



DOC NO.141
Rev.12
3/17/2015

Basic-PSA

the Original Mechanical Snubber

INSTRUCTION MANUAL

INSTALLATION AND MAINTENANCE MECHANICAL SHOCK ARRESTORS

MODELS

PSA-1/4

PSA-1/2

PSA-1

PSA-3

PSA-10

PSA-35

PSA-100



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DOC. NO. 141 RECORD OF REVISIONS

DATE	REV NO	COMMENTS
May 1977	1	Revision #1 is a complete re-write and is a result of comments and additional experience. The manual has been divided into five sections: • A general information section, applicable to all of the listed BASIC-PSA Mechanical Shock Arrestors • Models PSA-1/4 and PSA-1/2 in Section I. • Models PSA-1, PSA-3, PSA-10 in Section II. • Models PSA-35 and PSA-100 in Section III. • Section IV deals with the installation of pipe clamps. Requested deviations to this manual must be negotiated and supplied under a different document number. Rev. #1 abbreviates the description, deletes certain options, which were not being requested, isolates cautionary notes into one area and simplifies the spare parts recommendations.
April 1980	2	Clarified Table of Contents and added reference to additional, related manuals by means of a note. Corrected typographical error on Page 14.
February 1981	3	Added Section IV
April 1982	4	Clarified breakaway force data for inspection on Page 10.
June 1983	5	Revised Table 1 of Section IV to incorporate additional torque values.
June 1985	6	Corrected Typographical error on Page 9, 12 and 13. Revised Torque Values on Table 1 of Section IV.
October 1985	7	Added data and revised some torque values on Table 1 of Section IV.
August 1980	8	Added revised and updated information. Initial issue by Basic-PSA, Inc.
November 2006	9	New letterhead-New Repair & Regrease References added (PS 501, 502, 503)
May 2012	10	Added instructions for disassembly, welding, & reassembly of transition tube assemblies:
October 2012	11	Revised Table 4-1. Bolt Torque per BE-419 Clamp Torque Testing and Analysis Final Report, CTC Document Control Number 12-7537, Dated October 1, 2012
March 2015	12	Revised 2.6 & 3.6 to reference DR3020. Deleted 2.7 para 5 & 3.7 para. 3.



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NOTE: For repair and overhaul refer to BASIC-PSA Documents:
PS 501 / PS 192 (Models PSA 1/4 and 1/2)
PS 502 / PS 193 (Models PSA 1, PSA 3 and PSA 10)
PS 503 / PS 194 (Models PSA 35 and PSA 100)



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SECTION I GENERAL

1.1 DESCRIPTION

Mechanical Shock Arrestors manufactured by BASIC-PSA, Johnstown, Pa, are devices used to prevent seismic shock forces from causing damaging motions in piping and related systems. The arrestors, purely mechanical in design, control such motion by becoming load carrying members between the piping or related systems and building structure when a force sufficient to cause abnormal motion is initiated. This potentially damaging motion is arrested and absorbed to acceptable limits. During normal thermal expansion or contraction of the piping or related systems the arrestors telescope freely in either direction through their full operating stroke.

1.2 PACKAGING

All arrestors manufactured by BASIC-PSA are packaged in accordance with American National Standards ANSI N45.2.2-1972 (Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants (During Construction Phase) Level C which in essence states: "items shall be protected from exposure to salt spray, rain, dust, dirt, and other airborne and windblown contaminants". To insure compliance with ANSI N45.2.2-1972, BASIC-PSA has generated in house packaging documents covering the various sizes of arrestors. Larger containers than those indicated below are customized if welded extensions or lengths of pipe are included.

All arrestors, Models PSA-1/4, PSA-1/2, PSA-1 PSA-3 and PSA-10 are packaged in corrugated boxes, one item per box, and supported in the box with an end pad. Accessories, if any will be installed, size permitting.

Models PSA-35 and PSA-100 are cradle mounted on wooden skids and metal band around the lid of the same material.

All arrestor packages are marked on the outside with a minimum of: customer purchase order number, mark number, (if applicable), BASIC-PSA serial and part number. If arrestors are returned to BASIC-PSA, packaging shall be equivalent to the foregoing.



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1.3 STORAGE

At arrival on site, if the arrestors are not to be inspected and installed immediately, the containers shall be stored in a building so that the containers are protected from inclement weather, in accordance with ANSI N45.2.2-1972. However, before storage, all the containers shall be inspected for external damage that may have been caused during transit. Containers showing signs of external damage should be opened and the contents inspected immediately. Any visual damage or defect found to the contents shall be reported to BASIC-PSA within 24 hours, along with all the data shown on the containers.

It is recommended that a forklift or similar equipment be used when storing PSA-35 and PSA-100 arrestors. When unpacking these arrestors for installation, it is recommended that some movable or traveling hoist device is used.

1.4 CAUTION NOTES

The following notes provide a summary of the caution notes contained in this manual. Read the following summary to become acquainted with the precautions to be observed.

- a. At no time shall installed arrestors be used as steps or handholds.
- b. No welding shall be performed with snubber attached.
- c. When arc welding, do not attach ground to arrestor or any part of the arrestor which will cause arcing current to pass through arrestor.
- d. For PSA-1/4, 1/2, 1, 3, & 10 snubbers: before welding, be sure the forward adapter and the snubber are oriented so that the two ends will fit properly in their respective fittings such as a pipe clamp & rear bracket.
- e. For PSA-35 & 100 snubbers when aligning the end caps: Under no circumstances shall the end cap be rotated more than one turn from its bottomed position. This could cause the threads to shear during a seismic event.
- f. When establishing the length of the extension pipe be sure to consider the cold setting of the snubber.
- g. Do not sand blast arrestors. Arrestors are pre-finished with acceptable corrosion protection.
- h. If sand blasting is to be performed on adjacent parts such as unfinished pipe or structure, arrestor and bearings in attaching parts must be masked for protection.



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- i. If severe pipe vibration or water hammer is encountered it is recommended that an engineering decision be requested to determine if the correct arrestor size is being or has been specified. A solution may be to specify an arrestor of higher load carrying capacity.
- j. If an arrestor is accidentally dropped, check the function by extending and retracting through the full stroke. If there is no evidence of sticking or binding, it may be assumed that no internal damage has occurred. If there is evidence of a malfunction, the arrestor should be returned to BASIC-PSA for inspection, a report of the corrective action required and an estimate of repair price and delivery.
- k. To avoid driving spherical bearings free or damaging bearings, use care in inserting pins. Pins should be snug but not tight. Light tapping with a fiber mallet is allowable.

1.5 UNPACKING

On arrestors PSA-1/4, -1/2, -1, -3 and -10, simply slit open cartons and remove arrestors and accessories (if any.) On arrestors PSA-35 and -100, make certain that the wooden skid is on a flat stable surface. Cut metal banding around container, lift off lid. Remove top cradles. When removing arrestors from skid after lid and top cradles have been removed, it is suggested that a sling is placed around the arrestor and the arrestor hoisted from the skid. After removal of arrestors from carton or skid, inspect painted or zinc plated areas for damage. Inspect arrestors for any signs of obvious external damage.

1.6 RECEIVING INSPECTION

After unpacking, arrestors of PSA-1/4 through 10 may be checked for freedom of movement by grasping the indicator tube and slowly extending and retracting the indicator tube. On larger models, considerable force will be required to perform the extension and retraction of the indicator tube and should not be considered necessary as a receiving inspection function unless evidence of damage is present.

Return to BASIC-PSA if malfunction is evident.



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SECTION II **PSA-1/4, 1/2, 1, 3, & 10**

- 2.1** See Figure 2-1, page 13, for an illustration of a typical model of the arrestors.

For PSA-1/4 & 1/2: the inner mechanisms of the two models are the same except that the Model PSA-1/4 is longer and has a 4" stroke as compared to the 2-1/2" stroke of the PSA-1/2.

For PSA-1, 3, 10: The inner mechanisms of the three-(3) models are the same except that the components vary in size according to load carrying requirements.

BASIC-PSA, in some instances, may supply only shock arrestors and some other source may supply extensions and attachment hardware.

See Figures on page 14 for illustrations of "minimum" length and "variable" length arrestors.

- 2.2** MINIMUM LENGTH arrestors consist of an arrestor, a forward bracket assembly and either one or two rear bracket assemblies. Two rear brackets are supplied if attachment at one end is to be made other than to a pipe clamp.
- 2.3** VARIABLE LENGTH arrestors are supplied in several modes: (Refer to Figure 2-2 and to the applicable "strut" drawing.) In addition to the arrestor, a rear bracket assembly, transition tube assembly, and a forward adapter assembly may be supplied. With this combination of parts it is necessary for the installer to supply a length of pipe cut to the appropriate 'pin-to-pin' length requirements (if pipe is not supplied by the factory). BASIC-PSA, supplies a 'strut' drawing and a "mark" number on the nameplate if contractually required.

The foregoing parts may also include a length of pipe either pre-cut to length or over-length to be final cut at time of assembly and either welded into one or both mating fittings, or not welded at all (See 2.4 below for installation instructions for variable length arrestors).



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2.4 INSTALLATION

Before proceeding, read and observe the caution notes in Section I, 1.4 Caution Notes. Consult drawing and mark number data. Before welding the rear bracket(s) to structure it is recommended that the installation to be "dummied up" to determine that the planned fits and location agree with the actual condition.

As stated in 2.3, extension pieces may be supplied with the welding done offsite; the transition tube welded to the pipe (pipe furnished 6" longer than the theoretical length required to allow for field fit and weld); or no welding performed.

2.4.1 DISASSEMBLY OF TRANSITION TUBE FROM SNUBBER

CAUTION: NO WELDING SHALL BE PERFORMED WITH THE SNUBBER ATTACHED.

- a. Using appropriate wrench, break the torque and remove bolts securing the transition tube assembly to the housing of the snubber. NOTE: PSA-1/4 & 1/2 contain (3) bolts and PSA-1, 3, & 10 contain (4) bolts.
- b. Place snubber in a secure location away from the welding area.

For extensions with no welding done proceed below to 2.4.2. For installation and welding instructions where the extension pipe is welded to the transition tube at the factory proceed to 2.4.3.

2.4.2 WELDING EXTENSION PIPE TO TRANSITION TUBE

CAUTION: NO WELDING SHALL BE PERFORMED WITH THE SNUBBER ATTACHED.

NOTE: The welding procedure shall be qualified to ASME Section IX or the code approved by the local enforcing agency.

- a. Insert one end of the extension pipe in the transition tube approximately 1 inch.
- b. Line the pipe up parallel to the transition tube.



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- c. NOTE: Tack welding may be used to secure the extension pipe in place prior to performing an all around weld. Perform an all around weld on the extension pipe and transition tube per Table 2-1 listed below.

Table 2-1 Weld Size for Extension Pipe	
Model Size	Weld Size (Min) in
PSA- 1/4 & 1/2	1/8
PSA- 1	1/8
PSA- 3	5/32
PSA- 10	1/4

CAUTION: DO NOT SAND BLAST ARRESTORS. ARRESTORS ARE PRE-FINISHED WITH ACCEPTABLE CORROSION PROTECTION.

2.4.3 CUTTING OF EXTENSION PIPE

- a. Measure the actual pin to pin dimension at the hanger location. NOTE: If the actual measurement varies from the pin to pin measurement on the drawing, extension pipe shall be cut to accommodate the actual pin to pin dimension. Extension pipe was supplied 6 inches longer to allow for field weld and fit.

CAUTION: WHEN ESTABLISHING THE LENGTH OF THE EXTENSION PIPE BE SURE TO CONSIDER THE COLD SETTING OF THE SNUBBER.

- b. Determine the required length of the extension pipe with the snubber at the cold setting position (or mid-position if the cold setting is not determined).
- c. Cut the pipe an additional 1 inch longer to allow for 1 inch insertion into forward adapter.

2.4.4 WELDING FORWARD ADAPTER TO EXTENSION PIPE

CAUTION: NO WELDING SHALL BE PERFORMED WITH THE SNUBBER ATTACHED.

NOTE: The welding procedure shall be qualified to ASME Section IX or the code approved by the local enforcing agency.

- a. Insert the open end of the extension in the forward adapter approximately 1 inch. NOTE: If necessary to ensure the forward adapter and end cap line up, bolt the transition tube to the snubber and install the bolts, but do not torque the bolts.



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CAUTION: BEFORE WELDING, BE SURE THE FORWARD ADAPTER AND THE SNUBBER ARE ORIENTED SO THAT THE TWO ENDS WILL FIT PROPERLY IN THEIR RESPECTIVE FITTINGS SUCH AS A PIPE CLAMP & REAR BRACKET. THE SPHERICAL BEARINGS ARE DESIGNED TO MOVE +/- SIX DEGREES WITHIN THE BEARING SOCKET. HOWEVER, ELIMINATE AS MUCH MISALIGNMENT AS POSSIBLE. REMOVE SNUBBER PRIOR TO WELDING.

- b. NOTE: Tack welding may be used to secure the extension pipe in place prior to performing an all around weld. Perform an all around weld on the extension pipe and forward adapter per Table 2-2 listed below.

Table 2-2. Weld Size for Extension Pipe	
Model Size	Weld Size (Min) in
PSA- 1/4 & 1/2	1/8
PSA- 1	1/8
PSA- 3	5/32
PSA- 10	1/4

CAUTION: DO NOT SAND BLAST ARRESTORS. ARRESTORS ARE PRE-FINISHED WITH ACCEPTABLE CORROSION PROTECTION.

CAUTION: IF SANDBLASTING AND/OR PAINTING ARE REQUIRED ON ADJACENT PARTS SUCH AS UNFINISHED PIPE OR STRUCTURE, ARRESTOR AND SPHERICAL BEARING MUST BE CAREFULLY MASKED FOR PROTECTION.

2.4.5 ASSEMBLY OF TRANSITION TUBE ASSEMBLY TO SNUBBER

- a. Apply loctite 242 to bolts and install to secure transition tube assembly to housing assembly. Using the appropriate torque wrench, torque the bolts per Table 2-3 listed below. NOTE: The bolts may be secured using safety wire instead of loctite. See Table 2-3 below for wire size.

Table 2-3. Torque for Bolts of Transition Tube Assembly		
Model Size	Bolt Torque in-lbs	Safety Wire Dia in
PSA-1/4 & 1/2	22 +/-2	.030/.040
PSA-1	45 +/-5	.030/.051
PSA-3	120 +/-10	.030/.051
PSA-10	440 +/-20	.030/.062



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The spherical bearings are designed to move +/- six (6) degrees within the bearing socket. However, as good practice, eliminate as much misalignment as possible and determine that not more than +/- six (6) degrees be utilized at any position of the total stroke.

2.4.6 ASSEMBLY OF FORWARD BRACKET ASSEMBLY TO SNUBBER

- a. Apply loctite 242 to bolts and install to secure forward bracket assembly to housing assembly. Using the appropriate torque wrench, torque the bolts per Table 2-4 listed below. NOTE: The bolts may be secured using safety wire instead of loctite. See Table 2-4 below for wire size.

Table 2-4. Torque for Bolts of Forward Bracket Assembly		
Model Size	Bolt Torque in-lbs	Safety Wire Dia in
PSA-1/4 & 1/2	22 +/-2	.030/.040
PSA-1	45 +/-5	.030/.051
PSA-3	120 +/-10	.030/.051
PSA-10	440 +/-20	.030/.062

2.4.7 ALIGNMENT OF END CAP

If it is necessary to rotate the cylinder end cap, follow these instructions very carefully:

- a. Remove attachments from the arrestor.
- b. Place the arrestor in a vertical position on a table, sitting on the arrestor housing.
- c. For PSA-1/4 & 1/2: Keep a slight downward hand pressure on the top end to avoid any linear movement, use retaining ring pliers to free retaining ring. Maintain a slight downward hand pressure, slowly turn the end cap by hand only to desired rotational position, (do not use wrench or other mechanical means). While maintaining hand pressure, replace retaining ring.

For PSA-1, 3, 10: Loosen but do not entirely free retaining. While loosened, rotate tubular member upon whom the scale is printed until desired rotational position is gained. Allow retaining ring to expand back into place.

- d. Expand and contract arrestor slowly through full stroke to determine that repositioning has not damaged interior components.



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Brackets will be supplied with a protective coating, which does not require removal prior to welding. Weld the bracket(s). The welding procedure shall be qualified to ASME Section IX or the code approved by the local enforcing agency. Mask bearings and paint per local requirements.

Extend and retract arrestor through full stroke as a final check for binding.

Secure arrestor to rear bracket with pin, washers and cotter pins provided. Washers are to be located one on each side of the spherical bearing.

Secure the forward bracket or forward adapter to other rear bracket or pipe clamp in the same manner as in paragraph above.

2.5 OPERATION

No operating instructions are required for BASIC-PSA Mechanical Shock Arrestors. Operation is purely automatic.

2.6 MAINTENANCE

BASIC-PSA Shock Arrestors' service life as defined under DR 1319 is 60 years, with appropriate maintenance and operation within the rated load and environmental limits specified in Sections 5.3 and 5.4 of DR 1319. DR 3020 is a supplement to DR 1319 and provides guidance as to what is considered "appropriate maintenance". DR 3020 also identifies the methodology to extend the service life of mechanical snubbers indefinitely beyond the originally designed service life of 40 years.

2.7 INSPECTION

The following information is provided as a guide to owners rather than specific recommendations. When convenient, arrestors may be checked to determine that units are remaining functionally satisfactory.

Detach one end of the arrestor from its retaining fittings.

Manually extend and retract the arrestor through its full stroke range.

With arrestor positioned horizontally, mechanical friction (breakaway force) to extend and retract the arrestor should not exceed 2% (2) percent of its rated load. The nameplate carries rated load data.

If preferred, units may be returned to BASIC-PSA for a complete functional inspection, utilizing specialized equipment.



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WARNING: If arrestors have been installed in a containment area, they shall be decontaminated before shipment to BASIC-PSA. Observe local regulations in this regard.

2.8 SPARE PARTS

Recommended spare parts in this manual include transition tube assemblies, forward adapter assemblies, forward bracket assemblies and rear bracket assemblies. These items are designated as "assemblies" because such components as spherical bearings, washers, and cotter pins are included in the various combinations. The accessories may or may not be manufactured by BASIC-PSA. Therefore, if, because of loss, damage, or rejected condition, if it is necessary to order assemblies or parts of assemblies, it is important to supply as much information to BASIC-PSA as possible. This information includes model number, date of manufacture, and serial number on the arrestor nameplate. Also, nomenclature, part numbers, and material code numbers of the components in question are of assistance. Contact with the original purchaser of the equipment from BASIC-PSA should provide further traceability and assurance that correct replacement parts are being specified.

The quantity of "insurance" components to be considered for supporting original installations and to maintain as a hedge against later damage or loss is left to the discretion of the purchaser.

As a part of Revision 2, reference is made in the Table of Contents to repair and overhaul manuals. These manuals are recommended for snubber mechanism parts and internal subassemblies, which may be purchased as spare parts.



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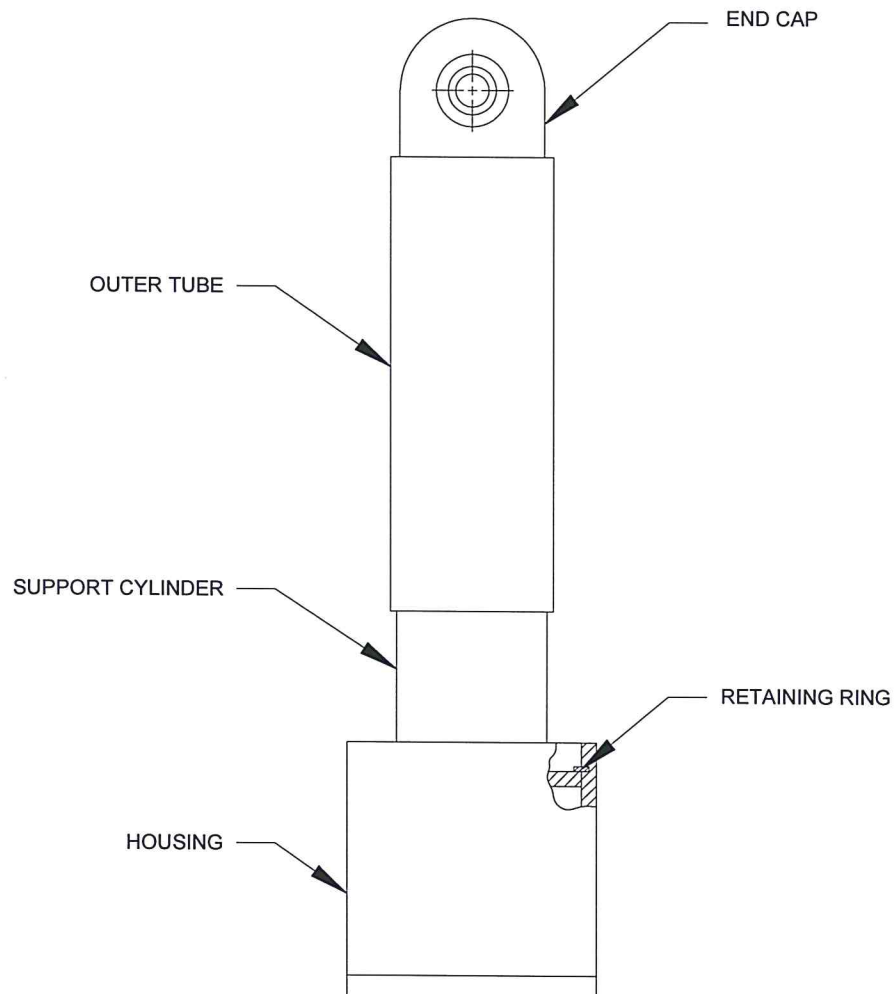


Figure 2-1
PSA-1/4, 1/2, 1, 3, & 10



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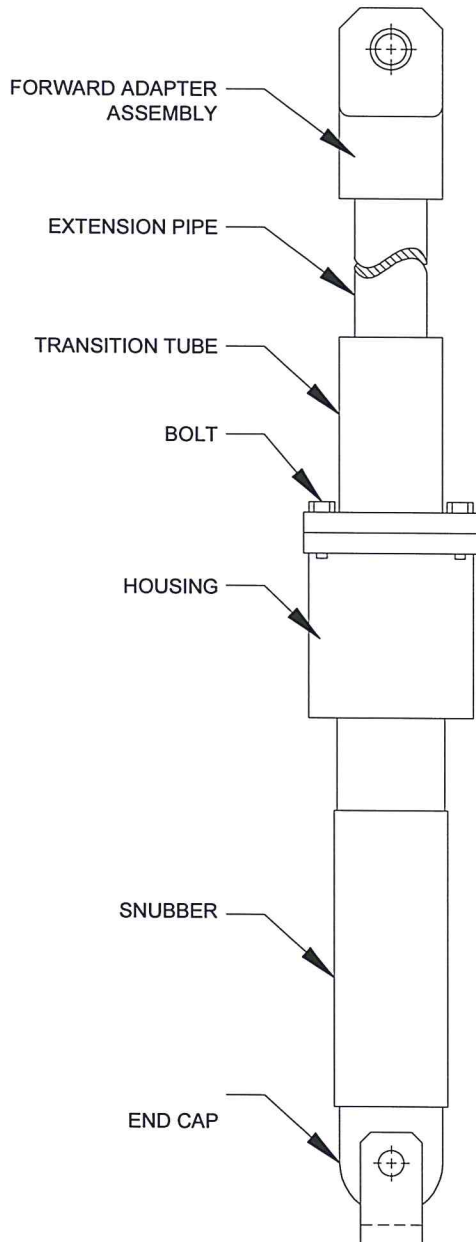


Figure 2-2
Variable Length

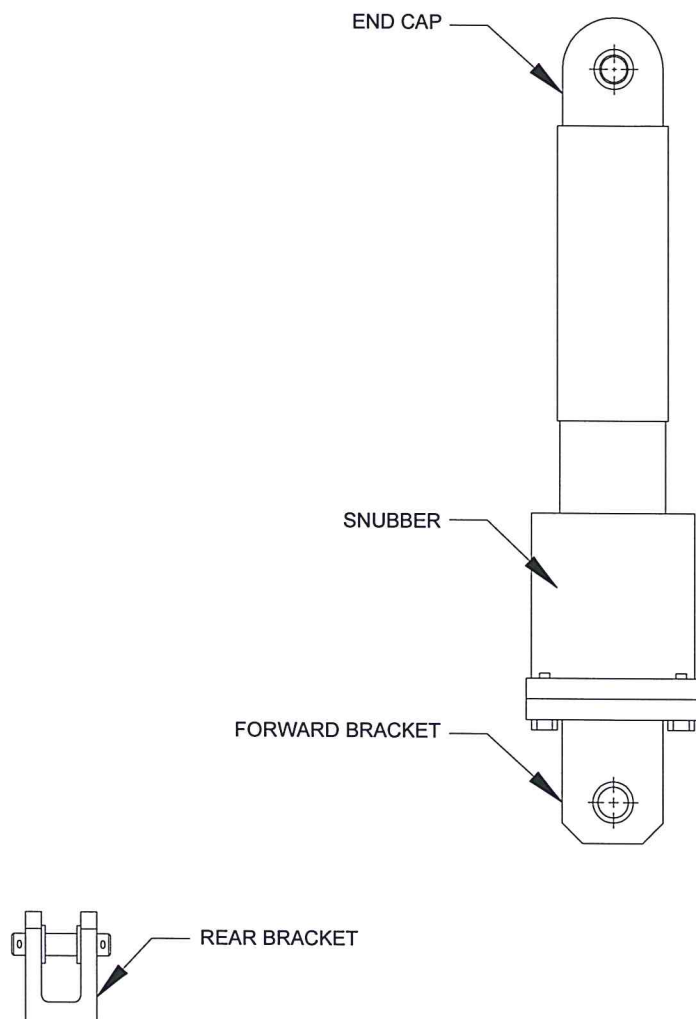


Figure 2-3
Minimum Length



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SECTION III **PSA-35 & 100**

- 3.1** See Figure 3-1, page 21, for an illustration of a typical model. The inner mechanisms of the two models are of the same basic design. The difference is in the size of the components as related to load carrying capability.

See Figure 3-3, page 22, for an illustration of 'minimum' length arrestors.

- 3.2** MINIMUM LENGTH arrestors consist of an arrestor, and either one (1) or two (2) rear bracket assemblies. Two (2) rear brackets are supplied if attachment at one end is to be made other than to a pipe clamp.
- 3.3** VARIABLE LENGTH arrestors are supplied in several modes: (Refer to Figure 3-2, page 22, and to the applicable "Strut" drawing.) In addition to the arrestor, a rear bracket assembly and an end cap assembly may be supplied. Either a weld adapter (male thread at one end) or a forward tube (male thread on end that inserts in arrestor and female thread to accept threaded end cap) will be pre-assembled as received. With the combination of parts including the weld adapter it is necessary for the installer to supply a length of pipe cut to the appropriate 'pin-to pin' length requirements (if pipe is not supplied by the factory). A 'strut' drawing and a "mark" number on the nameplate may or may not be contractually required from BASIC-PSA.

The foregoing parts may also include a length of pipe either pre-cut to length or over-length to be final cut at time of assembly and either welded into one or both mating fittings or not welded at all (See 3.4 below for installation instructions for variable length arrestors).

3.4 INSTALLATION

Before proceeding read and observe the caution notes in Section I, 1-4 Caution Notes. Consult drawing and mark number data. Before welding the rear bracket(s) to structure it is recommended that the installation is "dummied up". to determine that the planned fit and location agree with the actual condition.

As stated in 3.3, extension pieces may be supplied with the welding done offsite; the transition tube welded to the pipe (pipe furnished 6" longer than the theoretical length required to allow for field fit and weld); or no welding performed.



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3.4.1 DISASSEMBLY OF TRANSITION TUBE FROM SNUBBER

CAUTION: NO WELDING SHALL BE PERFORMED WITH THE SNUBBER ATTACHED.

- If locking washer is staked, using a mallet and punch, straighten deformations in locking washer in three places to unlock transition tube.
- Unthread transition tube from snubber.
- Place snubber in a secure location away from the welding area.

For extensions with no welding done proceed below to 3.4.2. For installation and welding instructions where the extension pipe is welded to the transition tube at the factory proceed to 3.4.3.

3.4.2 WELDING EXTENSION PIPE TO TRANSITION TUBE

CAUTION: NO WELDING SHALL BE PERFORMED WITH THE SNUBBER ATTACHED.

NOTE: The welding procedure shall be qualified to ASME Section IX or the code approved by the local enforcing agency.

- Insert one end of the extension pipe into the transition tube approximately 3 inches.
- Line the pipe up parallel to the transition tube.
- NOTE:** Tack welding may be used to secure the extension pipe in place prior to performing an all around weld. Perform an all around weld on the extension pipe and transition tube per Table 3-1 listed below.

Table 3-1. Weld Size for Extension Pipe	
Model Size	Weld Size (Min) in
PSA-35	9/16
PSA-100	7/8

CAUTION: DO NOT SAND BLAST ARRESTORS. ARRESTORS ARE PRE-FINISHED WITH ACCEPTABLE CORROSION PROTECTION.



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3.4.3 CUTTING OF EXTENSION PIPE

- a. Measure the actual pin to pin dimension at the hanger location. NOTE: If the actual measurement varies from the pin to pin measurement on the drawing, extension pipe shall be cut to accommodate the actual pin to pin dimension. Extension pipe was supplied 6 inches longer to allow for field weld and fit.

CAUTION: WHEN ESTABLISHING THE LENGTH OF THE EXTENSION PIPE BE SURE TO CONSIDER THE COLD SETTING OF THE SNUBBER.

- b. Determine the required length of the extension pipe with the snubber at the cold setting position (or mid-position if the cold setting is not determined).
- c. Cut the pipe an additional 1 inch longer to allow for 1 inch insertion into weld adapter.

3.4.4 WELDING OF WELD ADAPTER TO EXTENSION PIPE

CAUTION: NO WELDING SHALL BE PERFORMED WITH THE SNUBBER ATTACHED.

NOTE: The welding procedure shall be qualified to ASME Section IX or the code approved by the local enforcing agency.

- a. Insert the open end of the extension pipe in the weld adapter approximately 1 inch.
- b. NOTE: Tack welding may be used to secure the extension pipe in place prior to performing an all around weld. Perform an all around weld on the weld adapter and extension pipe per Table 3-2 listed below.

Table 3-2. Weld Size for Extension Pipe	
Model Size	Weld Size (Min) inches
PSA-35	9/16
PSA-100	7/8

CAUTION: DO NOT SAND BLAST ARRESTORS. ARRESTORS ARE PRE-FINISHED WITH ACCEPTABLE CORROSION PROTECTION.

CAUTION: IF SANDBLASTING AND/OR PAINTING ARE REQUIRED ON ADJACENT PARTS SUCH AS UNFINISHED PIPE OR STRUCTURE, ARRESTOR AND SPHERICAL BEARING MUST BE CAREFULLY MASKED FOR PROTECTION.



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3.4.5 ASSEMBLY OF TRANSITION TUBE ASSEMBLY TO SNUBBER

- a. Lubricate mating threads of housing assembly and transition tube with NRRG-2.
- b. Seat locking washer on transition tube. Hand tighten transition tube until bottomed against housing and transition tube. Verify the locking washer is seated flat between the housing and transition tube.
- c. Thread end cap into weld adapter.
- d. Insert torque wrench in socket of torque wrench adapter.
- e. Set torque wrench to 150 (+/-10) ft-lbs and torque end cap.
- f. Remove torque wrench and torque wrench adapter.
- g. Using mallet and punch, deform locking washer a minimum bend radius of 60° in three places: one into housing slot and two slots of transition tube.

The spherical bearings are designed to move +/- 6 degrees within the bearing socket. However, as good practice, eliminate as much misalignment as possible and determine that not more than +/- 6 degrees be utilized at any position of the total stroke.

3.4.6 ALIGNMENT OF REAR END CAP

If adjustment is necessary to align the two end fittings with their respective supports (rear bracket, pipe clamp, mounting lug, etc.):

CAUTION: UNDER NO CIRCUMSTANCES SHALL THE END CAP BE ROTATED MORE THAN ONE TURN FROM ITS BOTTOMED POSITION. THIS COULD CAUSE THE THREADS TO SHEAR DURING A SEISMIC EVENT.

- a. With the assembly cradled on a bench remove the screws and indicator tube. Extend sufficiently to expose part of the telescoping tube (Refer to Figure 3-1
- b. While the telescoping tube is restrained from rotating, loosen the left hand threaded nut.
NOTE: The nut may be torque to 150 ft-lbs at the factory.
- c. Rotate the rear end cap counterclockwise to the desired position with the least possible rotations.
- d. Rotate end cap nut clockwise until tight against the end cap.



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- e. Install appropriate end cap assembly adapter and torque wrench on end cap assembly. Torque end cap to 150 (+/-10) ft-lbs.
- f. Replace the indicator tube and screws.
- g. Extend and retract the arrestor through full stroke to assure that no internal damage occurred during adjustment.

Brackets will be supplied with a protective coating, which does not require removal prior to welding. The welding procedure shall be qualified to ASME Section IX or the code approved by the local enforcing agency. Mask bearings and paint per local requirements.

Secure arrestor to rear bracket with pin, washers and cotter pins provided. Washers are to be located one on each side of the spherical bearing.

Secure end cap to other rear bracket or pipe clamp in the same manner as in the paragraph above.

3.5 OPERATION

No operating instructions are required for BASIC-PSA Mechanical Shock Arrestors. Operation is purely automatic.

3.6 MAINTENANCE

BASIC-PSA Shock Arrestors' service life as defined under DR 1319 is 60 years, with appropriate maintenance and operation within the rated load and environmental limits specified in Sections 5.3 and 5.4 of DR 1319. DR 3020 is a supplement to DR 1319 and provides guidance as to what is considered "appropriate maintenance". DR 3020 also identifies the methodology to extend the service life of mechanical snubbers indefinitely beyond the originally designed service life of 40 years.

3.7 INSPECTION

The following information is provided as a guide to owners rather than specific recommendations. When convenient, arrestors may be checked to determine that units are remaining functionally satisfactory.

On Models PSA-35 and PSA-100 detach one end of the arrestor from its retaining fittings. Use slings and hoists as necessary.



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The mechanical friction (breakaway force) to extend and retract the arrestor should not exceed 2 percent (2%) of its rated load. The nameplate carries rated load data.

If preferred, units may be returned to BASIC-PSA or a complete functional inspection - utilizing specialized equipment.

WARNING: If arrestors have been installed in a containment area, they shall be decontaminated before shipment to BASIC-PSA. Observe local regulations in this regard.

3.8 SPARE PARTS

Recommended spare parts in this manual include transition tube assemblies, forward adapter assemblies, forward bracket assemblies and rear bracket assemblies. These items are designated as "assemblies" because such components as spherical bearings, washers and cotter pins are included in the various combinations. The accessories may or may not be manufactured by BASIC-PSA. Therefore, if, because of loss, damage or rejected by BASIC-PSA. Therefore, if, because of loss, damage or rejected condition, if it is necessary to order assemblies or parts of assemblies, it is important to supply as much information to BASIC-PSA as possible. This information includes model number, date of manufacture and serial number on the arrestor nameplate. Also, nomenclature, part numbers and material code numbers of the components in question are of assistance. Contact with the original purchaser of the equipment from BASIC-PSA should provide further traceability and assurance that correct replacement parts are being specified.

The quantity of "insurance" components to be considered for supporting original installations and to maintain as a hedge against later damage or loss is left to the discretion of the purchaser.

As a part of Revision 2, reference is made in the Table of Contents to repair and overhaul manuals. These manuals recommend snubber mechanism parts and internal subassemblies, which may be purchased as spare parts.



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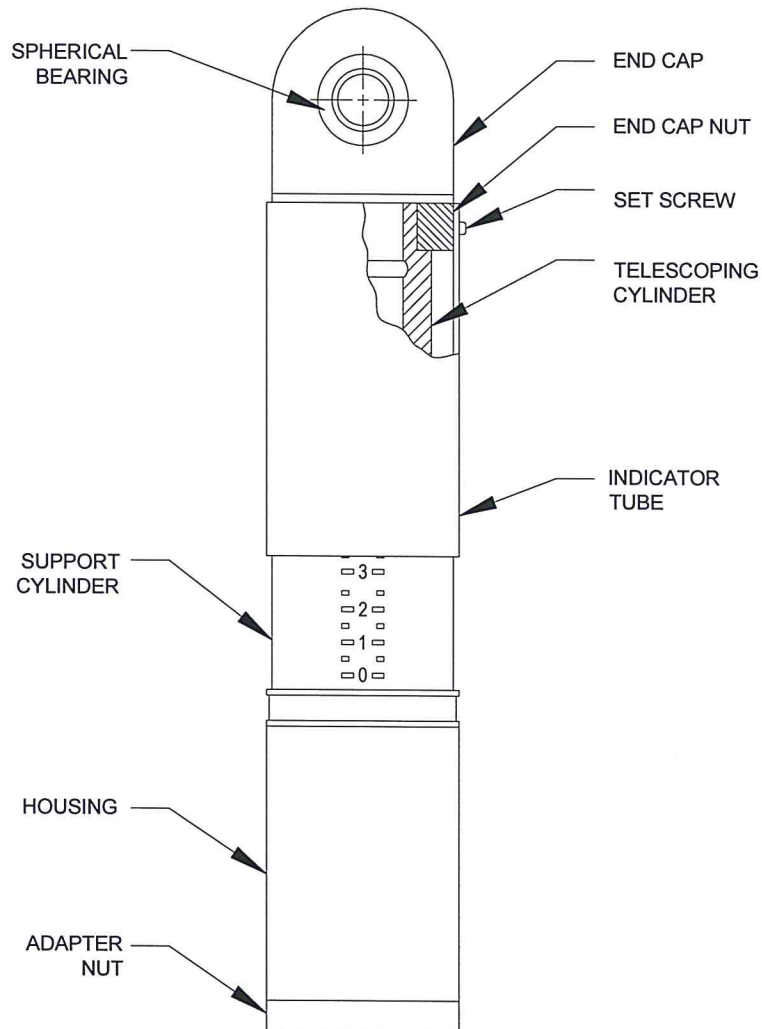


Figure 3-1
PSA-35 & 100



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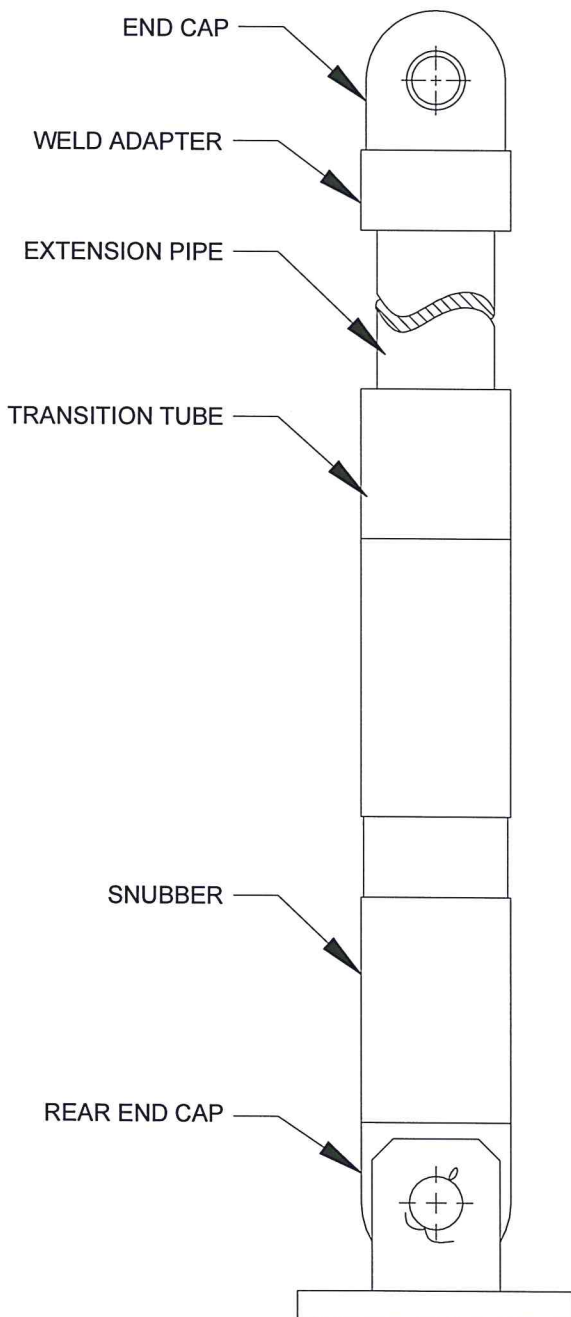


Figure 3-2
Variable Length

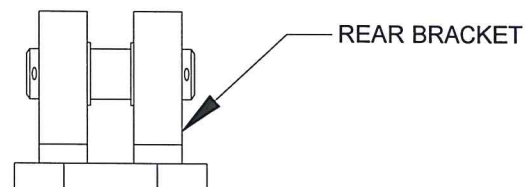
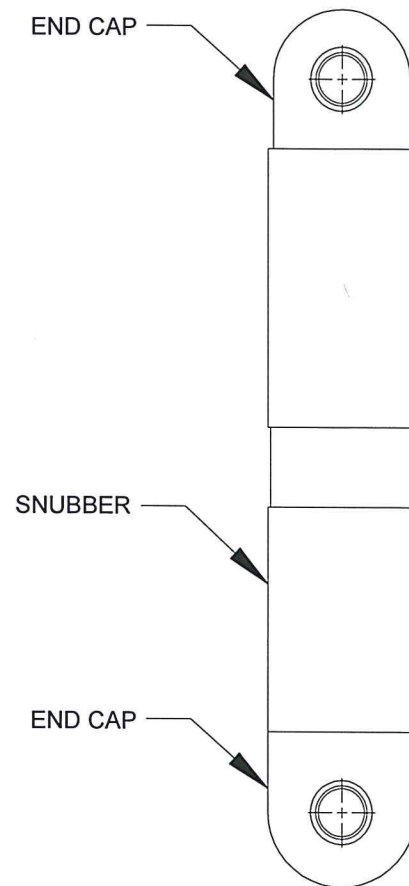


Figure 3-3
Minimum Length



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SECTION IV **INSTALLATION OF 1802 SERIES PIPE CLAMPS**

4.1 GENERAL

All pipe clamps are shipped with hardware loosely attached.
All clamp bodies are finished with an inorganic zinc primer.

All clamp bolts, studs, jam nuts and spacers are zinc plated.

All load studs, load stud spacers and jam nuts (used for attaching shock arrestor) are of stainless steel construction.

The clamp bodies are matched halves and are not interchangeable. Check to determine that each half carries the same serial number and maintain in matched sets.

Clamps for use with shock arrestor models PSA-1/4 through PSA-10 use bolts rather than studs except for the load stud that attaches to the shock arrestor. Clamps for use with models PSA-35 and PSA-100 use studs in all locations.

For detail clamp dimensions, load capacities, and materials refer to Load Capacity Data Sheet BE-419 and drawings 1802001 through 1802006, (not included in this manual)

Regardless of the direction of installation, the clamp end to which the shock arrestor is attached is referred to as the 'top end'.



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4.2 INSTALLATION

(Refer to Figure 4-1, page 25, for description of typical pipe clamp components).

- a. Place clamp body halves on pipe and insert clamp inner bolt/stud through the pipe spacer and install nuts loosely.
- b. Insert bottom bolt/stud and install nuts loosely.
- c. Insert load stud through spacers and mating shock arrestor spherical bearing and install nuts loosely.
- d. Check clamp alignment then tighten inner bolt/stud. Refer to Table 4-1 for applicable torque limits.
- e. Tighten bottom bolt to the minimum torque value listed in Table 4-1. If the B-B dimension between the bottom ears is equal to or smaller than the B-B dimension at the pipe spacer, do not tighten bottom bolt any further. If B-B dimension between the bottom ears is larger than the B-B dimension at the pipe spacer, continue to tighten bottom bolt until ears are parallel.
- f. Tighten load stud nuts until top clamp ears are parallel, or until load stud spacers are snug against the spherical bearing.
- g. Lock all outside jam nuts against the inside jam nuts to prevent loosening.
- h. Check to assure that the shock arrestor is free to pivot about the load stud. The shock arrestor attaching end must not interfere with the clamp body in the cold or hot system condition.



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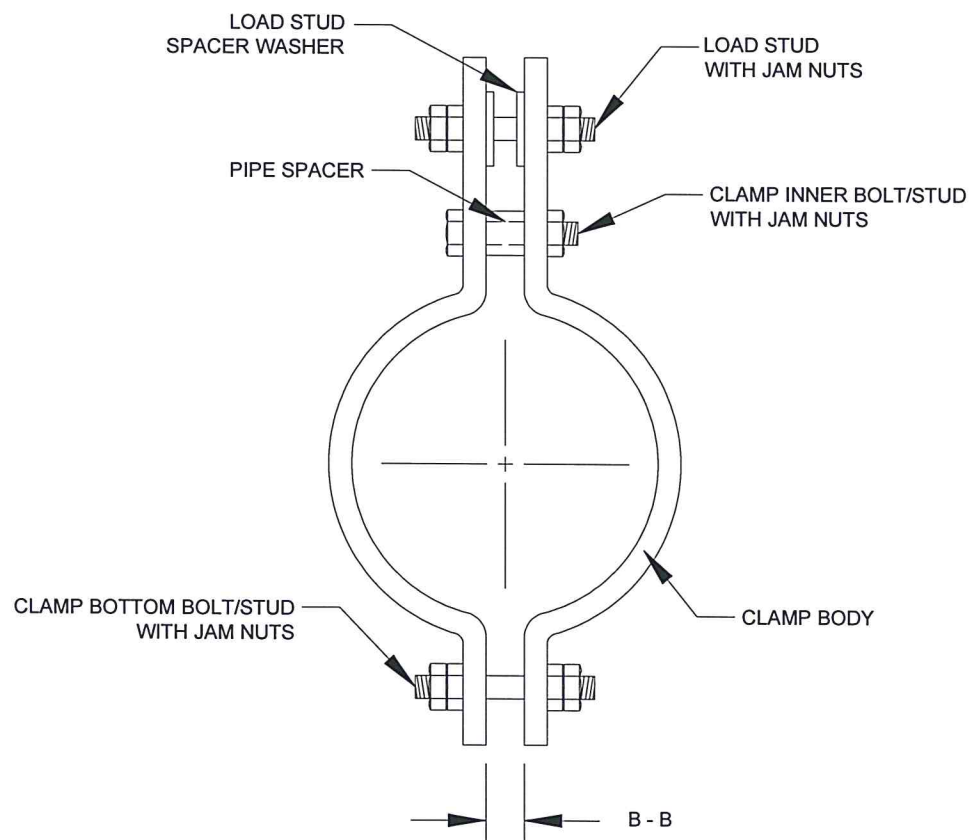


Figure 4-1
Typical 1802 Series Pipe Clamp



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Table 4-1. Bolt Torque			
Snubber Model	Clamp Part No. (Min/Max)	Bolt Size (in)	Torque Value (min / max)
PSA-1/4 & 1/2	1802001-0075 thru 1802001-060	3/8	40 / 50 in-lb _f
	1802001-080 thru 1802001-240	1/2	97 / 107 in-lb _f
PSA-1	1802002-010 thru 1802002-050	1/2	100 / 110 in-lb _f
	1802002-060 thru 1802002-240	5/8	195 / 215 in-lb _f
PSA-3	1802003-020 thru 1802003-060	3/4	370 / 400 in-lb _f
	1802003-080 thru 1802003-140	7/8	590 / 620 in-lb _f
	1802003-160 thru 1802003-240	1	870 / 920 in-lb _f
	1802003-280 thru 1802003-420	1 1/4	145 / 155 ft-lb _f
PSA-10	1802004-040 thru 1802004-140	1 1/4	145 / 155 ft-lb _f
	1802004-160 thru 1802004-180	1 3/8	185 / 200 ft-lb _f
	1802004-200 thru 1802004-300	1 1/2	250 / 270 ft-lb _f
	1802004-360	1 3/4	392 / 417 ft-lb _f
PSA-35	1802005-060 thru 1802005-200	2 1/4	875 / 930 ft-lb _f
	1802005-240 thru 1802005-360	2 1/2	1175 / 1245 ft-lb _f
	1802005-380	2 3/4	1585 / 1600 ft-lb _f
PSA-100	1802006-080 thru 1802006-180	3 1/4	2830 / 2970 ft-lb _f
	1802006-200 thru 1802006-380	3 1/2	3500 / 3720 ft-lb _f