/8	3 7/16	1	2 7/8	1 1/4	1/4	0.374	1	9 5/8	53 1/8	15 1/2	60
B	1500	1	1 3/8	4 7/16	2 1/8	5	3 5/8	1/2	0.749	1 1/2	10 1/8	99 1/8	19	108
C	4500	1	1 3/8	4 7/16	2 1/8	5	3 5/8	1/2	0.749	2	10 1/8	111 1/8	19	120
1	8000	1 1/4	1 1/2	4 13/16	2 1/2	4 1/2	3	3/4	0.999	2	11 3/8	110 3/8	21	120
2	11630	1 1/2	1 1/2	5	2 1/2	4 1/2	3	3/4	0.999	2 1/2	11 3/8	110	21 3/8	120
3	15700	1 3/4	2	5 3/4	3 1/4	5 3/8	3 9/16	1	1.249	2 1/2	11 3/8	108 1/2	22 7/8	120
4	20700	2	2	6	3 1/4	5 3/8	3 9/16	1	1.249	3	14	108	26	120
5	27200	2 1/4	2 1/2	6 3/4	4	6 1/8	4 1/4	1 1/4	1.499	3	14	106 1/2	27 1/2	120
6	33500	2 1/2	3	7 5/8	5	7 7/8	5 3/8	1 3/4	1.749	4	14	104 3/4	29 1/4	120
7	68200	3	3 1/2	8 3/4	5 3/4	9 1/8	6 1/4	2	1.999	4	15	102 1/2	37 1/2	120
8	120000	4	4 3/4	11	7 1/4	14	8 3/4	2 1/4	2.499	6	17 1/4	98	39 1/4	120



STRUTS

FIG. 315 THREADED SWAY STRUT ASSEMBLY (ALTERNATE DESIGN) CONTINUED

APPLICATION: Threaded Sway Strut Assemblies are used in power plant and process plants of all types to restrain movement of piping in one direction while allowing for movement lateral to the axis of the sway strut. A Threaded Sway Strut allows for adjustment of the length in the field at the time of installation. See the installation instructions below for assistance in determining the required sway strut fit-up length.

APPLICABLE CODES AND STANDARDS: Threaded Sway Struts are manufactured in accordance with the requirements of the U.S. Government and the power and process industries. These include the Federal Specification WW-H-171E, Manufacturers Standardization Society MSS-SP-58, ASME B31.1, B31.3 and B31.5 piping codes.

FEATURES:

- Handles both compressive and tensile loads
- Requires minimal maintenance
- Provides up to 3 ½" field adjustment (plus or minus)
- Provides for + or – 5 ° combined angular rotation and misalignment
- Field adjustment accomplished by rotating the extension piece in one direction to shorten the assembly and in the other direction to lengthen the assembly. Once the desired length is achieved, the lock nut is to be locked to eliminate further length changes resulting from vibration, etc.

SELECTING THE CORRECT SIZE SWAY STRUT

1. Given the tension load, go to the load and dimension table on the threaded sway strut assembly data sheet. Select the sway strut that has a load rating equal to or slightly larger than the design tension and compression load.
2. Determine the required C - C dimension. If the unit being specified is option 1, subtract the "A" dimension from the total length to determine the C – C length. If the unit being specified is option 2, subtract two times the "A" dimension from the total length to determine the C – C length. If the unit being specified is option 3, subtract the "A" dimension for the rear bracket and the "K" dimension for the clamp from the total length to determine the C – C length.
3. Given the desired C – C dimension, verify that the C – C dimension for the selected sway strut is equal to or greater than the minimum C – C and less than or equal to the maximum C – C shown in the tables.

CONSTRUCTION: A-36 Carbon Steel, Special materials available on request.

FINISHES AVAILABLE: Carbon Steel - Black, Painted or Hot Dip Galvanized. Stainless Steel – Plain (Special)

ORDERING: Specify figure number (Fig. 315G), name (Threaded Sway Strut Assembly Alternate), sway strut size (A, B, C and 1 thru 8), "C-C" dimension, design compression and tension loads, option number (1, 2 or 3), pipe diameter, if applicable, material, if other than carbon steel, and finish.

EXAMPLE: Fig. 315G Threaded Sway Strut Assembly Alternate, Size 2, C-C = 5'-0", Design Compression and Tension Load = 9,000 lbs, Option #3, 6" Pipe Dia., HDG.

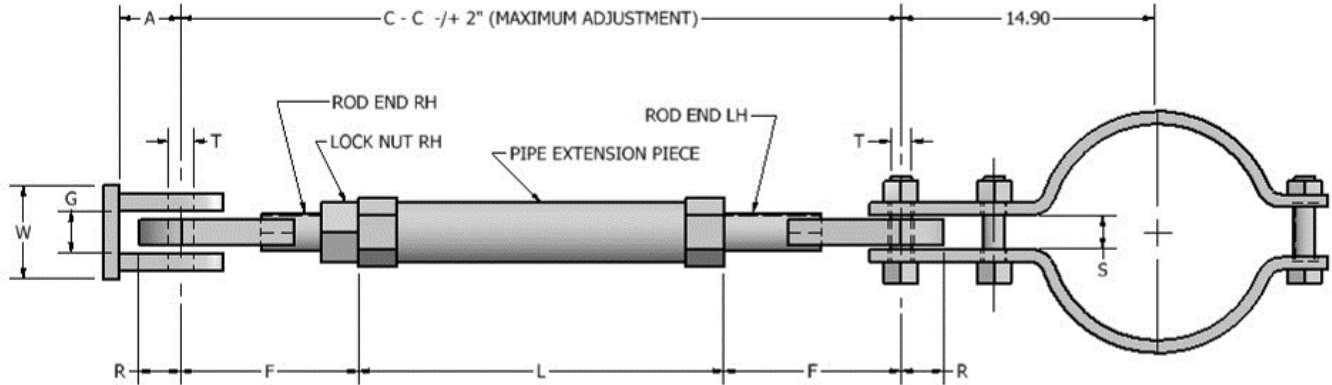
INSTALLATION:

1. Weld rear bracket to the structure,
2. Install strut clamp around pipe for option 3 or weld rear bracket to other member for option 2,
3. Insert rod ends into the extension piece and turn the rod ends equally until the C – C dimension equals the distance between the pin connections in the rear bracket(s) and/or the strut clamp,
4. Attach one rod end to the rear bracket and the other to the strut clamp or rear bracket, as applicable,
5. Align the strut so that the components between the pinned connections form a straight line and are tight. To achieve the tightened condition, rotate the extension piece until the strut components are snug.
6. Tighten the lock nut.



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FIG. 320 THREADED SWAY STRUT ASSEMBLY WITH FIELD-WELDED EXTENSION PIECE (ALTERNATE DESIGN)



SWAY STRUT SIZE	MAX. RATED TENSION LOAD (LBS)	ROD END			REAR BRACKET				NOM. PIN/STUD DIA. (IN)	EXTENSION PIECE			C - C	
		ROD END DIA. (IN)	PADDLE RADIUS (IN)	F (IN)	TAKE OUT A (IN)	H (IN)	W (IN)	N (IN)		PIPE DIA. (IN)	LENGTH L MIN. (IN)	LENGTH L MAX. (IN)	MIN. (IN)	MAX. (IN)
A	650	3/4	5/8	2 11/16	1	2 7/8	1 1/4	1/4	0.374	1	6 3/4	54 5/8	12 1/8	60
B	1500	1	1 3/8	3 11/16	2 1/8	5	3 5/8	1/2	0.749	1 1/2	7 1/16	88 5/8	14 7/16	96
C	4500	1	1 3/8	3 11/16	2 1/8	5	3 5/8	1/2	0.749	2	7 1/16	88 5/8	14 7/16	96
1	8000	1 1/4	1 1/2	4 1/8	2 1/2	4 1/2	3	3/4	0.999	2	8 1/4	87 3/4	16 1/2	96
2	11630	1 1/2	1 1/2	4 1/4	2 1/2	4 1/2	3	3/4	0.999	2 1/2	8 3/8	87 1/2	16 7/8	96
3	15700	1 3/4	2	5	3 1/4	5 3/8	3 9/16	1	1.249	2 1/2	8 3/8	86	18 3/8	96
4	20700	2	2	5 1/4	3 1/4	5 3/8	3 9/16	1	1.249	3	10	85 1/2	20 1/2	96
5	27200	2 1/4	2 1/2	6	4	6 1/8	4 1/4	1 1/4	1.499	3	10	84	22	96
6	33500	2 1/2	3	6 7/8	5	7 7/8	5 3/8	1 3/4	1.749	4	10	82 1/4	23 3/4	96
7	68200	3	3 1/2	8	5 3/4	9 1/8	6 1/4	2	1.999	4	12	80	28	96
8	120000	4	4 3/4	10 1/4	7 1/4	14	8 3/4	2 1/4	2.499	6	14 1/4	75 1/2	34 3/4	96



STRUTS

FIG. 320 THREADED SWAY STRUT ASSEMBLY WITH FIELD-WELDED EXTENSION PIECE (ALTERNATE DESIGN) CONTINUED

APPLICATION: Threaded Sway Strut Assemblies are used in power plant and process plants of all types to restrain movement of piping in one direction while allowing for movement lateral to the axis of the sway strut. A Threaded Sway Strut with a Field Welded Extension Piece allows for maximum adjustment of the length in the field at the time of installation. The Extension Piece can be shipped without one threaded end piece welded to the pipe. The "W" length can be determined in the field, the pipe cut to the desired length and the threaded end piece welded to the pipe. See the installation instructions below for assistance in determining the required sway strut fit-up length.

APPLICABLE CODES AND STANDARDS: Threaded Sway Struts are manufactured in accordance with the requirements of the U.S. Government and the power and process industries. These include the Federal Specification WW-H-171E, Manufacturers Standardization Society MSS-SP-58, ASME B31.1, B31.3 and B31.5 piping codes.

FEATURES:

- Handles both compressive and tensile loads
- Requires minimal maintenance
- Provides maximum field adjustment (plus or minus)
- Provides for + or - 5 ° combined angular rotation and misalignment
- Field adjustment accomplished by rotating the extension piece in one direction to shorten the assembly and in the other direction to lengthen the assembly. Once the desired length is achieved, the lock nut is to be locked to eliminate further length changes resulting from vibration, etc.

SELECTING THE CORRECT SIZE SWAY STRUT

1. Given the tension load, go to the load and dimension table on the threaded sway strut assembly data sheet. Select the sway strut that has a load rating equal to or slightly larger than the design tension and compression load.
2. Determine the required C - C dimension. If the unit being specified is option 1, subtract the "A" dimension from the total length to determine the C - C length. If the unit being specified is option 2, subtract two times the "A" dimension from the total length to determine the C - C length. If the unit being specified is option 3, subtract the "A" dimension for the rear bracket and the "K" dimension for the clamp from the total length to determine the C - C length.
3. Given the desired C - C dimension, verify that the C - C dimension for the selected sway strut is equal to or greater than the minimum C - C and less than or equal to the maximum C - C shown in the tables.

CONSTRUCTION: A-36 Carbon Steel, Special materials available on request.

FINISHES AVAILABLE: Carbon Steel - Black, Painted or Hot Dip Galvanized. Stainless Steel - Plain (Special)

ORDERING: Specify figure number (Fig. 320), name (Threaded Sway Strut with Field Welded Extension Piece), sway strut size (A, B, C and 1 thru 8), desired "C-C" dimension, design compression and tension loads, option number (1, 2 or 3), pipe diameter, if applicable, material, if other than carbon steel, and finish.

EXAMPLE: Fig. 320 Threaded Sway Strut with Field Welded Extension Piece, Size 2, C-C = 6'-0", Design Compression and Tension Load = 9,000 lbs, Option #3, 6" Pipe Dia., HDG.

INSTALLATION:

1. Weld rear bracket to the structure,
2. Install strut clamp around pipe for option 3 or weld rear bracket to other member for option 2,
3. Insert rod ends into the extension piece on one end and turn the rod end until half of the threads have gone into the extension piece. Then insert the other rod end into the loose threaded piece and turn the rod end until half of the threads have gone into the threaded piece.
4. Attach one rod end to the rear bracket and the other to the strut clamp or rear bracket, as applicable,
5. Align the strut so that the components between the pinned connections form a near straight line. Then mark the length at which the extension piece is to be cut. Once it is cut, then weld the threaded piece to the extension piece.
6. Then align the strut so that the components between the pinned connections form a straight line and rotate the extension piece until the components of the strut are snug.
7. Tighten the lock nut.



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FIG. 325 PIPE CLAMP FOR SWAY STRUT ASSEMBLY FIGS. 315 & 320

APPLICATION: These pipe clamps are for use with Sway Strut Assemblies Figs. 315 and 320.

FEATURES:

- Maximum design temperature is 650 °F
- Design angle maximum is 5°

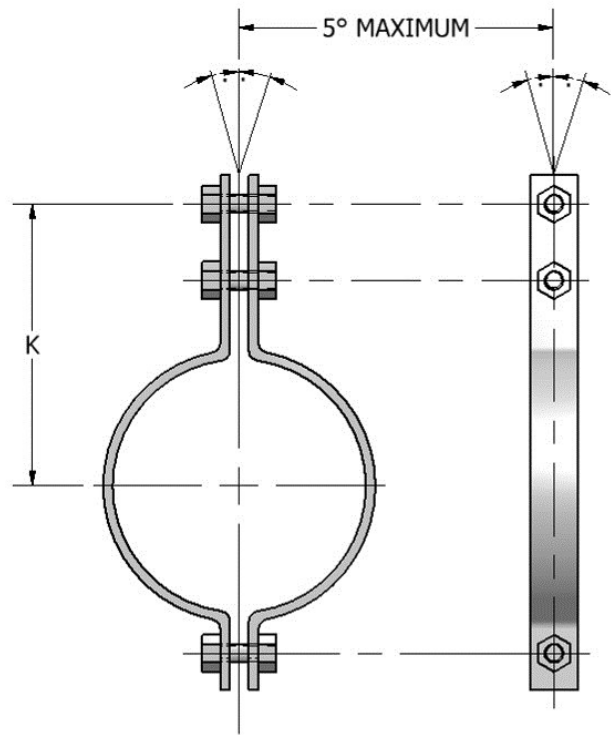
SELECTING THE CORRECT SWAY STRUT CLAMP: Once the sway strut assembly has been properly sized and select, the clamp can be easily specified by stating the figure number of the clamp followed by a dash and the sway strut size (1-10). that has a tension load rating equal to or slightly larger than the design tension load.

CONSTRUCTION: A-36 Carbon Steel, Special materials available on request.

FINISHES AVAILABLE: Carbon Steel - Black, Painted or Hot Dip Galvanized.

ORDERING: Specify name (Pipe Clamp for Sway Strut Assembly), Fig. 325 - sway strut size (A, B, C, or 1-8), pipe diameter, material, if other than carbon steel, and finish.

EXAMPLE: Pipe Clamp for Sway Strut Assembly, Fig. 325 – 5, 6” Pipe Dia., HDG.

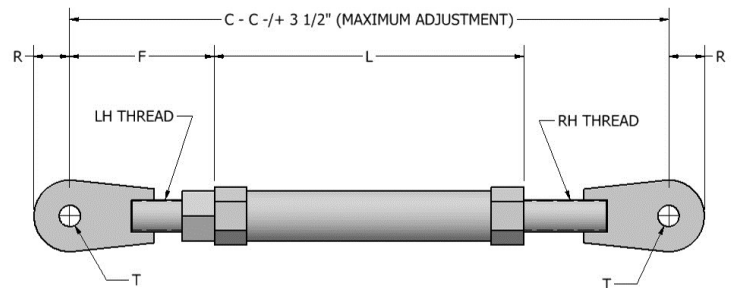


NOM. PIPE DIA. (IN)	CLAMP TAKE OUT DIMENSION "K" FOR SWAY STRUT ASSEMBLIES 315 & 320							
	SPECIFY PART NUMBER 325- FOLLOWED BY THE SWAY STRUT SIZE							
	A	B & C	1 & 2	3 & 4	5	6	7	8
3/4	2 7/16							
1	2 9/16							
1 1/4	2 11/16							
1 1/2	4 1/8							
2	5 1/8	6 3/8	6 3/8					
2 1/2	5 3/8	7	7	8 1/8				
3	5 15/16	7	7	8 1/8				
3 1/2	6 3/16	7	7	8 1/8	10			
4	6 1/2	7 1/4	7 1/4	8 3/8	10			
5	7 3/4	7 3/4	7 3/4	9 1/8	10			
6	8 3/8	8 3/8	8 3/8	10	10	11 7/8		
8	9 3/8	9 3/8	9 3/8	11 1/4	11 1/4	12 5/8		
10	10 1/2	10 1/2	10 1/2	12 3/4	12 3/4	14 1/4	14 1/4	16 1/4
12		11 7/8	11 7/8	13 7/8	13 7/8	15 3/8	15 3/8	17 1/4
14		12 5/8	12 5/8	14 1/2	14 1/2	16	16 1/4	18
16		13 5/8	13 5/8	15 1/4	15 1/4	17 1/8	17 1/2	19
18		14 5/8	14 5/8	16 3/8	16 3/8	18 1/4	18 1/2	20 1/4
20		15 3/4	15 3/4	17 3/4	17 3/4	19 1/4	19 3/4	21 1/2
24		18 1/8	18 1/8	19 7/8	19 7/8	21 3/4	21 3/4	24
30		21 1/4	21 1/4	23	23	25	25	28
36		24	24	26 1/2	26 1/2	28 1/8	28 1/8	31 1/4



STRUTS

FIG. 330 REPLACEMENT THREADED SWAY STRUT



APPLICATION: Replacement threaded Sway Strut Assemblies are used in power plants and process plants of all types. When design constraints enable the replacement of snubbers with rigid sway struts, these replacement units offer a viable alternative which restricts movement of piping in one direction while allowing for movement lateral to the axis of the sway strut. A Replacement Threaded Sway Strut allows for adjustment of the length in the field at the time of installation.

APPLICABLE CODES AND STANDARDS: Replacement Threaded Sway Struts are manufactured in accordance with the requirements of the U.S. Government and the power and process industries. These include the Federal Specification WW-H-171E, Manufacturers Standardization Society MSS-SP-58, ASME B31.1, B31.3 and B31.5 piping codes.

FEATURES:

- Handles both compressive and tensile loads
- Requires minimal maintenance
- Provides up to 3 1/2" field adjustment (plus or minus)
- Provides for + or - 5 ° combined angular rotation and misalignment
- Field adjustment accomplished by rotating the extension piece in one direction to shorten the assembly and in the other direction to lengthen the assembly. Once the desired length is achieved, the lock nut is to be locked to eliminate further length changes resulting from vibration, etc.

SELECTING THE CORRECT SIZE REPLACEMENT SWAY STRUT

1. Determine the pin diameter of the unit to be replaced.
2. Find the same pin diameter on the Replacement Sway Strut data sheet and note the replacement sway strut size.
3. For this replacement sway strut size, check the tension load rating. The rated load must be greater that the load carried by the unit being replaced.
4. Then check the compression load rating. Use the Compression Load Table for Fig. 305. The rated load must be greater that the load carried by the unit being replaced.
5. Determine the required C - C dimension and verify that the C - C length is equal to or greater than the minimum length and equal to or less than the maximum length shown in the Replacement Sway Strut data sheet.

CONSTRUCTION: A-36 Carbon Steel, Special materials available on request.

FINISHES AVAILABLE: Carbon Steel - Black, Painted or Hot Dip Galvanized. Stainless Steel - Plain (Special)

ORDERING: Specify figure number (Fig. 330), name (Replacement Threaded Sway Strut), sway strut size (0 thru 11), "C-C" dimension, design tension load, design compression load, material, if other than carbon steel, and finish.

EXAMPLE: Fig. 330 Replacement Threaded Sway Strut, Size 2, C-C = 5'-0", Tension Load = 9,000 lbs, Compression Load = 7,500 lbs, HDG.

INSTALLATION:

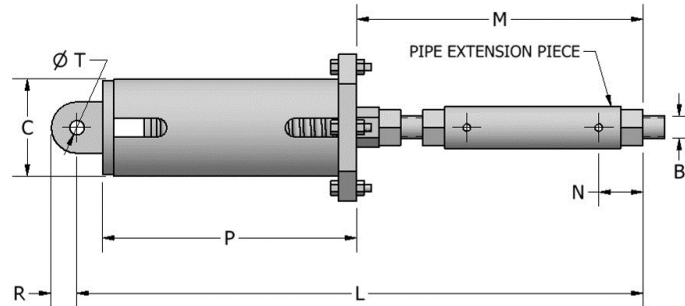
1. Insert rod ends into the extension piece and turn the rod ends equally until the C - C dimension equals the distance between the pin connections in the rear bracket(s) and/or the strut clamp,
2. Attach one rod end to the rear bracket and the other to the strut clamp or rear bracket, as applicable,
3. Align the strut so that the components between the pinned connections form a straight line and are tight. To achieve the tightened condition, rotate the extension piece until the strut components are snug.
4. Tighten the lock nut.

DIMENSIONAL DATA - FIG. 330 REPLACEMENT THREADED SWAY STRUT									
SWAY STRUT SIZE	MAXIMUM RATED TENSION LOAD (LBS)	ROD END			EXTENSION PIECE		NOMINAL PIN/STUD DIA. (IN)	C - C	
		ROD END DIA. (IN)	PADDLE RADIUS MAX. (IN)	F (IN)	PIPE DIA. (IN)	LENGTH W MINIMUM (IN)		MIN. (IN)	MAX. (IN)
0	738	1/2	3/4	3 3/4	1/2 STD	8 3/4	3/8	16 1/4	3'-0"
1/2	1434	3/4	1	4 1/8	3/4 STD	9 1/4	1/2	17 1/2	4'-6"
1	5950	1	1 3/8	4 3/4	1 1/4 XS	9 1/4	5/8	18 3/4	7'-0"
2	9750	1 1/4	1 1/2	5 7/16	1 1/2 XS	9 5/8	3/4	20 1/2	9'-0"
3	11900	1 1/2	1 1/2	6 1/8	2 XS	10 1/2	1	22 3/4	11'-0"
4	19350	1 3/4	2 1/4	8 3/16	2 1/2 XS	11 1/8	1 1/4	27 1/2	14'-0"
5	22800	2	2 1/4	8 1/2	2 1/2 XS	11 1/2	1 1/4	28 1/2	14'-0"
6	27600	2 1/4	2 1/2	9 1/8	3 XS	13	1 1/2	31 1/4	17'-0"
7	40850	2 1/2	3	10 3/4	3 1/2XS	13 1/2	1 3/4	35	20'-0"
8	46200	3	3	11	4 XS	14 1/2	1 3/4	36 1/2	23'-0"
9	64400	3 1/2	3 1/4	11 7/8	5 XS	15 3/4	2	39 1/2	25'-0"
10	95950	4 3/4	4 3/4	14 1/8	6 XS	18 1/2	2 3/4	46 3/4	25'-0"
11	145400	5 3/4	6 5/16	19 1/4	8 XS	20 1/2	3 3/4	59	25'-0"



SWAY BRACES

FIG. E350 VIBRATION CONTROL AND SWAY BRACE

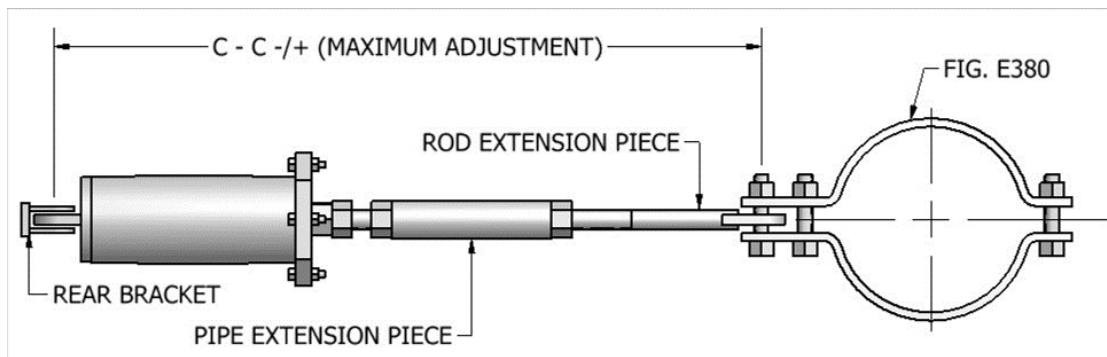


This sway brace consists of a sway brace unit with a single lug on top and a connector rod with a thrust nut, a lock nut and a rod coupling. This unit can be attached to the existing sway brace hardware.

ORDERING: Specify figure number (Fig. E350), name (Vibration Control and Sway Brace), sway brace size (1 thru 6), material, if other than carbon steel, and finish.

SWAY BRACE SIZE	FOR USE WITH PIPE DIA.	PRELOAD (LBS)	SPRING RATE (LBS/IN)	MAX FORCE (LBS)	WEIGHT (LBS)	ROD DIA. B (IN)	NOM. PIN DIA. T (IN)	ROD TAKE OUT E (IN)	F (IN)	OVERALL LENGTH L (IN)	M (IN)	N (IN)	CASING	
													O.D. C (IN)	LENGTH P (IN)
1	1 to 2 1/2	50	50	200	19	3/4	1/2	14 7/16	1 1/8	19 3/16	7 15/16	1	4 1/2	8 3/8
2	3 to 4	150	150	600	22	1	1/2	15 5/16	1 1/8	20 1/16	8 7/16	1	4 1/2	8 3/4
3	5 to 8	450	450	1800	31	1	5/8	17 11/16	1 3/8	22 15/16	8 7/16	1	4 1/2	10 7/8
4	10 to 14	900	900	3600	72	1 1/4	3/4	19 5/8	1 5/8	25 5/8	9 5/16	1 1/2	6 5/8	12 3/16
5	16 to 20	1350	1350	5400	89	1 1/2	3/4	22 5/8	1 3/4	28 5/8	9 3/4	1 1/2	6 5/8	14 5/8
6	24 to 40	1800	1800	7200	108	1 1/2	1	25 1/16	2	31 5/16	9 3/4	1 1/2	6 5/8	16 13/16

FIG. E355 VIBRATION CONTROL AND SWAY BRACE ASSEMBLY



This sway brace consists of a rear bracket, a sway brace unit with a single lug on the top, a connector rod with a thrust nut, a lock nut and a rod coupling, a male rod extension piece with a lock nut and a sway brace pipe clamp. The C-C length must be equal to or greater than the minimum length in the table below and equal to or greater than the maximum length in the table below.

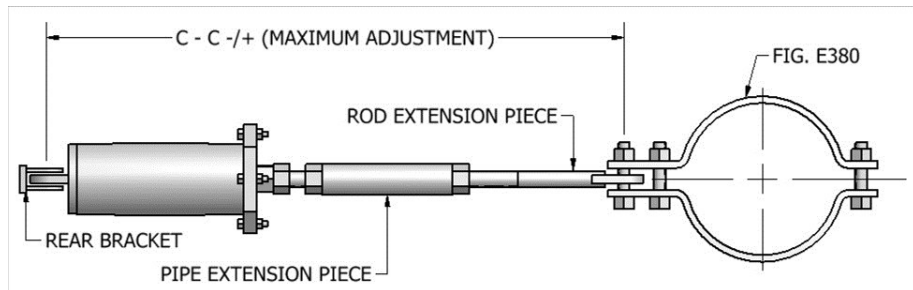
ORDERING: Specify figure number (Fig. E355), name (Vibration Control and Sway Brace), sway brace size (1 thru 6), "C-C" dimension, pipe diameter, material, if other than carbon steel, and finish.

SWAY BRACE "C-C" DIMENSION							
SWAY BRACE SIZE		1	2	3	4	5	6
E 355	MIN	1'-9 13/16"	1'-11 9/16"	2'-1 15/16"	2'-4 5/8"	2'-7 3/4"	2'-10 3/16"
	MAX	3'-1 1/4"	3'-9 5/8"	4'-0"	4'-8 1/4"	5'-5 3/4"	5'-1 7/8"



SWAY BRACES

FIG. E360 VIBRATION CONTROL AND SWAY BRACE EXTENDED ASSEMBLY



This sway brace consists of a rear bracket, a sway brace unit with a single lug on the top, a connector rod with a thrust nut, a lock nut and a rod coupling, a male rod extension piece with a pipe extension piece, a male adaptor rod, a lock nut and a sway brace pipe clamp. The C-C length must be equal to or greater than the minimum length in the table below and equal to or greater than the maximum length in the table below.

ORDERING: Specify figure number (Fig. E360), name (Vibration Control and Sway Brace), sway brace size (1 thru 6), "C-C" dimension, pipe diameter, material, if other than carbon steel, and finish.

SWAY BRACE "C-C" DIMENSION							
SWAY BRACE SIZE		1	2	3	4	5	6
E 360	MIN	2'-2 7/16"	2'-4 15/16"	2'-7 3/16"	2'-11 1/8"	3'-3 1/2"	3'-5 15/16"
	MAX	6'-7 3/4"	8'-3 1/8"	8'-2"	8'-7 3/4"	9'-7 3/4"	8'-6 1/8"
Extension Piece		1" Sch 160	1 1/4" Sch 160	1 1/4" Sch 160	1 1/2" Sch 160	2" XXS	2" XXS

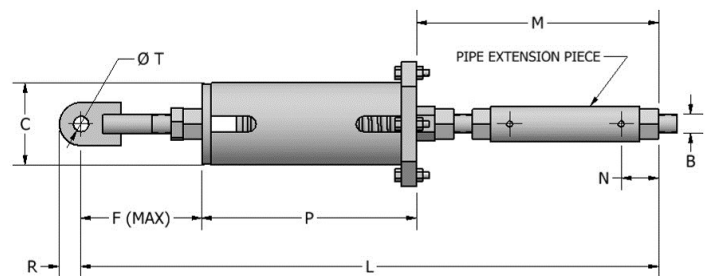
FIG. E365 VIBRATION CONTROL AND SWAY BRACE WITH ADJUSTABLE PRELOAD

This sway brace consists of a male rod extension piece with an adjustment nut, a lock nut, a sway brace unit, a connector rod with a thrust nut, a lock nut and a rod coupling. This unit can be attached to the existing sway brace hardware.

This unit allows for preload adjustment. The adjustment nut can be turned until the desired preload is shown by the indicator. The thrust nut should also be turned until it is in contact with the spring plate. Lock nuts should then be tightened against the thrust nut and the adjustment nut.

ORDERING: Specify figure number (Fig. E365), name (Vibration Control and Sway Brace with Adjustable Preload), sway brace size (1 thru 6), desired "L" dimension, material, if other than carbon steel, and finish.

EXAMPLE: Fig. E365 Vibration Control and Sway Brace with Adjustable Preload, Size 2, L = 24", HDG.

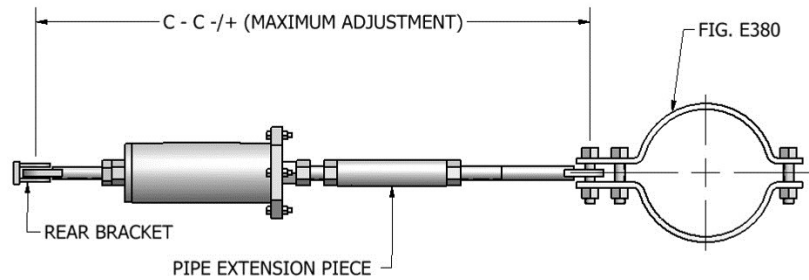


SWAY BRACE SIZE	FOR USE WITH PIPE DIA.	PRELOAD (LBS)	SPRING RATE (LBS/IN)	MAX FORCE (LBS)	WEIGHT (LBS)	ROD DIA. B (IN)	NOM. PIN DIA. T (IN)	ROD TAKE OUT E (IN)	F (IN)	OVERALL LENGTH L (IN)	M (IN)	N (IN)	CASING	
													O.D. C (IN)	LENGTH P (IN)
1	1 to 2 1/2	50	50	200	19	3/4	1/2	20	6 1/2	24 9/16	7 15/16	1	4 1/2	8 3/8
2	3 to 4	150	150	600	23	1	1/2	20 7/8	6 1/2	25 7/16	8 7/16	1	4 1/2	8 3/4
3	5 to 8	450	450	1800	32	1	5/8	23 7/8	7 3/8	28 15/16	8 7/16	1	4 1/2	10 7/8
4	10 to 14	900	900	3600	75	1 1/4	3/4	26 1/2	8 5/16	32 5/16	9 5/16	1 1/2	6 5/8	12 3/16
5	16 to 20	1350	1350	5400	91	1 1/2	3/4	29 1/2	8 5/16	35 3/16	9 3/4	1 1/2	6 5/8	14 5/8
6	24 to 40	1800	1800	7200	112	1 1/2	1	32 3/4	9 5/16	38 5/8	9 3/4	1 1/2	6 5/8	16 13/16



SWAY BRACES

FIG. E370 VIBRATION CONTROL AND SWAY BRACE ASSEMBLY WITH ADJUSTABLE PRELOAD



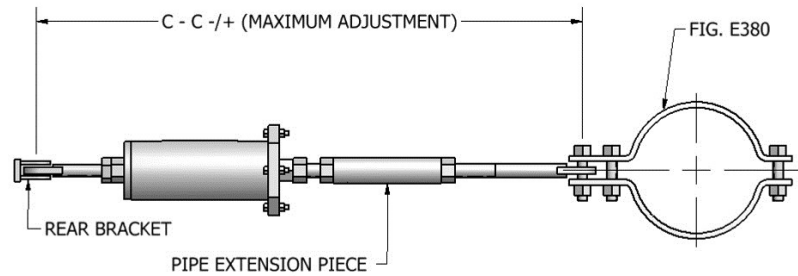
This sway brace consists of a rear bracket, a male rod extension piece with an adjustment nut, a lock nut, a sway brace unit, a connector rod with a thrust nut, a lock nut, a rod coupling, a male rod extension piece with a lock nut and a sway brace pipe clamp. The C-C length must be equal to or greater than the minimum length in the table below and equal to or less than the maximum length in the table below.

This unit allows for preload adjustment. The adjustment nut can be turned until the desire preload is shown by the indicator. The thrust nut should also be turned until it is in contact with the spring plate. Lock nuts should then be tightened against the thrust nut and the adjustment nut.

ORDERING: Specify figure number (Fig. E370), name (Vibration Control and Sway Brace Assembly with Adjustable Preload), sway brace size (1 thru 6), "C-C" dimension, pipe diameter, material, if other than carbon steel, and finish.

SWAY BRACE "C-C" DIMENSION							
SWAY BRACE SIZE		1	2	3	4	5	6
E 370	MIN	2'-3 3/4"	2'-5 1/8"	2'-8 1/8"	2'-11 1/2"	3'-2 5/8"	3'-5 7/8"
	MAX	3'-6 7/8"	4'-3 1/4"	4'-6 1/4"	5'-0 5/8"	5'-10 3/8"	5'-7 3/8"

FIG. E375 VIBRATION CONTROL AND SWAY BRACE EXTENDED ASSEMBLY WITH ADJUSTABLE PRELOAD



This sway brace consists of a rear bracket, a male rod extension piece with an adjustment nut, a lock nut, a sway brace unit, a connector rod with a thrust nut, a lock nut, a rod coupling, a lock nut, a male adaptor rod, a female extension piece, a male rod extension piece, a male rod extension piece and a sway brace pipe clamp. The C-C length must be equal to or greater than the minimum length in the table below and equal to or less than the maximum length in the table below.

This unit allows for preload adjustment. The adjustment nut can be turned until the desire preload is shown by the indicator. The thrust nut should also be turned until it is in contact with the spring plate. Lock nuts should then be tightened against the thrust nut and the adjustment nut.

ORDERING: Specify figure number (Fig. E375), name (Vibration Control and Sway Brace Extended Assembly with Adjustable Preload), sway brace size (1 thru 6), "C-C" dimension, pipe diameter, material, if other than carbon steel, and finish.

SWAY BRACE "C-C" DIMENSION							
SWAY BRACE SIZE		1	2	3	4	5	6
E 375	MIN	2'-8"	2'-10 3/8"	3'-1 3/8"	3'-6"	3'-10 3/8"	4'-1 5/8"
	MAX	6'-5 3/8"	7'-11 3/4"	7'-5 1/4"	7'-10 5/8"	8'-10 5/8"	7'-9 7/8"
Female Extension Piece		1" Sch 160	1 1/4" Sch 160	1 1/4" Sch 160	1 1/2" Sch 160	2" XXS	2" XXS



SWAY BRACES

FIG. 380 PIPE CLAMP FOR SWAY BRACE ASSEMBLY FIGS. E355, E360, E370 and E375

APPLICATION: These pipe clamps are for use with Sway Brace Assemblies Figs. E355, E360, E370, & E375.

FEATURES:

- Maximum design temperature is 650 °F
- Design angle maximum is 5 °

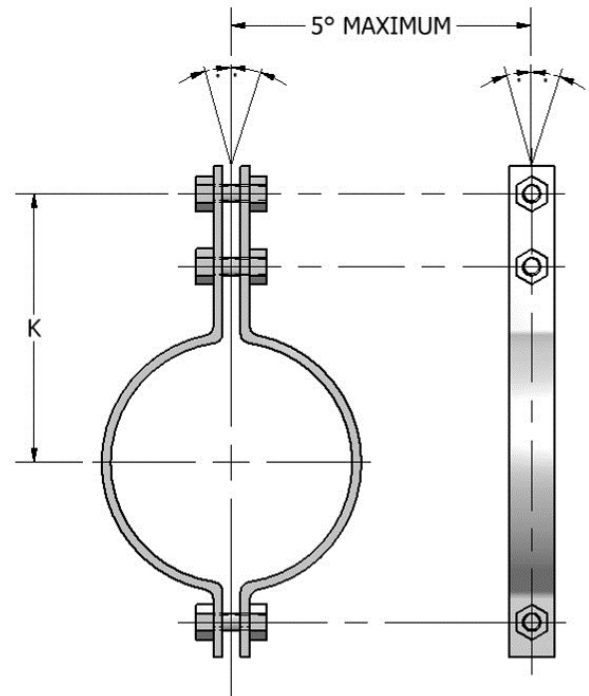
SELECTING THE CORRECT SWAY STRUT CLAMP: Once the sway brace assembly has been properly sized and selected, the clamp can be easily specified by stating the figure number of the clamp followed by a dash and the sway brace size (1-6).

CONSTRUCTION: A-36 Carbon Steel, Special materials available on request.

FINISHES AVAILABLE: Carbon Steel - Black, Painted or Hot Dip Galvanized.

ORDERING: Specify name (Pipe Clamp for Sway Brace Assembly), Fig. E380 - sway brace size (0-6), pipe diameter, material, if other than carbon steel, and finish.

EXAMPLE: Pipe Clamp for Sway Brace Assembly, Fig. E380-4, 12" Pipe Dia., HDG.

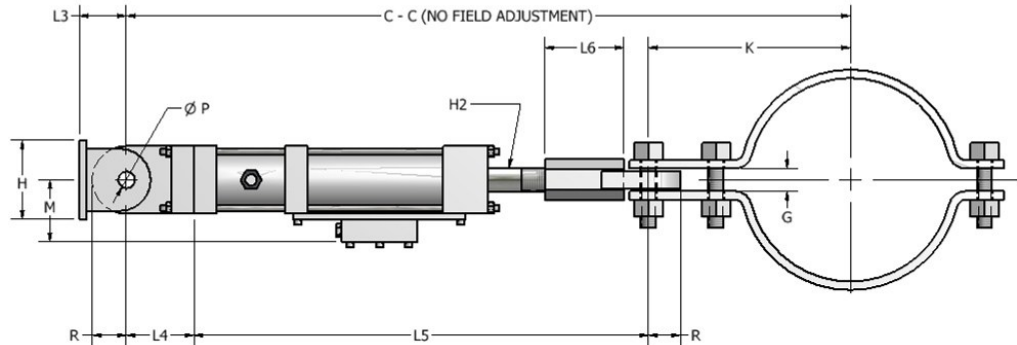


NOM. PIPE DIA. (IN)	CLAMP TAKE OUT DIMENSION "K" IN INCHES FOR SWAY BRACE ASSEMBLIES E355, E360, E370 & E375					
	SPECIFY PART NUMBER E380- FOLLOWED BY THE SWAY BRACE SIZE					
	1	2	3	4	5	6
1	5 3/4					
1 1/4	5 7/8	5 7/8	6 1/4			
1 1/2	6	6	6 3/8	6 1/2		
2	6 1/4	6 1/4	6 5/8	6 3/4	6 3/4	6 3/4
2 1/2	6 1/2	6 1/2	6 7/8	7	7	7
3	6 3/4	6 3/4	7 1/8	7 1/4	7 1/4	7 1/4
3 1/2	7	7	7 3/8	7 1/2	7 1/2	7 1/2
4	7 1/4	7 1/4	7 5/8	7 3/4	7 3/4	7 3/4
5		7 7/8	8 1/4	8 3/8	8 3/8	8 3/8
6		8 3/8	8 3/4	8 7/8	8 7/8	8 7/8
8		9 3/8	9 3/4	9 7/8	9 7/8	9 7/8
10		10 3/8	10 3/4	10 7/8	10 7/8	10 7/8
12		11 3/8	11 3/4	11 7/8	11 7/8	11 7/8
14		12	12 3/8	12 1/2	12 1/2	12 1/2
16		13	13 3/8	13 1/2	13 1/2	13 1/2
18		14	14 3/8	14 1/2	14 1/2	14 1/2
20		15	15 3/8	15 1/2	15 1/2	15 1/2
22		16	16 3/8	16 1/2	16 1/2	16 1/2
24		17	17 3/8	17 1/2	17 1/2	17 1/2
26			18 3/8	18 1/2	18 1/2	18 1/2
28			19 3/8	19 1/2	19 1/2	19 3/4
30			20 3/8	20 1/2	20 1/2	20 3/4
32				21 1/2	21 1/2	21 3/4
34				22 1/2	22 1/2	22 3/4
36				23 1/2	23 1/2	23 7/8
38					24 1/2	25 3/8
40					25 1/2	26 3/8
42					26 3/4	27 3/8



HYDRAULIC SNUBBERS

FIG. 385 HYDRAULIC SNUBBER SHORT ASSEMBLY

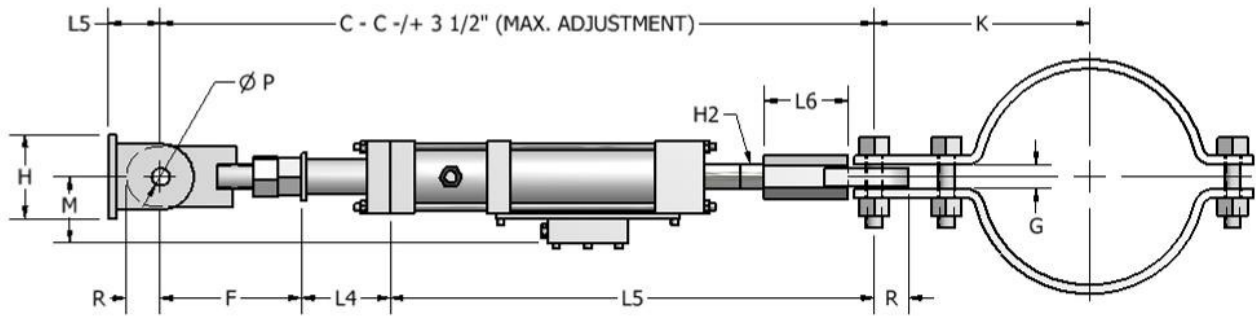


CYLINDER		MAX. RATED LOAD (LBS)	REAR BRACKET			W	L4	L5			M	THREAD		C-C MIN **	R MAX	GAP G	NOMINAL PIN/STUD DIA. P
BORE SIZE	STROKE		WEIGHT (LBS)	TAKE OUT L3	H			MIN	MID	MAX		LENGTH L6	SIZE H2				
3/4	5	738	19	1 1/4	1 1/4	1 1/4	1 5/8	15 7/8	18 3/8	20 7/8	1 7/16	1 5/8	1/2-20 NF-3A	17 1/2	3/4	9/16	3/8
3/4	10	738	24	1 1/4	1 1/4	1 1/4	1 5/8	23 3/8	23 3/8	33 3/8	1 7/16	1 5/8	1/2-20 NF-3A	25	3/4	9/16	3/8
1	5	1434	23	1 3/4	1 1/2	1 1/4	2 1/8	16 3/4	19 1/4	21 3/4	1 11/16	1 3/4	5/8-18 NF-3A	18 7/8	1	21/32	1/2
1	10	1434	28	1 3/4	1 1/2	1 1/4	2 1/8	24 1/4	29 1/4	34 1/4	1 11/16	1 3/4	5/8-18 NF-3A	26 3/8	1	21/32	1/2
1 1/2	5	3900	31	2 1/4	2	1 1/2	2 3/4	18 7/8	21 3/8	23 7/8	3 5/16	1 3/8	3/4-16 UNF	21 5/8	1 1/4	25/32	5/8
1 1/2	10	3900	38	2 1/4	2	1 1/2	2 3/4	26 3/8	31 3/8	36 3/8	3 5/16	1 3/8	3/4-16 UNF	29 1/8	1 1/4	25/32	5/8
1 1/2	15	3900	44	2 1/4	2	1 1/2	2 3/4	33 7/8	41 3/8	48 7/8	3 5/16	1 3/8	3/4-16 UNF	36 5/8	1 1/4	25/32	5/8
1 1/2	20	3900	51	2 1/4	2	1 1/2	2 3/4	41 3/8	51 3/8	61 3/8	3 5/16	1 3/8	3/4-16 UNF	44 1/8	1 1/4	25/32	5/8
2	5	7000	42	2 1/2	2 1/4	2	3 3/8	19 1/8	21 5/8	24 1/8	3 9/16	1 3/4	1 - 14 NF	22 1/2	1 1/2	29/32	3/4
2	10	7000	51	2 1/2	2 1/4	2	3 3/8	26 5/8	31 5/8	36 5/8	3 9/16	1 3/4	1 - 14 NF	30	1 1/2	29/32	3/4
2	15	7000	60	2 1/2	2 1/4	2	3 3/8	34 1/8	41 5/8	49 1/8	3 9/16	1 3/4	1 - 14 NF	37 1/2	1 1/2	29/32	3/4
2	20	7000	69	2 1/2	2 1/4	2	3 3/8	41 5/8	51 5/8	61 5/8	3 9/16	1 3/4	1 - 14 NF	45	1 1/2	29/32	3/4
2 1/2	5	11000	55	2 3/4	2 5/8	2 1/4	3 1/2	20 5/8	23 1/8	25 5/8	3 13/16	2 1/8	1 1/4 - 12 UNF	24 1/8	1 1/2	1 1/32	1
2 1/2	10	11000	66	2 3/4	2 5/8	2 1/4	3 1/2	28 1/8	33 1/8	38 1/8	3 13/16	2 1/8	1 1/4 - 12 UNF	31 5/8	1 1/2	1 1/32	1
2 1/2	15	11000	77	2 3/4	2 5/8	2 1/4	3 1/2	35 5/8	43 1/8	50 5/8	3 13/16	2 1/8	1 1/4 - 12 UNF	39 1/8	1 1/2	1 1/32	1
2 1/2	20	11000	88	2 3/4	2 5/8	2 1/4	3 1/2	43 1/8	53 1/8	63 1/8	3 13/16	2 1/8	1 1/4 - 12 UNF	46 5/8	1 1/2	1 1/32	1
3 1/4	5	17600	95	3 1/2	3 3/4	3	4	25	27 1/2	30	4 5/16	2 7/8	1 3/4 - 12 UN	29	2 1/4	1 19/32	1 1/4
3 1/4	10	17600	112	3 1/2	3 3/4	3	4	32 7/8	37 7/8	42 7/8	4 5/16	2 7/8	1 3/4 - 12 UN	36 7/8	2 1/4	1 19/32	1 1/4
3 1/4	15	17600	130	3 1/2	3 3/4	3	4	40 3/4	48 1/4	55 3/4	4 5/16	2 7/8	1 3/4 - 12 UN	44 3/4	2 1/4	1 19/32	1 1/4
3 1/4	20	17600	147	3 1/2	3 3/4	3	4	48 5/8	58 5/8	68 5/8	4 5/16	2 7/8	1 3/4 - 12 UN	52 5/8	2 1/4	1 19/32	1 1/4
4	5	28200	126	4 1/2	5	3 3/4	4 1/4	25 3/4	28 1/4	30 3/4	4 9/16	3 1/4	2 - 12 UN	30	2 1/2	1 25/32	1 1/2
4	10	28200	147	4 1/2	5	3 3/4	4 1/4	33 1/4	38 1/4	43 1/4	4 9/16	3 1/4	2 - 12 UN	37 1/2	2 1/2	1 25/32	1 1/2
4	15	28200	168	4 1/2	5	3 3/4	4 1/4	40 3/4	48 1/4	55 3/4	4 9/16	3 1/4	2 - 12 UN	45	2 1/2	1 25/32	1 1/2
4	20	28200	189	4 1/2	5	3 3/4	4 1/4	48 1/4	58 1/4	68 1/4	4 9/16	3 1/4	2 - 12 UN	52 1/2	2 1/2	1 25/32	1 1/2
5	5	44000	220	5	7	7	5 1/4	28 3/8	31 1/4	33 3/4	5 5/16	4	2 1/2 - 12 UN	34	3	2 7/32	1 3/4
5	10	44000	253	5	7	7	5 1/4	36 1/4	41 1/4	46 1/4	5 5/16	4	2 1/2 - 12 UN	41 1/2	3	2 7/32	1 3/4
5	15	44000	287	5	7	7	5 1/4	43 3/4	51 1/4	58 3/4	5 5/16	4	2 1/2 - 12 UN	49	3	2 7/32	1 3/4
5	20	44000	321	5	7	7	5 1/4	51 1/4	61 1/4	71 1/4	5 5/16	4	2 1/2 - 12 UN	56 1/2	3	2 7/32	1 3/4
6	5	63600	332	5 3/4	8	8	5 3/4	31 5/8	34 1/8	36 5/8	5 13/16	4 3/4	3 - 12 UN	37 3/8	3 1/4	2 13/32	2
6	10	63600	376	5 3/4	8	8	5 3/4	39 1/8	44 1/8	49 1/8	5 13/16	4 3/4	3 - 12 UN	44 7/8	3 1/4	2 13/32	2
6	15	63600	421	5 3/4	8	8	5 3/4	46 5/8	54 1/8	61 5/8	5 13/16	4 3/4	3 - 12 UN	52 3/8	3 1/4	2 13/32	2
6	20	63600	465	5 3/4	8	8	5 3/4	54 1/8	64 1/8	74 1/8	5 13/16	4 3/4	3 - 12 UN	59 7/8	3 1/4	2 13/32	2
8	5	113000	684	7 1/2	10	10	8	38	40 1/2	43	6 13/16	6 1/4	4 - 12 UN	46	4 3/4	3 7/16	2 3/4
8	10	113000	755	7 1/2	10	10	8	45 1/2	50 1/2	55 1/2	6 13/16	6 1/4	4 - 12 UN	53 1/2	4 3/4	3 7/16	2 3/4
8	15	113000	828	7 1/2	10	10	8	53	60 1/2	68	6 13/16	6 1/4	4 - 12 UN	61	4 3/4	3 7/16	2 3/4
8	20	113000	900	7 1/2	10	10	8	60 1/2	70 1/2	80 1/2	6 13/16	6 1/4	4 - 12 UN	68 1/2	4 3/4	3 7/16	2 3/4
10	5	187900	1308	9 1/2	13	13	9 1/2	45 1/16	47 9/16	50 1/16	8 3/8	7	4 1/2 - 12 UN	54 9/16	6 1/3	4 5/16	3 3/4
10	10	187900	1419	9 1/2	13	13	9 1/2	52 9/16	57 9/16	62 9/16	8 3/8	7	4 1/2 - 12 UN	62 1/16	6 1/3	4 5/16	3 3/4
10	15	187900	1529	9 1/2	13	13	9 1/2	60 1/16	67 9/16	75 1/16	8 3/8	7	4 1/2 - 12 UN	69 9/16	6 1/3	4 5/16	3 3/4
10	20	187900	1640	9 1/2	13	13	9 1/2	57 9/16	77 9/16	87 9/16	8 3/8	7	4 1/2 - 12 UN	77 1/16	6 1/3	4 5/16	3 3/4



HYDRAULIC SNUBBERS

FIG. 390 HYDRAULIC SNUBBER ASSEMBLY



CYLINDER BORE SIZE	STROKE	MAX* RATED LOADS (LBS)	REAR BRACKET			L5			F	M	C-C MIN **	FEMALE PIPE EXT. PIECE	R MAX	GAP G	NOM. PIN/STUD DIA. P	L4 MIN	THREAD	
			TAKE OUT L3	H	W	MIN	MID	MAX									LENGTH L6	SIZE H2
3/4	5	738	1 1/4	1 1/4	1 1/4	15 7/8	18 3/8	20 7/8	5 1/2	1 7/16	29 5/8	1/2 - STD	3/4	9/16	3/8	8 1/4	1 5/8	1/2-20 NF-3A
3/4	10	738	1 1/4	1 1/4	1 1/4	23 3/8	23 3/8	33 3/8	5 1/2	1 7/16	37 1/8	1/2 - STD	3/4	9/16	3/8	8 1/4	1 5/8	1/2-20 NF-3A
1	5	1434	1 3/4	1 1/2	1 1/4	16 3/4	19 1/4	21 3/4	5 3/4	1 11/16	31 1/8	3/4 STD	1	21/32	1/2	8 5/8	1 3/4	5/8-18 NF-3A
1	10	1434	1 3/4	1 1/2	1 1/4	24 1/4	29 1/4	34 1/4	5 3/4	1 11/16	38 5/8	3/4 STD	1	21/32	1/2	8 5/8	1 3/4	5/8-18 NF-3A
1 1/2	5	3900	2 1/4	2	1 1/2	18 7/8	21 3/8	23 7/8	6 1/4	3 5/16	34	1 1/4 XS	1 1/4	25/32	5/8	8 7/8	1 3/8	3/4 - 16 UNF
1 1/2	10	3900	2 1/4	2	1 1/2	26 3/8	31 3/8	36 3/8	6 1/4	3 5/16	41 1/2	1 1/4 XS	1 1/4	25/32	5/8	8 7/8	1 3/8	3/4 - 16 UNF
1 1/2	15	3900	2 1/4	2	1 1/2	33 7/8	41 3/8	48 7/8	6 1/4	3 5/16	49	1 1/4 XS	1 1/4	25/32	5/8	8 7/8	1 3/8	3/4 - 16 UNF
1 1/2	20	3900	2 1/4	2	1 1/2	41 3/8	51 3/8	61 3/8	6 1/4	3 5/16	56 1/2	1 1/4 XS	1 1/4	25/32	5/8	8 7/8	1 3/8	3/4 - 16 UNF
2	5	7000	2 1/2	2 1/4	2	19 1/8	21 5/8	24 1/8	6 7/8	3 9/16	36 1/4	1 1/2 XS	1 1/2	29/32	3/4	9 1/4	1 3/4	1 - 14 NF
2	10	7000	2 1/2	2 1/4	2	26 5/8	31 5/8	36 5/8	6 7/8	3 9/16	42 3/4	1 1/2 XS	1 1/2	29/32	3/4	9 1/4	1 3/4	1 - 14 NF
2	15	7000	2 1/2	2 1/4	2	34 1/8	41 5/8	49 1/8	6 7/8	3 9/16	50 1/4	1 1/2 XS	1 1/2	29/32	3/4	9 1/4	1 3/4	1 - 14 NF
2	20	7000	2 1/2	2 1/4	2	41 5/8	51 5/8	61 5/8	6 7/8	3 9/16	57 3/4	1 1/2 XS	1 1/2	29/32	3/4	9 1/4	1 3/4	1 - 14 NF
2 1/2	5	11000	2 3/4	2 5/8	2 1/4	20 5/8	23 1/8	25 5/8	7 1/2	3 13/16	38	2XS	1 1/2	1 1/32	1	9 7/8	2 1/8	1 1/4 - 12 UNF
2 1/2	10	11000	2 3/4	2 5/8	2 1/4	28 1/8	33 1/8	38 1/8	7 1/2	3 13/16	45 1/2	2XS	1 1/2	1 1/32	1	9 7/8	2 1/8	1 1/4 - 12 UNF
2 1/2	15	11000	2 3/4	2 5/8	2 1/4	35 5/8	43 1/8	50 5/8	7 1/2	3 13/16	53	2XS	1 1/2	1 1/32	1	9 7/8	2 1/8	1 1/4 - 12 UNF
2 1/2	20	11000	2 3/4	2 5/8	2 1/4	43 1/8	53 1/8	63 1/8	7 1/2	3 13/16	60 1/2	2XS	1 1/2	1 1/32	1	9 7/8	2 1/8	1 1/4 - 12 UNF
3 1/4	5	17600	3 1/2	3 3/4	3	25	27 1/2	30	9 3/4	4 5/16	45 1/2	2 1/2 XS	2 1/4	1 19/32	1 1/4	10 3/4	2 7/8	1 3/4 - 12 UN
3 1/4	10	17600	3 1/2	3 3/4	3	32 7/8	37 7/8	42 7/8	9 3/4	4 5/16	53 3/8	2 1/2 XS	2 1/4	1 19/32	1 1/4	10 3/4	2 7/8	1 3/4 - 12 UN
3 1/4	15	17600	3 1/2	3 3/4	3	40 3/4	48 1/4	55 3/4	9 3/4	4 5/16	61 1/4	2 1/2 XS	2 1/4	1 19/32	1 1/4	10 3/4	2 7/8	1 3/4 - 12 UN
3 1/4	20	17600	3 1/2	3 3/4	3	48 5/8	58 5/8	68 5/8	9 3/4	4 5/16	69 1/8	2 1/2 XS	2 1/4	1 19/32	1 1/4	10 3/4	2 7/8	1 3/4 - 12 UN
4	5	28200	4 1/2	5	3 3/4	25 3/4	28 1/4	30 3/4	10 5/8	4 9/16	47 7/8	3XS	2 1/2	1 25/32	1 1/2	11 1/2	3 1/4	2 - 12 UN
4	10	28200	4 1/2	5	3 3/4	33 1/4	38 1/4	43 1/4	10 5/8	4 9/16	55 3/8	3XS	2 1/2	1 25/32	1 1/2	11 1/2	3 1/4	2 - 12 UN
4	15	28200	4 1/2	5	3 3/4	40 3/4	48 1/4	55 3/4	10 5/8	4 9/16	62 7/8	3XS	2 1/2	1 25/32	1 1/2	11 1/2	3 1/4	2 - 12 UN
4	20	28200	4 1/2	5	3 3/4	48 1/4	58 1/4	68 1/4	10 5/8	4 9/16	70 3/8	3XS	2 1/2	1 25/32	1 1/2	11 1/2	3 1/4	2 - 12 UN
5	5	44000	5	7	7	28 3/8	31 1/4	33 3/4	12 3/8	5 5/16	53 3/8	4XS	3	2 7/32	1 3/4	12 1/4	4	2 1/2 - 12 UN
5	10	44000	5	7	7	36 1/4	41 1/4	46 1/4	12 3/8	5 5/16	60 7/8	4XS	3	2 7/32	1 3/4	12 1/4	4	2 1/2 - 12 UN
5	15	44000	5	7	7	43 3/4	51 1/4	58 3/4	12 3/8	5 5/16	68 3/8	4XS	3	2 7/32	1 3/4	12 1/4	4	2 1/2 - 12 UN
5	20	44000	5	7	7	51 1/4	61 1/4	71 1/4	12 3/8	5 5/16	75 7/8	4XS	3	2 7/32	1 3/4	12 1/4	4	2 1/2 - 12 UN
6	5	63600	5 3/4	8	8	31 5/8	34 1/8	36 5/8	13 1/4	5 13/16	58	5XS	3 1/4	2 13/32	2	13 1/8	4 3/4	3 - 12 UN
6	10	63600	5 3/4	8	8	39 1/8	44 1/8	49 1/8	13 1/4	5 13/16	65 1/2	5XS	3 1/4	2 13/32	2	13 1/8	4 3/4	3 - 12 UN
6	15	63600	5 3/4	8	8	46 5/8	54 1/8	61 5/8	13 1/4	5 13/16	73	5XS	3 1/4	2 13/32	2	13 1/8	4 3/4	3 - 12 UN
6	20	63600	5 3/4	8	8	54 1/8	64 1/8	74 1/8	13 1/4	5 13/16	80 1/2	5XS	3 1/4	2 13/32	2	13 1/8	4 3/4	3 - 12 UN
8	5	113000	7 1/2	10	10	38	40 1/2	43	16	6 13/16	69 1/4	6XS	4 3/4	3 7/16	2 3/4	15 1/4	6 1/4	4 - 12 UN
8	10	113000	7 1/2	10	10	45 1/2	50 1/2	55 1/2	16	6 13/16	76 3/4	6XS	4 3/4	3 7/16	2 3/4	15 1/4	6 1/4	4 - 12 UN
8	15	113000	7 1/2	10	10	53	60 1/2	68	16	6 13/16	84 1/4	6XS	4 3/4	3 7/16	2 3/4	15 1/4	6 1/4	4 - 12 UN
8	20	113000	7 1/2	10	10	60 1/2	70 1/2	80 1/2	16	6 13/16	91 3/4	6XS	4 3/4	3 7/16	2 3/4	15 1/4	6 1/4	4 - 12 UN
10	5	187900	9 1/2	13	13	45 1/16	47 9/16	50 1/16	20 1/8	8 3/8	81 15/16	8XS	6 5/16	4 5/16	3 3/4	16 3/4	7	4 1/2 - 12 UN
10	10	187900	9 1/2	13	13	52 9/16	57 9/16	62 9/16	20 1/8	8 3/8	89 7/16	8XS	6 5/16	4 5/16	3 3/4	16 3/4	7	4 1/2 - 12 UN
10	15	187900	9 1/2	13	13	60 1/16	67 9/16	75 1/16	20 1/8	8 3/8	96 15/16	8XS	6 5/16	4 5/16	3 3/4	16 3/4	7	4 1/2 - 12 UN
10	20	187900	9 1/2	13	13	67 9/16	77 9/16	87 9/16	20 1/8	8 3/8	104 7/16	8XS	6 5/16	4 5/16	3 3/4	16 3/4	7	4 1/2 - 12 UN