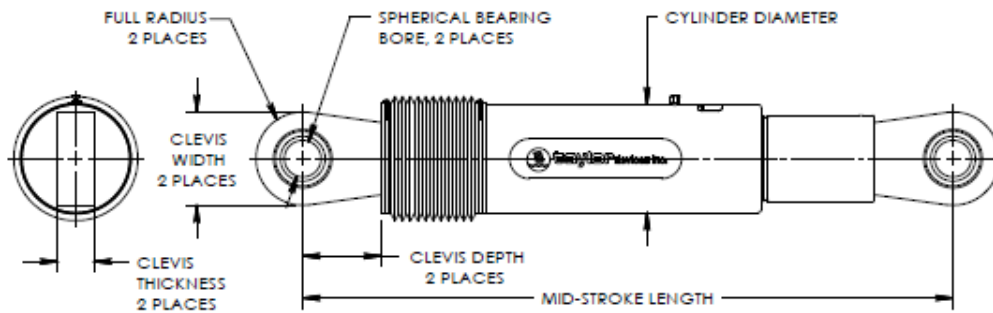


# Anexo 1

Modelos de disipadores de fluido viscoso que se analizaron para la elección del disipador.

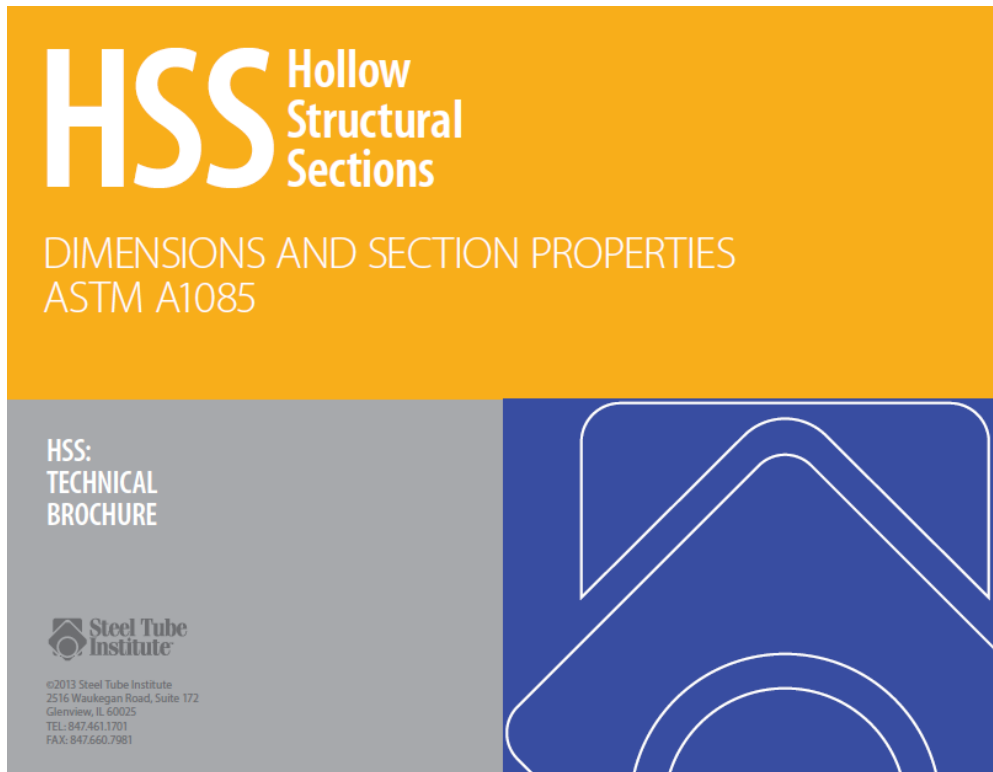


FORCE	SPHERICAL BEARING BORE DIA. (INCHES)	MID-STROKE LENGTH (INCHES)	STROKE (INCHES)	CLEVIS THICKNESS (INCHES)	CLEVIS WIDTH (INCHES)	CLEVIS DEPTH (INCHES)	CYLINDER DIA. (INCHES)	WEIGHT (lbs.)
55 KIP	1.50	34.13	±3	1.63	4 MAX.	3.25	4-1/2 MAX.	90
110 KIP	2.00	42.00	±4	2.13	4-3/4 MAX.	4.00	5-3/4 MAX.	185
165 KIP	2.25	47.00	±4	2.25	6 MAX.	5.10	7-1/4 MAX.	300
220 KIP	2.75	48.75	±4	2.75	7-1/2 MAX.	5.88	8-1/4 MAX.	425
330 KIP	3.00	51.75	±4	3.00	8 MAX.	6.38	9-1/2 MAX.	600
440 KIP	3.50	62.00	±5	3.50	9 MAX.	7.50	11-1/4 MAX.	900
675 KIP	4.00	62.00	±5	4.50	12-3/4 MAX.	8.00	13-3/4 MAX.	1300
900 KIP	5.00	74.00	±5	5.50	12-3/4 MAX.	10.75	16-3/4 MAX.	2650
1450 KIP	6.00	84.00	±5	6.00	13-3/4 MAX.	12.00	20-1/4 MAX.	4100
1800 KIP	7.00	88.25	±5	7.00	16-1/4 MAX.	12.50	22-1/4 MAX.	5500

NOTE: VARIOUS STROKES ARE AVAILABLE, FROM ±2 TO ±36 INCHES. FORCE CAPACITY MAY BE REDUCED FOR STROKE LONGER THAN STROKE LISTED IN TABLE. ANY STROKE CHANGE FROM THE STANDARD STROKE VERSION DEPICTED CHANGES MID-STROKE LENGTH BY FIVE INCHES PER ±1 INCH OF STROKE.

Según nuestros cálculos realizados necesitamos un disipador de 110 KIP como se indicó en el documento de la tesis.

## Anexo 2



### Table of Contents

<b>2</b>	Dimensions and Sections Properties of Round HSS
<b>6</b>	Dimensions and Sections Properties of Square HSS
<b>10</b>	Dimensions and Sections Properties of Rectangular HSS



### Foreword

*Note: The information presented in this publication has been prepared in accordance with recognized engineering principles and is for general information only. While it is believed to be accurate, this information should not be used or relied upon for any specific application without competent professional examination and verification of its accuracy, suitability, and applicability by a licensed professional engineer, designer, or architect. The publication of the material contained herein is not intended as a representation or warranty on the part of The Steel Tube Institute of North America or of any other person named herein, that this information is suitable for any general or particular use or of freedom from infringement of any patent or patents. Anyone making use of this information assumes all liability arising from such use.*

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HSS  
 HOLLOW STRUCTURAL SECTIONS  
 STEEL TUBE INSTITUTE.ORG/HSS

### Nomenclature

<b>b</b>	Nominal width minus 3 times the design wall thickness, $t$ (in.)
<b>C</b>	Torsional shear constant of cross-section (in.3)
<b>D</b>	Outside diameter of round HSS (in.)
<b>h</b>	Nominal depth minus 3 times the design wall thickness, $t$ (in.)
<b>I</b>	Moment of inertia of cross-section (in.4)
<b>J</b>	Torsional stiffness constant of cross-section (in.4)
<b>r</b>	Governing radius of gyration (in.)
<b>S</b>	Elastic section modulus (in.3)
<b>t</b>	Design wall thickness (in.), "units added"
<b>Z</b>	Plastic section modulus (in.3)

DIMENSIONS  
AND SECTION  
PROPERTIES OF  
ROUND HSS

Shape	Design Wall Thickness, t	Nominal Wt	Area, A	D/t	I	S	r	Z	Torsion	
									J	C
	in.	lb/ft	in. <sup>2</sup>		in. <sup>4</sup>	in. <sup>3</sup>	in.	in. <sup>3</sup>	in. <sup>4</sup>	in. <sup>3</sup>
HSS20X0.500	0.500	104.23	30.6	40.0	1480	148	6.90	190	2910	291
X0.375	0.375	78.67	23.1	53.3	1110	111	6.94	144	2230	223
HSS18X0.500	0.500	93.54	27.5	36.0	1050	117	6.19	153	2110	234
X0.375	0.375	70.66	20.8	48.0	807	89.6	6.23	117	1610	179
HSS16X0.625	0.625	102.73	30.2	25.6	894	112	5.44	148	1790	223
X0.500	0.500	82.85	24.3	32.0	732	91.5	5.48	120	1460	183
X0.438	0.438	72.87	21.4	36.5	649	81.1	5.50	106	1300	162
X0.375	0.375	62.64	18.4	42.7	582	70.3	5.53	91.6	1120	140
X0.312	0.312	52.32	15.4	51.3	473	60.2	5.55	76.8	946	118
X0.250	0.250	42.09	12.4	64.0	384	48.0	5.57	62.0	767	95.9
HSS14X0.625	0.625	89.36	26.3	22.4	589	84.1	4.73	112	1180	168
X0.500	0.500	72.16	21.2	28.0	484	69.1	4.78	91.2	968	138
X0.375	0.375	54.62	16.1	37.3	373	53.3	4.82	69.6	746	106
X0.312	0.312	45.65	13.4	44.9	314	44.9	4.84	58.5	629	89.7
X0.250	0.250	36.75	10.8	56.0	256	36.5	4.86	47.3	511	72.9
HSS12.75X0.500	0.500	65.48	19.2	25.5	362	66.7	4.33	75.1	723	113
X0.375	0.375	49.61	14.6	34.0	279	43.8	4.38	57.4	559	87.5
X0.250	0.250	33.41	9.82	51.0	192	30.1	4.42	39.1	384	60.1
HSS10.75X0.500	0.500	54.79	16.1	21.5	212	39.4	3.63	52.6	424	78.5
X0.375	0.375	41.59	12.2	28.7	165	30.6	3.67	40.4	329	61.1
X0.250	0.250	28.06	8.25	43.0	114	21.2	3.71	27.6	227	42.3
HSS10X0.625	0.625	62.64	18.4	16.0	203	40.6	3.32	55.0	406	80.6
X0.500	0.500	50.78	14.9	20.0	169	33.8	3.36	45.2	338	67.2
X0.375	0.375	38.58	11.3	26.7	132	26.3	3.41	34.8	263	52.5
X0.312	0.312	32.31	9.50	32.1	112	22.3	3.43	29.3	223	44.5
X0.250	0.250	26.06	7.66	40.0	91.1	18.2	3.45	23.8	182	36.4
X0.188	0.188	19.72	5.80	53.2	69.8	14.0	3.47	18.1	140	27.9

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DIMENSIONS  
AND SECTION  
PROPERTIES OF  
ROUND HSS

Shape	Design Wall Thickness, t	Nominal Wt	Area, A	D/t	I	S	r	Z	Torsion	
									J	C
	in.	lb/ft	in. <sup>2</sup>		in. <sup>4</sup>	in. <sup>3</sup>	in.	in. <sup>3</sup>	in. <sup>4</sup>	in. <sup>3</sup>
HSS9.625X0.500	0.500	48.77	14.3	19.2	150	31.1	3.23	41.7	299	61.9
X0.375	0.375	37.08	10.9	25.7	117	24.3	3.27	32.1	233	48.4
X0.312	0.312	31.06	9.13	30.8	99.1	20.6	3.29	27.1	198	41.1
X0.250	0.250	25.06	7.36	38.5	81.0	16.8	3.32	22.0	162	33.6
X0.188	0.188	18.97	5.57	51.2	62.1	12.9	3.34	16.7	124	25.8
HSS8.625X0.625	0.625	53.45	15.7	13.8	126	29.3	2.84	40.1	253	58.0
X0.500	0.500	43.43	12.8	17.2	106	24.5	2.88	33.0	211	48.7
X0.375	0.375	33.07	9.72	23.0	82.9	19.2	2.92	25.5	166	38.3
X0.322	0.322	28.58	8.40	26.8	72.5	16.8	2.94	22.2	145	33.5
X0.250	0.250	22.38	6.58	34.5	57.7	13.4	2.96	17.5	115	26.7
X0.188	0.188	16.96	4.98	45.9	44.4	10.3	2.98	13.4	88.7	20.6
HSS7.625X0.375	0.375	29.06	8.54	20.3	66.3	14.8	2.57	19.7	113	29.4
X0.328	0.328	25.59	7.52	23.2	50.1	13.2	2.58	17.5	100	26.2
HSS7.5X0.500	0.500	37.42	11.0	15.0	67.7	18.1	2.48	24.5	135	35.8
X0.375	0.375	28.56	8.39	20.0	53.4	14.2	2.52	19.1	107	28.4
X0.312	0.312	23.97	7.05	24.0	45.6	12.2	2.54	16.1	91.2	24.2
X0.250	0.250	19.38	5.69	30.0	37.5	9.99	2.56	13.1	74.9	19.9
X0.188	0.188	14.70	4.32	39.9	28.9	7.70	2.59	10.1	57.8	15.4
HSS7X0.500	0.500	34.74	10.2	14.0	54.2	15.5	2.30	21.2	108	30.7
X0.375	0.375	26.56	7.80	18.7	43.0	12.3	2.35	16.5	85.9	24.4
X0.312	0.312	22.31	6.56	22.4	36.7	10.5	2.37	14.0	73.5	20.9
X0.250	0.250	18.04	5.30	28.0	30.2	8.64	2.39	11.4	60.5	17.2
X0.188	0.188	13.69	4.02	37.2	23.4	6.67	2.41	8.73	46.7	13.3
HSS6.875X0.500	0.500	34.07	10.0	13.8	51.2	14.9	2.26	20.4	102	29.5
X0.375	0.375	26.06	7.66	18.3	40.6	11.8	2.30	15.9	81.2	23.5
X0.312	0.312	21.89	6.43	22.0	34.7	10.1	2.32	13.4	69.4	20.1
X0.250	0.250	17.71	5.20	27.5	28.6	8.32	2.34	11.0	57.2	16.6
X0.188	0.188	13.44	3.95	36.6	22.1	6.43	2.37	8.41	44.2	12.8

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DIMENSIONS  
AND SECTION  
PROPERTIES OF  
ROUND HSS

Shape	Design Wall Thickness, t in.	Nominal Wt lb/ft	Area, A in. <sup>2</sup>	D/t	I in. <sup>4</sup>	S in. <sup>3</sup>	r in.	Z in. <sup>3</sup>	Torsion	
									J in. <sup>4</sup>	C in. <sup>3</sup>
HSS6.625X0.500	0.500	32.74	9.62	13.2	45.4	13.7	2.17	18.8	90.8	27.1
X0.432	0.432	28.60	8.40	15.3	40.5	12.2	2.19	16.6	81.0	24.2
X0.375	0.375	25.06	7.36	17.7	36.1	10.9	2.21	14.7	72.2	21.6
X0.312	0.312	21.06	6.19	21.2	30.9	9.33	2.23	12.4	61.8	18.6
X0.280	0.280	18.99	5.58	23.7	28.1	8.50	2.25	11.3	56.3	16.9
X0.250	0.250	17.04	5.01	26.5	25.5	7.69	2.26	10.2	50.9	15.3
X0.188	0.188	12.94	3.80	35.2	19.7	5.95	2.28	7.79	39.4	11.9
HSS6X0.500	0.500	29.40	8.64	12.0	32.9	11.0	1.95	15.2	65.9	21.6
X0.375	0.375	22.55	6.63	16.0	28.3	8.78	1.99	11.9	52.7	17.4
X0.312	0.312	18.97	5.58	19.2	22.8	7.54	2.01	10.1	45.2	15.0
X0.280	0.280	17.12	5.03	21.4	20.6	6.88	2.02	9.17	41.3	13.7
X0.250	0.250	15.37	4.52	24.0	18.7	6.23	2.03	8.27	37.4	12.4
X0.188	0.188	11.68	3.43	31.9	14.5	4.84	2.06	6.35	29.0	9.66
HSS5.663X0.500	0.500	27.06	7.95	11.1	25.7	9.25	1.80	12.9	51.5	18.2
X0.375	0.375	20.80	6.11	14.8	20.7	7.43	1.84	10.1	41.3	14.7
X0.258	0.258	14.63	4.30	21.6	15.2	5.45	1.88	7.27	30.3	10.9
X0.188	0.188	10.80	3.17	29.6	11.5	4.13	1.90	5.43	23.0	8.24
HSS5.5X0.500	0.500	26.73	7.85	11.0	24.8	9.01	1.78	12.5	49.6	17.7
X0.375	0.375	20.55	6.04	14.7	19.9	7.25	1.82	9.87	39.9	14.4
X0.258	0.258	14.46	4.25	21.3	14.8	5.32	1.86	7.10	29.3	10.6
HSS5X0.500	0.500	24.05	7.07	10.0	18.1	7.25	1.60	10.2	36.2	14.2
X0.375	0.375	18.54	5.45	13.3	14.7	5.87	1.64	8.04	29.3	11.6
X0.312	0.312	15.64	4.6	16.0	12.7	5.07	1.66	6.87	25.4	10.1
X0.258	0.258	13.08	3.84	19.4	10.8	4.33	1.68	5.81	21.7	8.62
X0.250	0.250	12.69	3.73	20.0	10.8	4.22	1.68	5.65	21.1	8.40
X0.188	0.188	9.67	2.84	26.6	8.24	3.30	1.70	4.36	16.5	6.57

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DIMENSIONS  
AND SECTION  
PROPERTIES OF  
ROUND HSS

Shape	Design Wall Thickness, t in.	Nominal Wt lb/ft	Area, A in. <sup>2</sup>	D/t	I in. <sup>4</sup>	S in. <sup>3</sup>	r in.	Z in. <sup>3</sup>	Torsion	
									J in. <sup>4</sup>	C in. <sup>3</sup>
HSS4.5X0.375	0.375	16.54	4.86	12.0	10.4	4.63	1.46	6.40	20.8	9.13
X0.337	0.337	15.00	4.41	13.4	9.61	4.27	1.48	5.85	19.2	8.45
X0.237	0.237	10.80	3.17	19.0	7.23	3.21	1.51	4.31	14.5	6.39
X0.188	0.188	8.67	2.55	23.9	5.93	2.64	1.53	3.50	11.9	5.25
HSS4X0.313	0.313	12.34	3.63	12.8	8.21	3.10	1.31	4.27	12.4	6.13
X0.250	0.250	10.02	2.95	16.0	5.20	2.60	1.33	3.52	10.4	5.16
X0.237	0.237	9.53	2.8	16.9	4.98	2.49	1.33	3.36	10.0	4.94
X0.226	0.226	9.12	2.68	17.7	4.79	2.39	1.34	3.22	9.58	4.76
X0.220	0.220	8.89	2.61	18.2	4.68	2.34	1.34	3.15	9.36	4.65
X0.188	0.188	7.66	2.25	21.3	4.10	2.05	1.35	2.73	8.20	4.08
HSS3.5X0.313	0.313	10.66	3.13	11.2	4.02	2.30	1.13	3.19	8.03	4.52
X0.300	0.300	10.26	3.02	11.7	3.89	2.23	1.14	3.08	7.79	4.38
X0.250	0.250	8.69	2.55	14.0	3.39	1.94	1.15	2.65	6.78	3.83
X0.216	0.216	7.58	2.23	16.2	3.02	1.72	1.16	2.33	6.03	3.42
X0.203	0.203	7.15	2.10	17.2	2.87	1.64	1.17	2.21	5.74	3.26
X0.188	0.188	6.66	1.96	18.6	2.69	1.54	1.17	2.06	5.38	3.06
HSS3X0.250	0.250	7.35	2.16	12.0	2.08	1.37	0.976	1.90	4.12	2.71
X0.216	0.216	6.43	1.89	13.9	1.84	1.23	0.987	1.68	3.68	2.43
X0.203	0.203	6.07	1.78	14.8	1.75	1.17	0.991	1.59	3.51	2.32
X0.188	0.188	5.65	1.66	16.0	1.65	1.10	1.00	1.49	3.30	2.18
X0.152	0.152	4.63	1.36	19.7	1.38	0.922	1.01	1.23	2.77	1.83
HSS2.875X0.250	0.250	7.02	2.06	11.5	1.79	1.25	0.932	1.73	3.58	2.45
X0.203	0.203	5.80	1.70	14.2	1.53	1.06	0.947	1.45	3.06	2.11
X0.188	0.188	5.40	1.59	15.3	1.44	1.00	0.952	1.36	2.88	1.99
HSS2.5X0.250	0.250	6.01	1.77	10.0	1.13	0.908	0.800	1.27	2.26	1.77
X0.188	0.188	4.65	1.37	13.3	0.918	0.735	0.820	1.01	1.84	1.45
HSS2.375X0.250	0.250	5.68	1.67	9.50	0.955	0.804	0.756	1.13	1.91	1.57
X0.218	0.218	5.03	1.48	10.9	0.888	0.731	0.766	1.02	1.74	1.44
X0.188	0.188	4.40	1.29	12.6	0.778	0.655	0.776	0.901	1.56	1.29
X0.154	0.154	3.66	1.07	15.4	0.686	0.581	0.787	0.761	1.33	1.11
HSS1.9X0.188	0.188	3.44	1.01	10.1	0.375	0.395	0.609	0.553	0.750	0.773

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