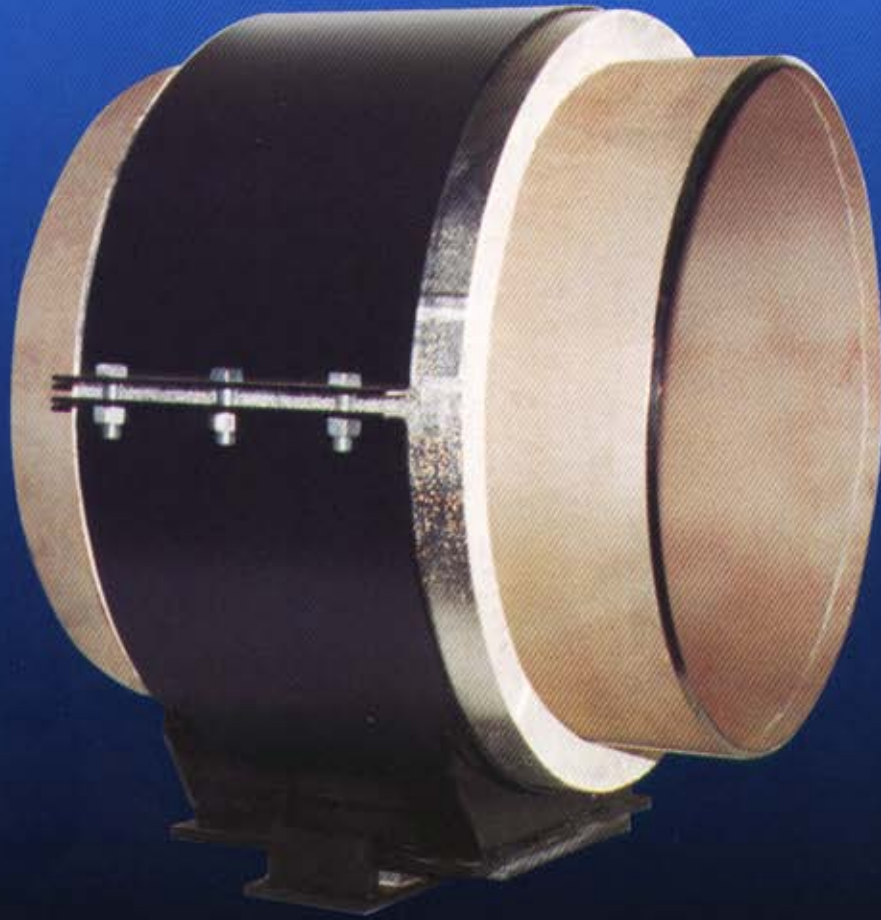


PRE-ENGINEERED

PRE-INSULATED OR UN-INSULATED

- LOW FRICTION PIPE SUPPORTS
- LOW FRICTION PIPE GUIDES



ALSO, PIPE ANCHORS AND RADIAL TYPE PIPE ALIGNMENT GUIDES



**ADVANCED
THERMAL
SYSTEMS, INC.**

**15 ENTERPRISE DRIVE/LANCASTER, NY 14086-9749
PHONE: 716-681-1800/FAX: 716-681-0228**

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BULLETIN P594



LOW FRICTION GRAPHITE PIPE GUIDES AND PIPE SUPPORTS

PRE-ENGINEERED DESIGNS FOR ALL SERVICE CONDITIONS

ATS Low Friction Graphite Guides and Supports provide the most dependable pipe support system available. Proper use of the ATS Low Friction Graphite Guides and Supports will provide trouble free service over the life of the piping system and ensure load stability at anchor locations due to the low coefficient of friction of the 1/2" thick GRAPHITE used on both the upper and lower surfaces. Designs available for direct welding to the carrier pipe, or pre-insulated designs which provide a thermal barrier between the steel carrier pipe and ambient air since there is no metal-to-metal contact between the pipe and support. Larger pipe sizes and special designs can be furnished for FRP or PVC piping systems. Select the correct Fig. No. from the table below.

ATS QUALITY AND SERVICE FOR PROVEN RELIABILITY:

- Standard Designs for Welding or Bolting to support structure.
- 1/2" Thick Graphite on both upper and lower assemblies. Epoxy bonded for applications up to 350°F, epoxy bonded and mechanically attached for applications over 350°F.
- Furnished standard with shop primer on all carbon steel components. Hot Dipped Galvanized or Epoxy Paint also available.
- Custom designs available with additional axial and/or lateral movement or to accommodate thicker insulation.



10" Fig. 101-W-4-8
Low Friction Pipe Guide

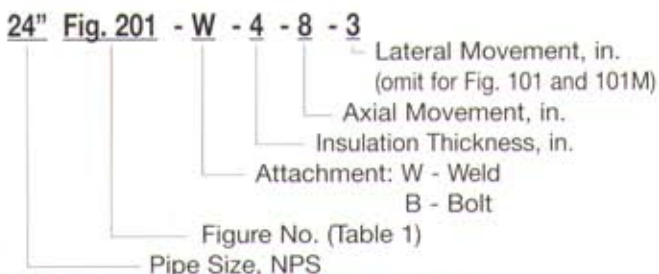


18" Fig. 201M-B-2-8-3
Pre-Insulated Pipe Support with 2" Thick Calcium Silicate Insulation and 0.016 Embossed Aluminum Jacket with Integral Moisture Barrier Split Line at 45° to permit Pipe Nesting

GRAPHITE PROPERTIES

Compressive Strength	2000 psi
Temperature Range	-20° to +750°F
Coefficient of Friction	0.15

ORDER BY CATALOG NUMBER**



**Specify Maximum Service Temperature

Table 1: ATS Guide and Support Selection Table

PIPE SIZE	STYLE	ATS FIG. NO.	MOVEMENT	
			AXIAL	LATERAL
1" to 2½"	Not Insulated	100	±4"	0
3" to 24"	Not Insulated	101	±4"	0
1" to 2½"	Not Insulated	200	±4"	±3"
3" to 24"	Not Insulated	201	±4"	±3"
3" to 24"	Pre-Insulated	101M	±4"	0
3" to 24"	Pre-Insulated	201M	±4"	±3"

FIG. 100 and FIG. 200 LOW FRICTION GRAPHITE GUIDES AND SUPPORTS FOR USE IN HOT SERVICE

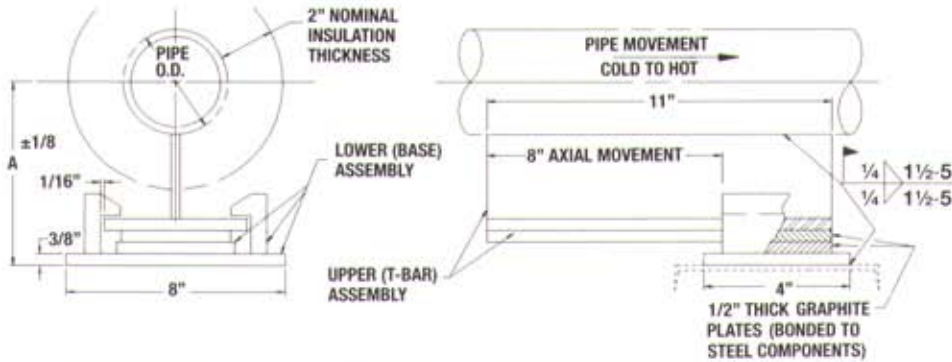


Fig. 100-W

DIMENSIONS (inches)		
PIPE SIZE	A	GRAPHITE BEARING AREA (sq. in.)
1	5 ⁵ / ₁₆	9
1 ¹ / ₄	5 ¹ / ₂	9
1 ¹ / ₂	5 ⁵ / ₈	9
2	5 ¹³ / ₁₆	9
2 ¹ / ₂	6 ¹ / ₁₆	9

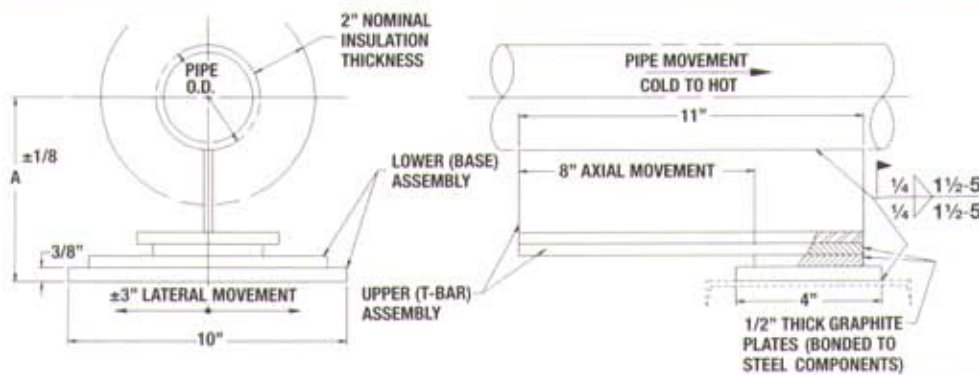


Fig. 200-W

DIMENSIONS (inches)		
PIPE SIZE	A	GRAPHITE BEARING AREA (sq. in.)
1	5 ⁵ / ₁₆	9
1 ¹ / ₄	5 ¹ / ₂	9
1 ¹ / ₂	5 ⁵ / ₈	9
2	5 ¹³ / ₁₆	9
2 ¹ / ₂	6 ¹ / ₁₆	9

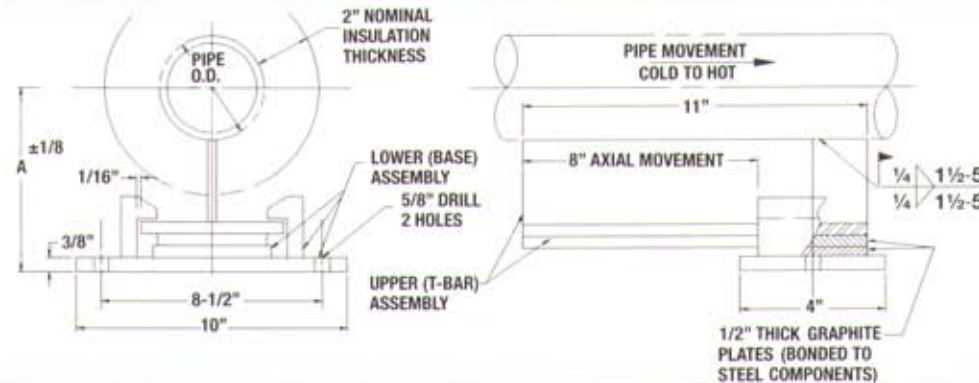


Fig. 100-B

DIMENSIONS (inches)		
PIPE SIZE	A	GRAPHITE BEARING AREA (sq. in.)
1	5 ⁵ / ₁₆	9
1 ¹ / ₄	5 ¹ / ₂	9
1 ¹ / ₂	5 ⁵ / ₈	9
2	5 ¹³ / ₁₆	9
2 ¹ / ₂	6 ¹ / ₁₆	9

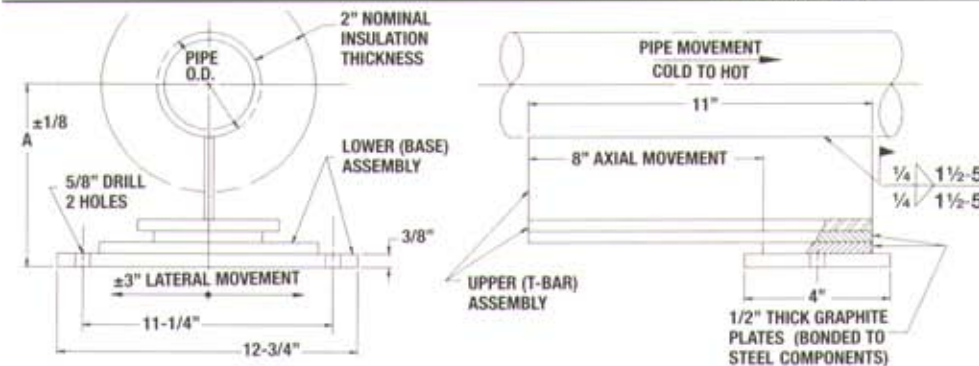


Fig. 200-B

DIMENSIONS (inches)		
PIPE SIZE	A	GRAPHITE BEARING AREA (sq. in.)
1	5 ⁵ / ₁₆	9
1 ¹ / ₄	5 ¹ / ₂	9
1 ¹ / ₂	5 ⁵ / ₈	9
2	5 ¹³ / ₁₆	9
2 ¹ / ₂	6 ¹ / ₁₆	9

NOTES:

1. See Page 2 for general information pertaining to Figure 100 and Figure 200 Pipe Guides and Supports.
2. Dimension "A" shown is for nominal 2" Thick Insulation. For applications requiring thicker insulation, Dimension "A" will increase accordingly.
3. Graphite is Epoxy bonded to steel for applications up to 350°F, epoxy bonded and mechanically attached for applications over 350°F.

FIG. 101-W and FIG. 201-W – WELD DOWN BASE LOW FRICTION GRAPHITE GUIDES AND SUPPORTS FOR USE IN HOT SERVICE

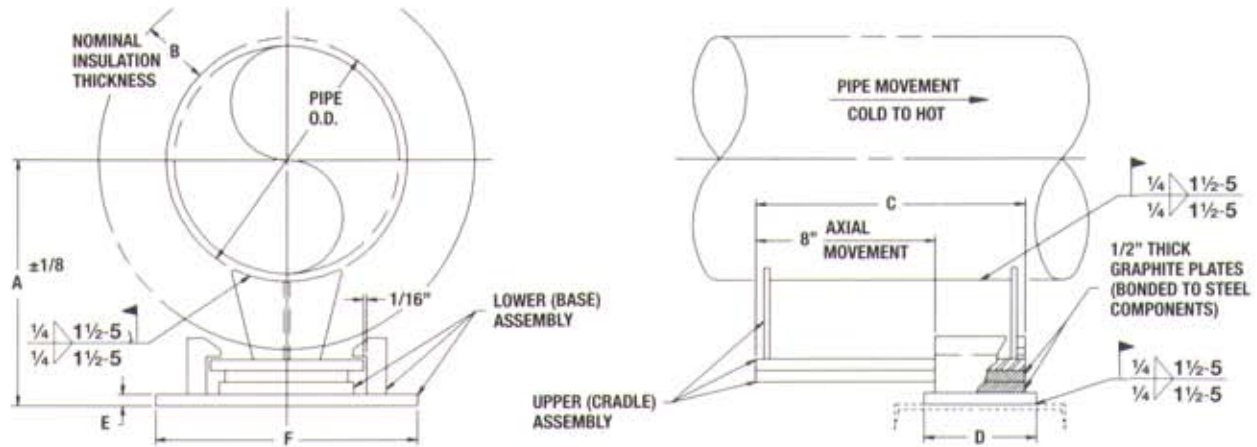


Fig. 101-W

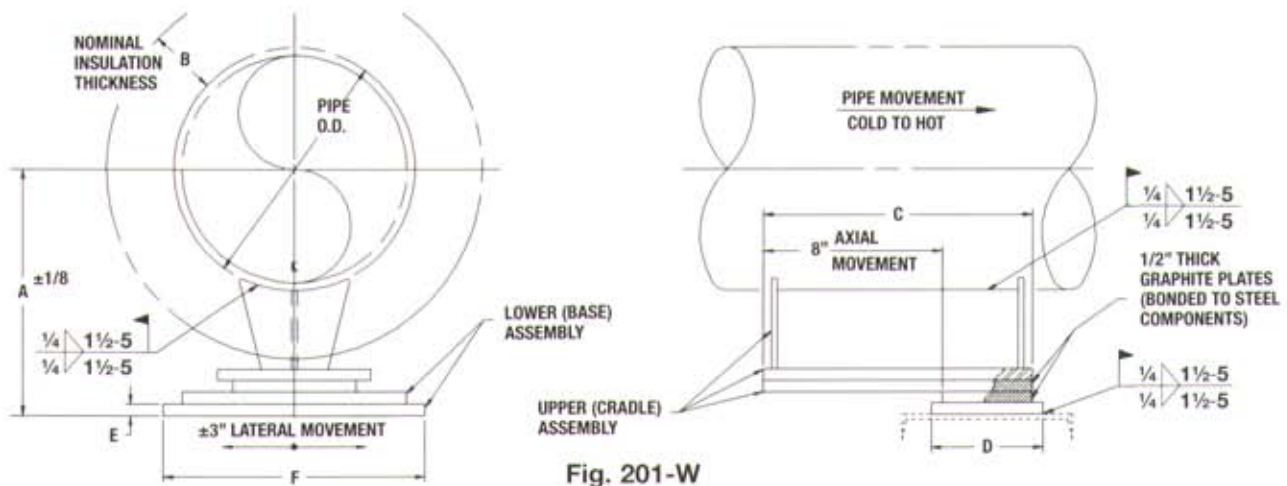


Fig. 201-W

PIPE SIZE	DIMENSIONS (inches)						GRAPHITE BEARING AREA (sq. in.)	FIG. NO.		PIPE SIZE
	A	B	C	D	E	101-W		201-W		
						F		F		
3	7 ¹ / ₈	3	11	4	3/8	16	9 ¹ / ₂	11	3	
4	7 ³ / ₈	3	11	4	3/8	16	9 ¹ / ₂	11	4	
5	8 ³ / ₁₆	3	11	4	3/8	16	9 ¹ / ₂	11	5	
6	9 ³ / ₁₆	4	12	5	1/2	20	10 ¹ / ₂	12	6	
8	10 ³ / ₁₆	4	12	5	1/2	20	10 ¹ / ₂	12	8	
10	11 ³ / ₈	4	12	5	1/2	24	12	13	10	
12	12 ³ / ₈	4	12	5	1/2	24	12	13	12	
14	13 ¹ / ₂	4	12	5	1/2	24	12	13	14	
16	14 ¹ / ₂	4	12	5	1/2	24	12	14	16	
18	15 ¹ / ₂	4	12	5	1/2	24	12	14	18	
20	16 ¹ / ₂	4	12	5	1/2	24	12	14	20	
24	18 ¹ / ₂	4	12	5	1/2	28	13	15	24	

NOTES:

- See Page 2 for general information pertaining to Figure 101 and Figure 201 Pipe Guides and Supports.
- Dimension "A" is for nominal insulation thickness shown (Dimension "B"). For applications requiring thicker insulation, Dimension "A" will increase accordingly.
- Graphite is Epoxy bonded to steel for applications up to 350°F, epoxy bonded and mechanically attached for applications over 350°F.

FIG. 101-B and FIG. 201-B – BOLT DOWN BASE LOW FRICTION GRAPHITE GUIDES AND SUPPORTS FOR USE IN HOT SERVICE

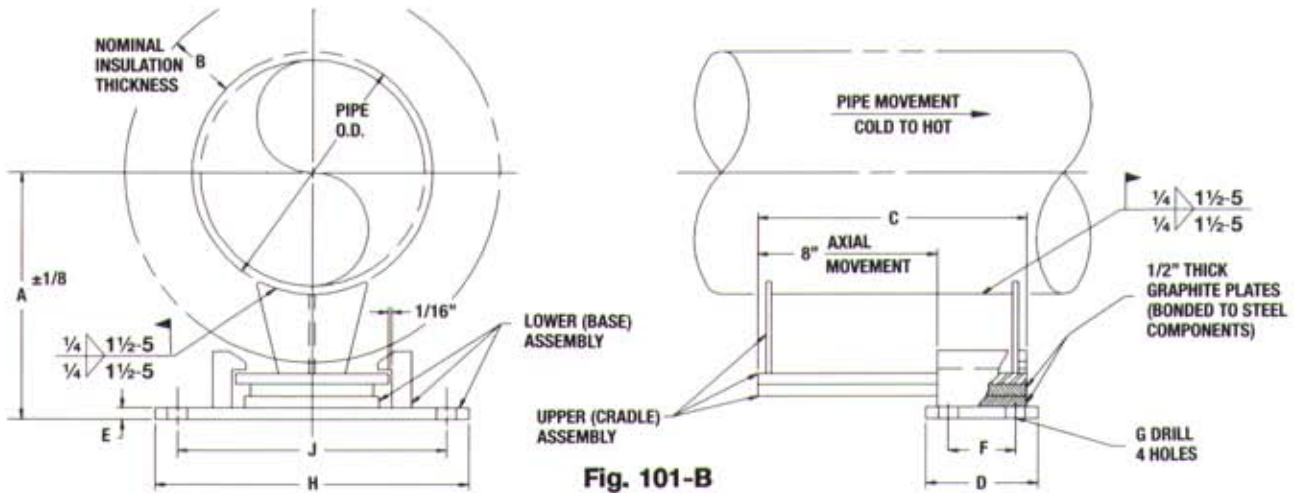


Fig. 101-B

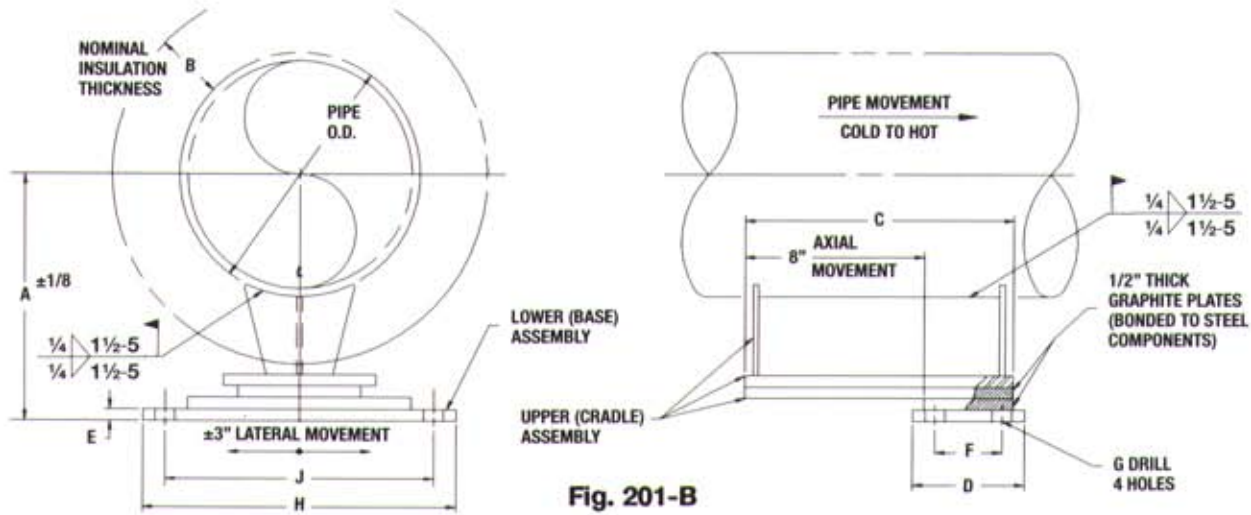


Fig. 201-B

PIPE SIZE	DIMENSIONS (inches)								GRAPHITE BEARING AREA (sq. in.)	FIG. NO.				PIPE SIZE
	A	B	C	D	E	F	G	101-B		201-B				
								H		J	H	J		
3	7 ¹ / ₈	3	11	4	3/ ₈	2 ¹ / ₂	3/ ₈	16	11 ¹ / ₂	10	14 ¹ / ₂	13	3	
4	7 ³ / ₈	3	11	4	3/ ₈	2 ¹ / ₂	3/ ₈	16	11 ¹ / ₂	10	14 ¹ / ₂	13	4	
5	8 ³ / ₁₆	3	11	4	3/ ₈	2 ¹ / ₂	3/ ₈	16	11 ¹ / ₂	10	14 ¹ / ₂	13	5	
6	9 ¹ / ₁₆	4	12	5	1/ ₂	3 ³ / ₄	3/ ₄	20	13	11 ¹ / ₄	16	14 ¹ / ₄	6	
8	10 ¹ / ₁₆	4	12	5	1/ ₂	3 ³ / ₄	3/ ₄	20	13	11 ¹ / ₄	16	14 ¹ / ₄	8	
10	11 ¹ / ₈	4	12	5	1/ ₂	3 ³ / ₄	7/ ₈	24	15	13	18	16	10	
12	12 ⁷ / ₁₆	4	12	5	1/ ₂	3 ³ / ₄	7/ ₈	24	15	13	18	16	12	
14	13 ¹ / ₂	4	12	5	1/ ₂	3 ³ / ₄	7/ ₈	24	15	13	18	16	14	
16	14 ¹ / ₂	4	12	5	1/ ₂	3 ³ / ₄	7/ ₈	24	15	13	18	16	16	
18	15 ¹ / ₂	4	12	5	1/ ₂	3 ³ / ₄	7/ ₈	24	15	13	18	16	18	
20	16 ¹ / ₂	4	12	5	1/ ₂	3 ³ / ₄	7/ ₈	24	15	13	18	16	20	
24	18 ¹ / ₂	4	12	5	1/ ₂	3	1	28	16	13 ³ / ₄	19	16 ³ / ₄	24	

NOTES:

- See Page 2 for general information pertaining to Figure 101 and Figure 201 Pipe Guides and Supports.
- Dimension "A" is for nominal insulation thickness shown (Dimension "B"). For applications requiring thicker insulation, Dimension "A" will increase accordingly.
- Graphite is Epoxy bonded to steel for applications up to 350°F, epoxy bonded and mechanically attached for applications over 350°F.

PRE-INSULATED GRAPHITE GUIDES AND SUPPORTS

FIG. 101M-W and FIG. 201M-W – WELD DOWN BASE

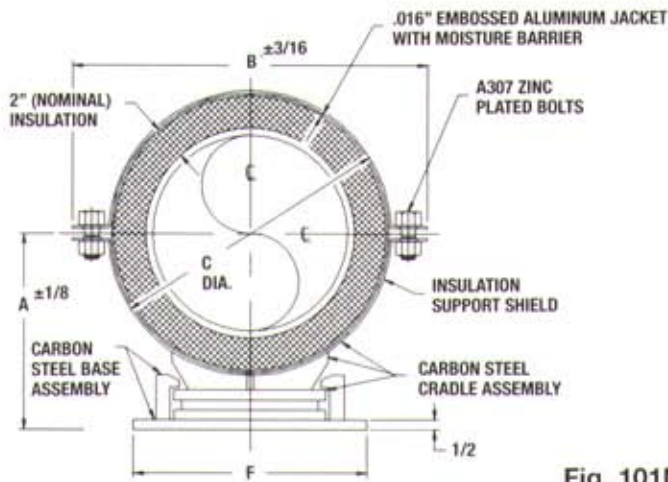


Fig. 101M-W

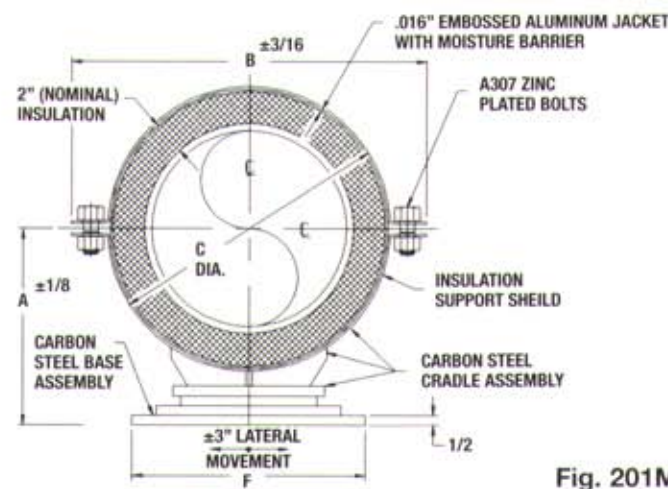
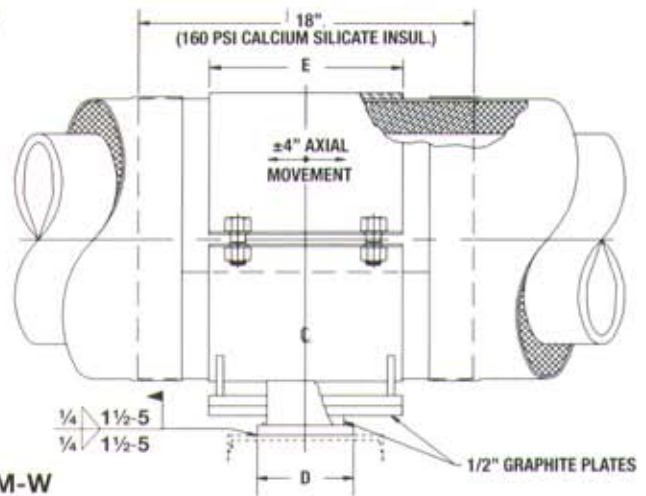
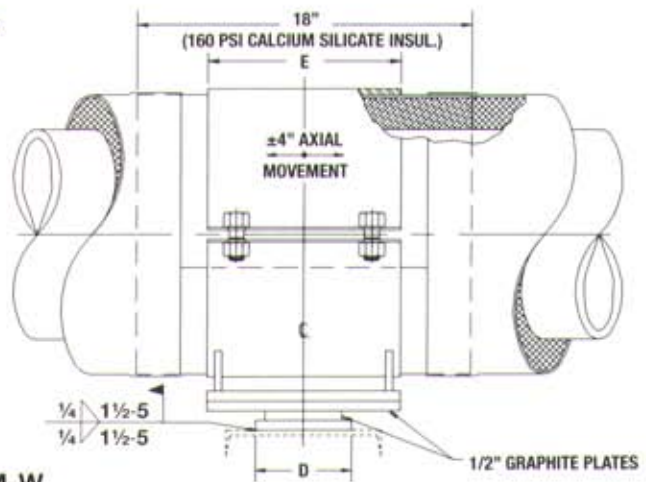


Fig. 201M-W



PIPE SIZE	LOAD RATING LBS.	DIMENSIONS (inches)					GRAPHITE BEARING AREA (sq. in.)	FIG. NO.		PIPE SIZE
		A	B	C	D	E		101M-W	201M-W	
3	1,100	7 $\frac{1}{4}$	11 $\frac{1}{2}$	8 $\frac{1}{8}$	4	10	12	8 $\frac{1}{2}$	11	3
4	1,500	7 $\frac{3}{4}$	12 $\frac{1}{2}$	9 $\frac{1}{8}$	4	10	12	8 $\frac{3}{4}$	11	4
5	1,800	8 $\frac{1}{4}$	13 $\frac{1}{2}$	10 $\frac{1}{8}$	4	10	12	8 $\frac{5}{8}$	11	5
6	2,600	9 $\frac{1}{8}$	14 $\frac{1}{4}$	11 $\frac{1}{4}$	5	12	20	9 $\frac{1}{2}$	12	6
8	3,400	10 $\frac{1}{8}$	17 $\frac{1}{8}$	13 $\frac{1}{4}$	5	12	20	9 $\frac{3}{4}$	12	8
10	4,300	11 $\frac{1}{4}$	19 $\frac{1}{8}$	15 $\frac{1}{2}$	5	12	20	10 $\frac{1}{2}$	12	10
12	5,100	12 $\frac{1}{4}$	21 $\frac{1}{8}$	17 $\frac{1}{2}$	5	12	20	10 $\frac{3}{4}$	12	12
14	5,600	13	22 $\frac{3}{8}$	18 $\frac{1}{2}$	5	12	24	11 $\frac{1}{2}$	13	14
16	6,400	14 $\frac{1}{8}$	24 $\frac{1}{8}$	20 $\frac{1}{2}$	5	12	32	13 $\frac{1}{8}$	15	16
18	7,200	15 $\frac{1}{8}$	26 $\frac{1}{4}$	22 $\frac{3}{8}$	5	12	32	14 $\frac{1}{8}$	15	18
20	8,000	16 $\frac{1}{8}$	28 $\frac{1}{4}$	24 $\frac{3}{8}$	5	12	32	14 $\frac{1}{2}$	15	20
24	11,200	18 $\frac{1}{8}$	32 $\frac{1}{4}$	28 $\frac{3}{8}$	5	14	40	15 $\frac{1}{2}$	17	24

NOTES:

1. See Page 2 for general information pertaining to Figure 101M and Figure 201M Pipe Guides and Supports.
2. Units furnished standard with split line horizontal as shown. Can be furnished with split line at 45° to permit pipe nesting.
3. Dimension "A" shown is for nominal 2" Thick Insulation. Thicker insulation available. An increase in insulation thickness will result in a corresponding increase in Dimension "A".
4. Load rating shown is based on XH pipe filled with water spaced in accordance with ANSI B31.1, (see Page 10). Guides and Supports with higher load rating available on application.

PRE-INSULATED GRAPHITE GUIDES AND SUPPORTS

FIG. 101M-B and FIG. 201M-B – BOLT DOWN BASE

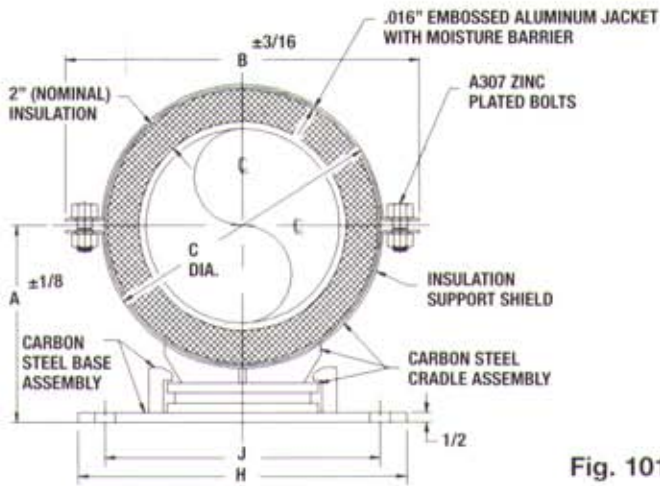


Fig. 101M-B

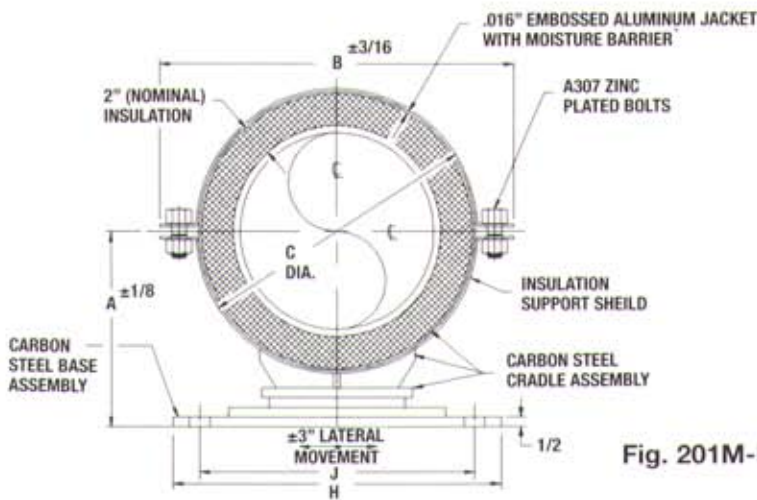
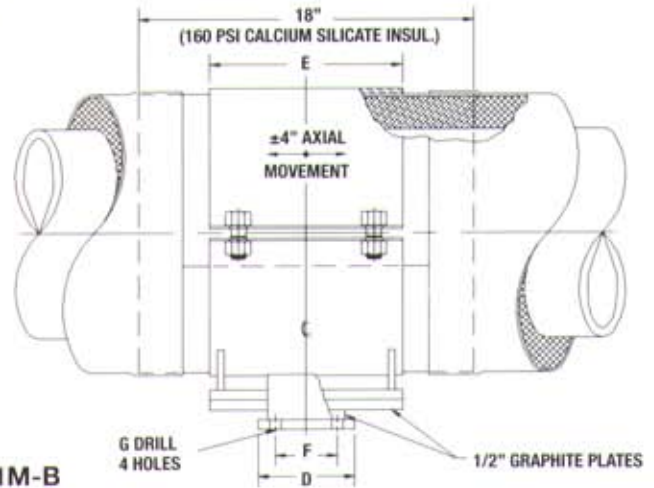
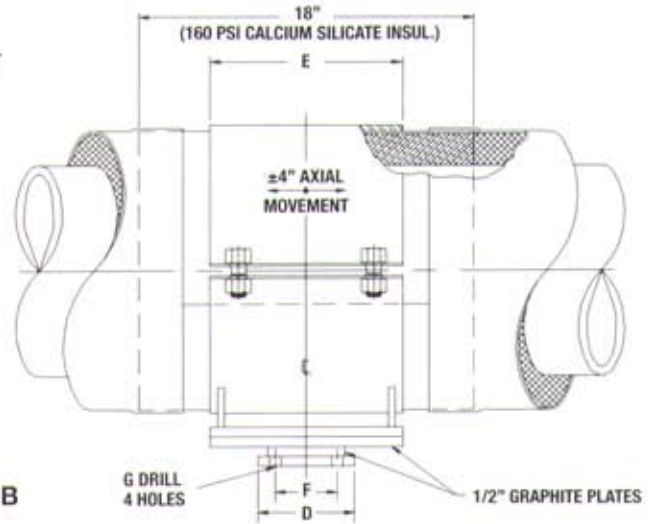


Fig. 201M-B



PIPE SIZE	LOAD RATING LBS.	DIMENSIONS (inches)							GRAPHITE BEARING AREA (sq. in.)	FIG. NO.				PIPE SIZE
		A	B	C	D	E	F	G		101M-B		201M-B		
									H	J	H	J		
3	1,100	7¼	11½	8¾	4	10	2½	¾	12	10½	9	13½	12	3
4	1,500	7¾	12½	9¾	4	10	2½	¾	12	10½	9	13½	12	4
5	1,800	8¼	13½	10¾	4	10	2½	¾	12	10½	9	13½	12	5
6	2,600	9¾	14¾	11¾	5	12	3¼	¾	20	12½	10¼	15	13¼	6
8	3,400	10½	17¾	13¾	5	12	3¼	¾	20	12½	10¼	15	13¼	8
10	4,300	11¼	19¾	15½	5	12	3¼	¾	20	14	12	16½	14½	10
12	5,100	12¼	21¾	17¾	5	12	3¼	¾	20	14	12	16½	14½	12
14	5,600	13	22¾	18½	5	12	3¼	¾	24	15	13	17½	15½	14
16	6,400	14¾	24¾	20¾	5	12	3¼	¾	32	17	15	19½	17½	16
18	7,200	15¾	26¾	22¾	5	12	3¼	¾	32	18	16	20½	18½	18
20	8,000	16¾	28¾	24¾	5	12	3¼	¾	32	18	16	20½	18½	20
24	11,200	18¾	32¾	28¾	5	14	3	1	40	19½	17¼	22	19¾	24

NOTES:

- See Page 2 for general information pertaining to Figure 101M and Figure 201M Pipe Guides and Supports.
- Units furnished standard with split line horizontal as shown. Can be furnished with split line at 45° to permit pipe nesting.
- Dimension "A" shown is for nominal 2" Thick Insulation. Thicker insulation available. An increase in insulation thickness will result in a corresponding increase in Dimension "A".
- Load rating shown is based on XH pipe filled with water spaced in accordance with ANSI B31.1, (see Page 10). Guides and Supports with higher load rating available on application.



ATS MODEL "CASA" PRE-INSULATED PIPE SADDLES

The ATS Model "CASA" pre-insulated pipe saddle is designed to simplify pipe installation and provide an uninterrupted run of insulated piping. This pipe saddle can be used in conjunction with all types of pipe supports and clevis hangers in addition to being used on flat surfaces. The Model "CASA" Pipe Saddle uses two (2) 180° sections of Hydrous Calcium Silicate Insulation. The insulation is bonded to a galvanized steel jacket which consists of a 180° bottom section and a 240° top section. The 240° top section provides a 30° overlap of the bottom section allowing the pipe saddle to clamp the pipe without additional fastening devices and eliminates the possibility of falling shields during installation.

MODEL "CASA" PIPE SADDLE:

DESIGNED FOR:

- Hot Water
- Steam
- Dual Temperature
- Chilled Water
- Air
- Gas

TEMPERATURE RANGE: Ambient to 1200°F

INSULATION MATERIAL:

- Hydrous Calcium Silicate
- K=0.4 with mean temperature of 200°F
- Compressive Strength: 140 psi
- Asbestos Free
- Thicker Insulation Available on Request

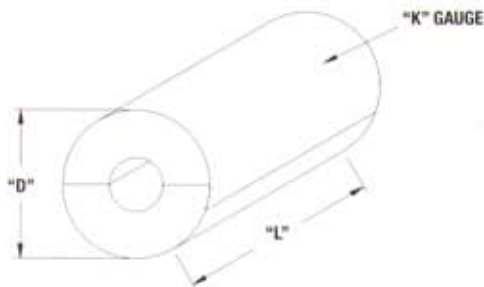
OUTER JACKET: Galvanized Steel

AVAILABLE SIZES:

- 1/2" to 12" NPS (Pipe)
- 5/8" to 4" Copper
- Larger Pipe Sizes Available on Request



**4" Model CASA-4
4" Pipe Saddle with 4" Cal Sil Insulation
with outer jacket cut back**



ORDER BY CATALOG NUMBER

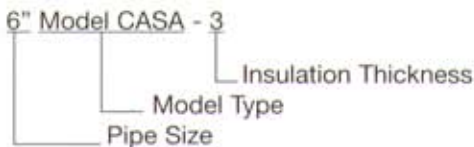


Table 2: Dimensions and Load Rating of CASA Pipe Saddles

PIPE SIZE NPS	LOAD RATING LBS.	1" THICK INSULATION			1-1/2" THICK INSULATION			2" THICK INSULATION			TUBE SIZE OD
		D	L	K	D	L	K	D	L	K	
—	40	3.13	6	20	3.75	6	20	—	—	—	5/8"
1/2" & 3/4"	40	3.13	6	20	4.25	6	20	5.25	6	18	7/8" & 1 1/8"
1"	65	3.75	6	20	4.75	6	18	5.80	6	18	1 3/8" & 1 1/2"
1 1/4"	85	3.75	6	20	5.25	6	18	5.80	6	18	—
1 1/2"	100	4.25	6	20	5.25	6	18	6.88	6	18	2 1/8"
2"	120	4.75	6	18	5.80	6	18	6.88	6	18	2 1/2"
2 1/2"	170	5.25	6	18	6.88	6	18	7.88	6	18	3 1/8"
3"	210	5.80	6	18	6.88	6	18	7.88	6	18	3 1/2"
4"	300	6.88	6	18	7.88	6	18	8.88	6	18	4 1/8"
5"	400	7.88	6	18	8.88	6	18	9.88	6	18	—
6"	510	8.88	9	18	9.88	9	18	11.0	9	18	—
8"	750	11.0	9	18	12.0	9	18	13.0	9	18	—
10"	1100	13.0	12	18	14.25	12	18	15.25	12	18	—
12"	1300	15.25	12	18	16.25	12	18	17.25	12	18	—

Load Rating:

The load rating shown in Table 2 is applicable when the pipe saddle is used in conjunction with a pipe clevis type hanger. When the saddle is used on a flat surface, use only 75% of the value shown. Refer to Table 3 on Page 9 for maximum hanger spacing for the ATS Model CASA Pipe Saddle.



ATS MODEL "CASA" PRE-INSULATED PIPE SADDLES

**Table 3:
Maximum Pipe Spacing with
CASA Saddles**

PIPE SIZE NPS	Recommended Maximum Support Spacing*		
	Per ANSI B31.1	CASA SADDLE CLEVIS HANGER	CASA SADDLE FLAT SURFACE
1½"	8	8	8
2"	10	10	10
2½"	11	11	10
3"	12	12	10
4"	14	14	10
5"	16	13	10
6"	17	13	10
8"	19	13	9
10"	22	13	9
12"	23	11	9

* Recommended Spacing based on Insulated Standard Wall Pipe filled with water.

NOTES:

1. Saddles available with heavier gauge sheet metal jacket and/or load distribution plate for higher load rating on application.
2. Pipe saddles for larger sizes and with thicker insulation available on application.
3. Saddles available with insulation exposed from sheet metal jacket.

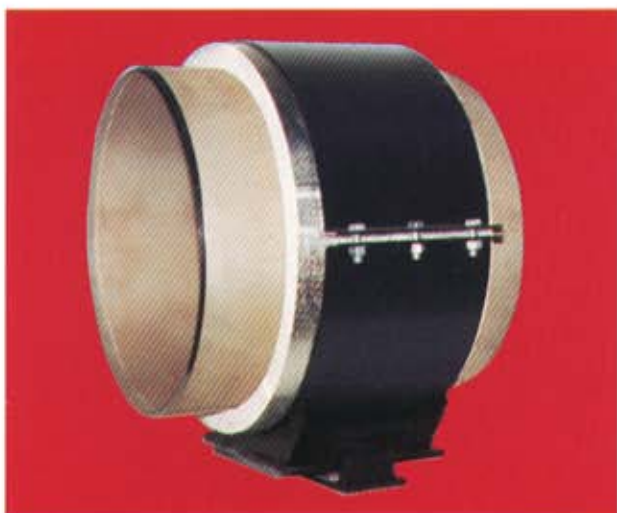


**1" Model CASA-2
Shown in Clevis Type
Hanger**

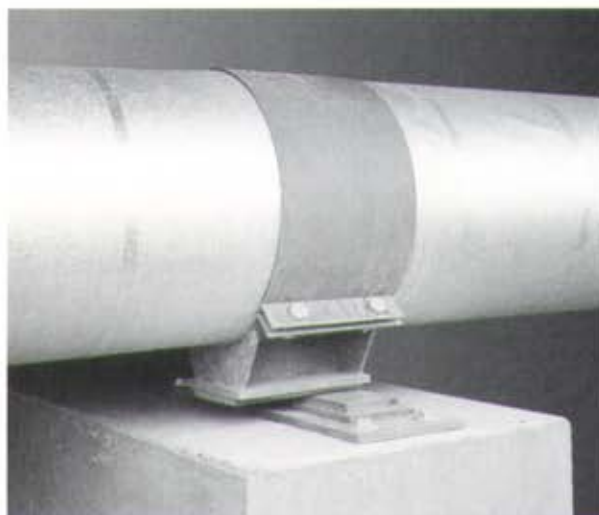


**1" Model CASA-2
Shown on Flat Surface**

PRE-INSULATED GRAPHITE GUIDES AND SUPPORTS



**30" Fig. 101M-W-2-8
30" Pre-Insulated Pipe Guide with 2" Insulation
and 8" Traverse**



**10" Fig. 201M-B-3-8-6
10" Pre-Insulated Pipe Support Installed in
HTHW Line at Dulles International Airport**



ATS MODEL "GA" RADIAL PIPE ALIGNMENT GUIDES

- ATS Model "GA" Radial Pipe Alignment Guides ensure positive pipe alignment by restricting pipe movement in all directions except along the axis of the pipe.
- **Recommended Choice as the "Primary" guide in piping systems which utilize the ATS Thermal Pak TP2 Expansion Joint. See "General Guidelines For Guiding and Supporting Pipe" for recommended spacing and locations of pipe guides and supports.**
- The "GA" Guide Assembly consists of a body cylinder which can be either bolted or welded to the support structure and a sliding spider that is attached to the pipe. The spider moves through the housing as the pipe expands and contracts.



10" GA16-2-8

10" GA Radial Pipe Guide for 2" Insulation and 8" Traverse

GENERAL GUIDELINES FOR GUIDING AND SUPPORTING PIPE:

1. The Primary and Intermediate Guide Spacings shown are for standard wall pipe and are satisfactory for above ground or tunnel installations. They are applicable to the following:
 - a. Single Expansion Joints with an integral anchor or Single Expansion Joints installed immediately adjacent to a line anchor.
 - b. Double Expansion Joints.
2. When a single expansion joint without base is installed in the center (or approximate center) of a pipe run, the primary guide spacing should be modified as follows:
 - a. Sizes 1-1/2" to 4" inclusive: Six (6) pipe diameters from each end of the expansion joint.
 - b. Sizes 5" to 24" inclusive: Three (3) pipe diameters from each end of the expansion joint.

To preclude the possibility of cocking the slip of heavier expansion joints, (sizes 6" and larger), a sliding support under the expansion joint body is recommended.
3. For buried conduit systems with expansion joints installed in manholes or vaults, a guide should be installed at the termination of the conduit pipe at the manhole wall (e.g., gland or link seal). In addition, consideration should be given to providing a "Moment" guide within 10 feet of the manhole wall (not to be integrally attached to the manhole wall). **LOW FRICTION NON-METALLIC "BRONZALON" GUIDE INSERTS SHOULD BE SPECIFIED FOR THE EXPANSION JOINT.**
4. **GUIDE/SUPPORT SELECTION:**

Primary Guides: The preferred designs are those that guide the pipe radially such as the ATS Models "GA" or "HL". For low profile systems the ATS Low Friction Figure 100, 101, and 101M Graphite Guides can be used, (consult factory for applications).

Intermediate Guides: The ATS Low Friction Figure 100, 101 and 101M Graphite Guides are recommended to reduce friction forces and eliminate corrosion of the sliding components.

Intermediate Supports: The ATS Low Friction Figure 200, 201 and 201M Graphite Supports are recommended to reduce friction forces and eliminate corrosion of the sliding components.
5. The pipe guiding and support spacing shown in Table 4 is the suggested maximum span as specified by the ASME/ANSI Power Piping Code B31.1, and is applicable for horizontal straight runs of pipe, without concentrated loads such as valves or heavy fittings between supports. The span distance applies to standard weight or heavier pipe operating at a maximum temperature of 750°F (400°C).
6. **LATERAL FORCES ON GUIDES:** Pipe Alignment Guides and their support structure may be subjected to lateral forces in addition to the frictional forces along the longitudinal axis of the pipe. It is recommended that alignment guides be designed to resist a lateral force equal to 250 lb./inch of nominal pipe size.

Table 4: Pipe Alignment Guide and Support Spacing

NOMINAL PIPE SIZE	PRIMARY (1st) GUIDE FROM END(S) OF SLIP (feet)	INTERMEDIATE GUIDE SPACING (feet)				PIPE SUPPORT SPACING (FEET)	
		PRESSURE (PSIG)				WATER	STEAM
		100	150	300	400		
1½	1½	8	8	7	7	8	10
2	2	9	9	8	8	10	13
2½	2	12	12	11	11	11	14
3	3	15	15	12	12	12	15
4	4	20	20	18	16	14	17
5	6	28	27	25	22	16	18
6	6	35	33	30	27	17	21
8	8	48	45	40	35	19	24
10	8	65	60	55	50	22	27
12	12	75	70	60	55	23	30
14	12	80	75	65	60	25	32
16	16	90	85	75	70	27	35
18	20	100	95	85	80	28	37
20	20	110	105	95	90	30	39
24	25	130	125	110	100	32	42



MODEL "GA" GUIDES - SELECTION CHART AND DIMENSIONS

Table 5: Body Size Selection Chart for GA Guides

PIPE SIZE	INSULATION THICKNESS							PIPE SIZE
	1"	1½"	2"	2½"	3"	3½"	4"	
½"	GA04	GA04	GA05	GA06	GA08	GA08	GA10	½"
¾"	GA04	GA05	GA06	GA08	GA08	GA10	GA10	¾"
1"	GA04	GA05	GA06	GA08	GA08	GA10	GA10	1"
1¼"	GA04	GA05	GA06	GA08	GA08	GA10	GA10	1¼"
1½"	GA05	GA05	GA06	GA08	GA08	GA10	GA10	1½"
2"	GA05	GA06	GA08	GA08	GA10	GA10	GA12	2"
2½"	GA06	GA06	GA08	GA08	GA10	GA10	GA12	2½"
3"	GA06	GA08	GA08	GA10	GA10	GA12	GA12	3"
4"	GA08	GA08	GA10	GA10	GA12	GA12	GA14	4"
5"	GA10	GA10	GA10	GA12	GA12	GA14	GA16	5"
6"	GA10	GA10	GA12	GA12	GA14	GA16	GA16	6"
8"	GA12	GA12	GA14	GA16	GA16	GA18	GA18	8"
10"	GA16	GA16	GA16	GA18	GA18	GA20	GA20	10"
12"	GA18	GA18	GA18	GA20	GA20	GA22	GA22	12"
14"	GA20	GA20	GA20	GA20	GA22	GA22	GA24	14"
16"	GA22	GA22	GA22	GA22	GA24	GA24	GA26	16"
18"	GA24	GA24	GA24	GA24	GA26	GA26	GA30	18"
20"	GA26	GA26	GA26	GA26	GA30	GA30	GA30	20"
24"	GA30	GA30	GA30	GA30	O/A	O/A	O/A	24"

Table 6: Standard Traverse

GA Guides are available with thicker insulation and longer traverse on request.

BODY SIZE	STANDARD TRAVERSE				
	3"	4"	6"	8"	12"
04	X			X	X
05	X			X	X
06	X			X	X
08	X			X	X
10		X		X	X
12		X		X	X
14			X	X	X
16			X	X	X
18			X	X	X
20			X	X	X
22				X	X
24				X	X
26				X	X
30				X	X

ORDER BY CATALOG NUMBER

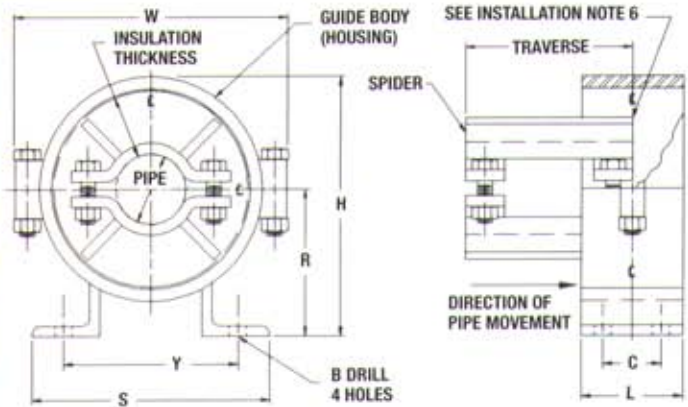
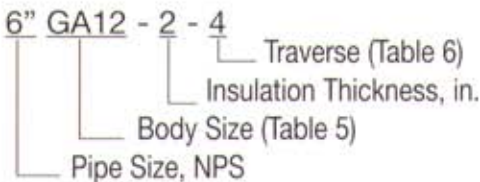


Table 7: Dimensions for Standard GA Guides

BODY SIZE	DIMENSIONS (INCHES)								BODY SIZE
	H	R	W	Y	B	C	L	S	
04	5¼	3½	5⅞	4¼	⅝	1¼	3	5½	04
05	6¼	4	7	4½	⅝	1¼	3	5¾	05
06	7⅞	4⅞	8	5¼	⅝	1¼	3	6½	06
08	9½	5¼	10⅞	6¼	⅝	1¼	3	7⅞	08
10	11⅞	6¼	12½	7¼	⅝	2¼	4	9	10
12	13⅞	7¼	14½	8¼	⅝	2¼	4	9⅞	12
14	15	8	15¼	10	¾	4	6	11¼	14
16	17	9	17¼	11	¾	4	6	13	16
18	18¾	9¾	20⅞	12	¾	4	6	13¾	18
20	21⅞	11⅞	22⅞	13½	¾	4	6	16	20
22	23⅞	12⅞	24⅞	14½	⅞	6	8	17	22
24	25	13	26⅞	15½	⅞	6	8	18	24
26	27¾	14¾	28⅞	17½	1⅞	6	8	19½	26
30	31½	16½	32⅞	19½	1⅞	6	8	22¼	30

NOTES:

1. Material: Carbon Steel.
2. Finish: One coat shop primer paint for rust protection.
3. Guide body can be split at 45° to permit pipe nesting.
4. Special guides available on request.
5. Body Size 14 and larger are supplied with four (4) bolts on body.
6. Position of guide spider at housing centerline at ambient temperature.
7. Pre-Insulated models available for chilled/cold water applications.

ATS Model HL & HLS **Heavy-Duty** Radial Pipe Alignment Guides with a split Cast Iron Guide Spider are available on application. Model "HL" is furnished with a one-piece guide cylinder while the "HLS" is furnished with a split guide cylinder. Insulation thickness is limited. Dimensions furnished on application.



ANCHOR FORCES - SLIP JOINT INSTALLATIONS

All piping systems must be divided into individual expanding segments by means of anchors which are attached to the piping and in turn to a support structure. Machinery and equipment, such as turbines and pumps are also considered anchors, since their bases are fixed and resist all forces and moments imposed upon them.

The installation of a slip type expansion joint, like any other axial motion type expansion joint, introduces forces which must be resisted by the anchors. Anchors can be categorized as either main or intermediate type, depending upon the forces they must withstand.

The main anchors must resist forces which involve the internal pressure of the system as well as frictional resistance of pipe supports and expansion joint packing. Intermediate anchors usually involve only the frictional forces of the system.

In the adjacent table the various forces acting on a **Main Anchor** have been summarized and totaled. The anchor force at two system pressures are shown. The support friction, F_s is based on a mean coefficient of friction of 0.35. The use of Low Friction Graphite Guides and Supports, i.e., ATS Figure 101 and 201 will reduce the value of F_s shown by 55%. The expansion joint packing friction, F_c is based on the value of 1000 lb./nominal inch of pipe diameter, a value used by ATS. The pressure thrust, F_p , is the product of the thrust area times the operating pressure. The value of F_{ma} shown is the sum of all the forces that can act on a Main Anchor simultaneously.

Intermediate anchors which are located in straight runs of pipe are not subjected to pressure thrust. However, if an isolation valve is located in the run, one or both of the anchors on either side of the valve may become a main anchor depending on the location of expansion joints.

The forces shown are for axial loads only. There are many cases in which forces will impose **moments** on a main anchor and must be considered in the anchor design. Moments can be due to branch connections, placement of the anchor at some distance from a change in direction, or other external forces. It is essential in anchor design that all forces and moments be considered.

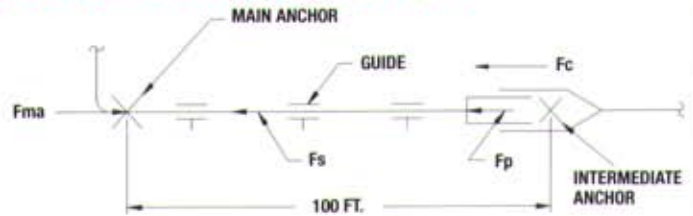


Table 8: Axial Forces Acting on Main Anchors

PIPE SIZE	THRUST AREA, in ²	FORCE TO COMPRESS Fc, (LBS)	SUPPORT FRICTION Fs, (LBS) per 100 ft	PRESSURE THRUST @ PSI, Fp-(LBS)		MAIN ANCHOR LOAD @ PSI, Fma-(LBS)	
				150	300	150	300
1½"	2.8	1,500	215	420	840	2,455	2,938
2"	4.4	2,000	270	660	1,320	3,370	4,129
2½"	6.5	2,500	390	975	1,950	4,444	5,566
3"	9.6	3,000	485	1,440	2,880	5,664	7,319
4"	15.9	4,000	735	2,385	4,770	8,188	10,931
5"	24.3	5,000	1,005	3,645	7,290	11,098	15,289
6"	34.5	6,000	1,315	5,175	10,350	14,365	20,315
8"	58.4	8,000	2,030	8,760	17,520	21,609	31,683
10"	90.8	10,000	3,000	13,620	27,240	30,613	46,276
12"	127.7	12,000	3,900	19,155	38,310	40,313	62,341
14"	153.9	14,000	4,500	23,085	46,170	47,823	74,371
16"	201.0	16,000	5,500	30,150	60,300	59,398	94,070
18"	254.5	18,000	6,710	38,175	76,350	72,318	116,219
20"	314	20,000	7,920	47,100	94,200	86,273	140,438
24"	452	24,000	10,770	67,000	135,600	117,036	195,926

$F_{ma} = 1.15 \times (F_c + F_s + F_p)$
 (Above Table shows F_{ma} at two System Pressures and includes 15% safety factor for transient loads.)



16" Fig. 701-SPC-B-2
 16" Pipe Anchor for 300 PSI System with 6" Branch Connection



8" Fig. 701-SPC-B-1
 8" Main Anchor Designed for 400 PSI System with 8" Schedule 80 Pipe Spool

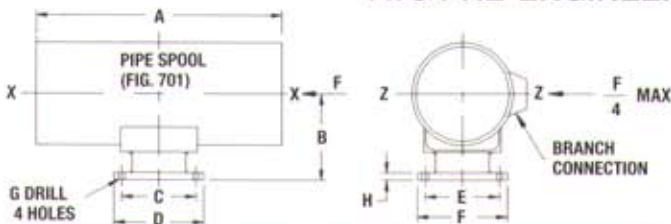


ATS PRE-ENGINEERED MAIN ANCHORS

FIG. NO. 701 and FIG. No. 702

ATS pre-engineered factory manufactured anchors offer the assurance of knowing the anchor will be properly designed and fabricated to meet the application requirements. Designs are easily modified to accommodate various centerline heights and load requirements. ATS can supply the anchor either attached to a spool section with ends to match the mating pipe, or as a loose assembly for field attachment to the pipeline. Branch connections up to the size of the pipeline can be incorporated for simplified field installations. All branch connections are forged steel Weld-O-Lets to ensure code compliance. In many instances due to high loads and moments imposed on a main anchor, it is desirable to have the anchor base assembly attached to a spool section that has a heavier wall thickness than that of the main pipe run, a feature that can be easily accommodated in an ATS pre-engineered factory manufactured anchor. In cases when the spool has a heavier wall thickness than the mating pipe, the ends of the spool are machined and beveled for welding to match the mating pipe. ATS also can offer **PRE-INSULATED ANCHORS** for applications in chilled water lines when it is desirable not to have direct metal contact between the pipeline and the support structure. Contact the local ATS Sales Representative or the factory for complete details.

ATS PRE-ENGINEERED ANCHORS



**Table 9:
Standard Anchors**

PIPE SIZE	DIMENSIONS, inches								F LBS.
	A	B	C	D	E	F	G	H	
1½"	12	4	4	5½	4	5½	¾	½	2,500
2"	12	4¼	4	5½	4	5½	¾	½	3,500
2½"	12	4¾	4	5½	4	5½	¾	½	4,500
3"	12	5	4½	6	4¼	6	¾	½	5,700
4"	12	5¾	4¾	7	4¾	7	¾	½	8,500
5"	12	6½	5¾	8	5¾	8	¾	½	11,500
6"	12	7¼	5¾	8	5¾	8	¾	½	15,000
8"	18	8¾	7½	10	7½	10	1	¾	22,000
10"	18	10½	8	10½	9½	12	1½	1	32,000
12"	18	11¼	8½	12	11½	14½	1¾	1	40,000
14"	18	12¼	10½	14	12	16	1¾	1	45,000
16"	18	13½	10½	14	12½	16	1½	1¼	55,000
18"	20	15	11	15	13	17	1¾	1¼	79,000
20"	22	16¼	13½	18	13½	18	1¾	1¼	89,000
24"	24	18¾	14	19	14	19	2½	1½	120,000

NOTES:

- Anchor Components are fabricated from ASTM A36 and A106 material. Pipe spool for Fig. 701 anchors is X-heavy ASTM A106 Gr. B Seamless Pipe with ends beveled to match standard wall pipe per B16.25 unless specified otherwise.
- Anchors for higher load requirements or branch connections, located other than as shown, are specially designed to suit the application. ATS must be provided with load requirements and/or branch locations when required. Drawings for special anchors shall be furnished for approval.
- For applications, greater than 600°F, a high density isolation pad can be furnished for insulating the anchor base plate from the concrete anchor pedestal to prevent degradation of the concrete.
- Load ratings are based upon the use of heavy hex anchor bolting (furnished by others) equal to ASTM A-325 Tensile Requirements. Bolt diameters are 1/8" less than the drilled hole, Dimension "G" shown in Table 9.
- Anchors constructed to the load ratings and dimensions shown in Table 9 are designated "STD" rating in the catalog number. Special anchors as described in Note 2 above, are designated "SPC" rating in the catalog number.

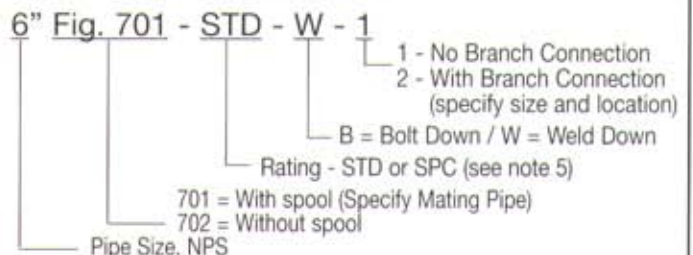


**6" Fig. 702-STD-B
6" Pipe Anchor without Spool**



**6" Fig. 701-STD-B-1
6" Pipe Anchor with Spool**

ORDER BY CATALOG NUMBER:





SPECIFICATIONS

LOW FRICTION GRAPHITE PIPE GUIDES AND PIPE SUPPORTS - ATS FIG. NO. 101 and 201:

1. All pipe guides/supports shall be fabricated by a supplier regularly engaged in the manufacture of these items. No work that can be completed by the manufacturer shall be left for completion in the field.
2. Pipe guides/supports shall utilize 1/2" Thick Low Friction Graphite on **both the upper and lower** backing plates of each assembly. The low friction graphite must have a coefficient of friction of 0.15 or less and a compressive strength of 2000 psi or greater. The guides/supports shall have sufficient contact surface between the upper and lower assemblies to ensure the loading does not exceed 300 psi.
3. Steel components shall be fabricated from ASTM A36 steel or equivalent.
4. Pipe guides/supports shall accommodate as a minimum the insulation thickness specified for the mating pipe.
5. The upper assembly shall be attached to the pipeline by field welding. The lower assembly shall be attached to the structural support by field welding or bolting as shown on the plans.
6. **Pipe Guides:** Pipe Guides shall be Advanced Thermal Systems, Inc. Fig. No. 100 or 101. All guides shall be constructed to allow a minimum 8"(*) of axial movement and a maximum $\pm 1/16"$ of lateral and 1/8" vertical up movement. The hold down bars that resist both the lateral and vertical up movement shall be machined from a one-piece carbon steel bar and be suitable to withstand 5,000 lbs. lifting force and 5,000 lbs. lateral force..
7. **Pipe Supports:** Pipe Supports shall be Advanced Thermal Systems, Inc. Fig. No. 200 or 201. Supports shall be constructed to allow a minimum 8"(*) of axial movement and $\pm 3"$ (*) of lateral movement.
8. The Graphite shall be epoxy bonded to the backing plate for all applications. If service conditions in the pipeline exceed 350°F, the Graphite shall be **both** epoxy bonded and **mechanically attached**.
9. Carbon steel components shall be painted with one coat of red oxide shop primer (Hot Dipped Galvanized or Epoxy Painted, optional).

PRE-INSULATED LOW FRICTION GRAPHITE PIPE GUIDES AND PIPE SUPPORTS - ATS FIG. NO. 101M and 201M:

1. All pipe guides/supports shall be fabricated by a supplier regularly engaged in the manufacture of these items. No work that can be completed by the manufacturer shall be left for completion in the field.
2. Pipe guides/supports shall utilize 1/2" Thick Low Friction Graphite on **both the upper and lower** backing plates of each assembly. The low friction material must have a coefficient of friction of 0.15 or less and a compressive strength of 2000 psi or greater. The guides/ supports shall have sufficient contact surface between the upper and lower assemblies to ensure the loading does not exceed 300 psi.
3. Steel components shall be fabricated from ASTM A36 steel or equivalent.
4. Pipe guides/supports shall be furnished with 2"(*) thick nominal of insulation. The insulation shall be Calcium Silicate having a minimum compressive strength of

160 psi. The insulation shall be furnished complete with both an ASJ vapor resistant jacket and a 0.016 thick Aluminum Jacket.

5. The pipe guides/supports shall have a minimum load rating sufficient to support Insulated Extra Heavy Wall Pipe filled with water and spaced in accordance with that recommended by ANSI B31.1.
6. The upper assembly shall be attached to the pipeline by clamping the insulation between two 180° shields using ASTM A307 and ASTM A563 plated bolting and nuts. The lower assembly shall be attached to the support structure by field welding or bolting as shown on the plans.
7. **Pipe Guides:** Pipe Guides shall be Advanced Thermal Systems, Inc. Fig. No. 101M. All guides shall be constructed to allow a minimum $\pm 4"$ (*) of axial movement and a maximum $\pm 1/16"$ of lateral and 1/8" vertical up movement. The hold down bars that resist both the lateral and vertical up movement shall be machined from carbon steel bar and be suitable to withstand 5,000 lbs. lifting force and 5,000 lbs. lateral force.
8. **Pipe Supports:** Pipe Supports shall be Advanced Thermal Systems, Inc. Fig. No. 201M. All supports shall be constructed to allow a minimum $\pm 4"$ (*) of axial movement and $\pm 3"$ (*) of lateral movement.
9. The Graphite shall be epoxy bonded to the steel for all applications.
10. All carbon steel components shall be painted with one coat of red oxide shop primer (Hot Dipped Galvanized or Epoxy Painted, optional).

PIPE ANCHORS:

1. Pipe anchors shall be pre-engineered and fabricated as completely as possible by a supplier regularly engaged in the manufacture of these items. No work that can be completed by the manufacturer shall be left for completion in the field.
2. Anchors shall be constructed from A36 and A106 or equivalent Carbon Steel material.
3. Pipe anchors which are to serve as main anchors shall be designed to withstand the following axial forces:
 - Pressure Thrust based on Design Pressure
 - Friction Force of Packed Expansion Joints
 - Friction Force of Pipe Guides and SupportsAnchors which are to serve as intermediate anchors shall be designed to withstand the following axial forces:
 - Friction Force of Packed Expansion Joints
 - Friction Force of Pipe Guides and SupportsAnchors shall be designed so that the allowable stress values specified in ASME/ANSI for the materials used are not exceeded at the system design pressure.
4. Anchors shall be furnished with a spool section and have ends beveled and machined to match the mating pipe. Where required, Anchors shall be furnished with Branch Connections and shall be designed to withstand both the axial forces of the main run and the axial forces and moments imposed by the branch line. The branch connection (schedule and ends as specified) shall be accomplished by a Forged Steel Weld-O-Let .
5. All carbon steel components shall be painted with one coat of red oxide shop primer.

***SPECIFY IF OTHER THAN SHOWN**



Wall Thickness
Top Numbers

Weight Per Foot
Bottom Numbers

Table 10
ANSI B36.1 CARBON STEEL PIPE SCHEDULE

PIPE SIZE	O.D. (inches)	5	10	20	30	40	STD.	60	80	E.H.	100	120	140	160	DBLE. E.H.
1/8"	.405	.035 .1383	.049 .1863			.068 .2447	.068 .2447		.095 .3145	.095 .3145					
1/4"	.540	.049 .2570	.065 .3297			.088 .4248	.088 .4248		.119 .5351	.119 .5351					
3/8"	.675	.049 .3276	.065 .4235			.091 .5676	.091 .5676		.126 .7388	.126 .7388					
1/2"	.840	.065 .5383	.083 .6710			.109 .8510	.109 .8510		.147 1.088	.147 1.088				.187 1.304	.294 1.714
3/4"	1.050	.065 .6838	.083 .8572			.113 1.131	.113 1.131		.154 1.474	.154 1.474				.218 1.937	.308 2.441
1"	1.315	.065 .8678	.109 1.404			.133 1.679	.133 1.679		.179 2.172	.179 2.172				.250 2.844	.358 3.659
1 1/4"	1.660	.065 1.107	.109 1.806			.140 2.273	.140 2.273		.191 2.997	.191 2.997				.250 3.765	.382 5.214
1 1/2"	1.900	.065 1.274	.109 2.085			.145 2.718	.145 2.718		.200 3.631	.200 3.631				.281 4.859	.400 6.408
2"	2.375	.065 1.604	.109 2.638			.154 3.653	.154 3.653		.218 5.022	.218 5.022				.343 7.444	.436 9.029
2 1/2"	2.875	.083 2.475	.120 3.531			.203 5.793	.203 5.793		.276 7.661	.276 7.661				.375 10.01	.552 13.70
3"	3.500	.083 3.029	.120 4.332			.216 7.576	.216 7.576		.300 10.25	.300 10.25				.437 14.32	.600 18.58
3 1/2"	4.000	.083 3.472	.120 4.973			.226 9.109	.226 9.109		.318 12.51	.318 12.51					.636 22.85
4"	4.500	.083 3.915	.120 5.613			.237 10.79	.237 10.79	.281 12.66	.337 14.98	.337 14.98	.437 19.01			.531 22.51	.674 27.54
4 1/2"	5.000						.247 12.53			.355 17.61					.710 32.53
5"	5.563	.109 6.349	.134 7.770			.258 14.62	.258 14.62		.375 20.78	.375 20.78	.500 27.04			.625 32.96	.750 38.55
6"	6.625	.109 7.585	.134 9.289			.280 18.97	.280 18.97		.432 28.57	.432 28.57	.562 36.39			.718 45.30	.864 53.16
7"	7.625						.301 23.57			.500 38.05					.875 63.08
8"	8.625	.109 9.914	.148 13.40	.250 22.36	.277 24.70	.322 28.55	.322 28.55	.406 35.64	.500 43.39	.500 43.39	.593 50.87	.718 60.93	.812 67.76	.906 74.69	.875 72.42
9"	9.625						.342 33.90			.500 48.72					
10"	10.750	.134 15.19	.165 18.70	.250 28.04	.307 34.24	.365 40.48	.365 40.48	.500 54.74	.593 64.33	.500 54.74	.718 76.93	.843 89.20	1.000 104.1	1.125 115.7	
11"	11.750						.375 45.55			.500 60.07					
12"	12.750	.165 22.18	.180 24.20	.250 33.38	.330 43.77	.406 53.53	.375 49.56	.562 73.16	.687 88.51	.500 65.42	.843 107.2	1.000 125.5	1.125 139.7	1.312 160.3	
14"	14.000		.250 36.71	.312 45.68	.375 54.57	.437 63.37	.375 54.57	.593 84.91	.750 106.1	.500 72.09	.937 130.7	1.093 150.7	1.250 170.2	1.406 189.1	
16"	16.000		.250 42.05	.312 52.36	.375 62.58	.500 82.77	.375 62.58	.656 107.5	.843 136.5	.500 82.77	1.031 164.8	1.218 192.3	1.437 223.5	1.593 245.1	
18"	18.000		.250 47.39	.312 59.03	.437 82.06	.562 104.8	.375 70.59	.750 138.2	.937 170.8	.500 93.45	1.156 208.0	1.375 244.1	1.562 274.2	1.781 308.5	
20"	20.000		.250 52.73	.375 78.60	.500 104.1	.593 122.9	.375 78.60	.812 166.4	1.031 208.9	.500 104.1	1.280 256.1	1.500 296.4	1.750 341.1	1.968 379.0	
24"	24.000		.250 63.41	.375 94.62	.562 140.8	.687 171.2	.375 94.62	.968 238.1	1.218 296.4	.500 125.5	1.531 367.4	1.812 429.4	2.062 483.1	2.343 541.9	

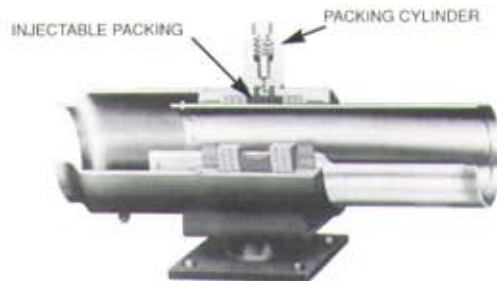
ATS THERMAL PAK TP2 EXPANSION JOINTS AND P2 FLEXIBLE BALL JOINTS DESIGNED FOR PACKING INJECTION UNDER FULL LINE PRESSURE



Two of eight 54" TP2's for Flare Gas service for a Midwest Refinery.



Installation of one of the 54" Dble. TP2 Expansion Joints pictured at left. This Refinery has 34 other TP2's installed.



Typical cross section of a TP2 Expansion Joint with low friction guide inserts - **an ATS first.**



103 - 18" TP2's designed for 875 PSIG/800°F were furnished in 1984 for a 5.5 mile Midwest steam Cogeneration transmission pipeline to replace multi-ply Inconel 600 Externally Pressurized Bellows Expansion Joints that were in service only a few months.



14" TP2 designed for 950 PSIG/760°F. Highest Pressure packed Expansion Joint designed for packing injection at full line pressure ever furnished by any manufacturer - **another ATS first.**



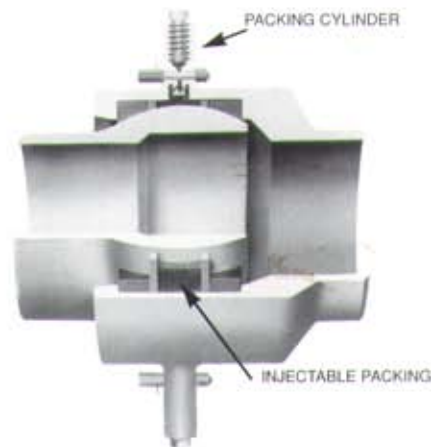
Modern machining facilities allows consistent close tolerances. 59" diam. CNC shown is one of three CNC's used for in-house machining of all components of the TP2 Expansion Joint and Flexible Ball Joints.



26" P2 Ball Joints for use in a Cogeneration facility. Note integral socket/retainer design - **an exclusive ATS design.**



Removable, Reusable Insulation Blankets are available for both Ball Joints and TP2 Expansion Joints. **ATS first to offer this option.**



Cross section of P2 Ball Joint with Type "B" Packing Cylinders which incorporate a positive shut-off valve for high pressure applications - **still another ATS first.**



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