BROWN & ROOT, INC. CPSES JOB 35-1195	NUMBER	REVISION	ISSUE DATE	PAGE
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TITLE:
INSTALLATION INSPECTIONS OF ASME CLASS 1, 2, and 3 SNUBBERS

ORIGINATOR: LaMansfield 11-7-83 DATE

REVIEWED BY: R Stumm 11-7-83 DATE

APPROVED BY: for Site QA Manager 11/7/83 DATE

1.0 REFERENCES

1-A ASME Boiler & Pressure Vessel Code Section III, 1974 Edition, with Addenda through Winter 1974

1-B CP-QAP-11.1, "Fabrication and Installation Inspection of Components, Component Supports and Piping"

1-C QI-QAP-2.1-5, "Training and Certification of Mechanical Inspection Personnel"

1-D CP-QAP-16.1, "Control of Nonconforming Items"

1-E CP-QAP-8.5, "Reclassification of Code Material"

1-F CP-QAP-12.1, "Inspection Criteria and Documentation Requirements Prior to System N-5 Certification"

1-G CP-QAP-14.1, "Inspection of Storage and Maintenance of Mechanical Equipment"

VOID

2.0 GENERAL

2.1 PURPOSE AND SCOPE

This instruction delineates the criteria and inspection requirements to be used when performing fabrication and installation of ASME Class 1, 2, and 3 snubber assemblies (Reference 1-A and 1-B).

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2.2 SNUBBER

These are supplied by both ITT Grinnell and NPSI in seven sizes, 1/4 through 100. All seven sizes are available in two configurations. One configuration is the fixed length type (ITT Grinnell - figure 306, NPSI - SMF). In this type, the bracket is attached directly to the snubber housing (see Attachments 1 and 2). The other configuration is the variable length type (ITT Grinnell figure 307, NPSI - SMA). The variable length snubber is supplied with a transition

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FOR INFORMATION ONLY

kit which consists of an adapter that mounts directly to the snubber, a pipe extension piece with an internally threaded end coupling welded on one end, and an eyerod which threads into the end coupling. (See Attachments 1 and 2).

2.3 RESPONSIBILITY

The Completions/Start-Up QC Superintendent shall be responsible for the implementation of this procedure.

2.4 PERSONNEL QUALIFICATIONS

All B&R inspectors shall be trained, qualified and certified in accordance with the requirements of Reference 1-C.

2.5 ANI HOLD POINTS

ANI hold points for snubber installation shall be established from pipe supports listed on the Hanger Installation Tracking System (HITS). The ANI's selection of hold points are listed on Attachment 3. Additional hold points may be selected from current HITS lists.

The Millwright Superintendent shall notify the QC Superintendent, or his designee, prior to installing a snubber that the ANI has established a hold point. The QC Superintendent, or his designee, shall notify the ANI that construction is ready to install a snubber listed as a hold point by the ANI.

After completion of installation activities, Quality Engineering Systems (QES) shall include pipe support Multiple Weld Data Card (MWDC) in the documentation package for the ANI to sign off his hold point for snubber installation.

3.0 INSTRUCTIONS

3.1 MATERIALS

3.1.1 Verification and Transfer of Material Traceability

The QC Inspector shall verify material acceptability per the Material Requisition (MR) (signed by QC Receiving) on the QC Checklist. Prior to material separation QCI shall verify that material ID marking (heat number, heat code, etc.) has been transferred. This will be documented in the comment section of the QC Checklist (Attachment 4) or Vendor Supplied Component Modification Record (Attachment 5) as applicable.

3.1.2 Material Salvaging

Salvaging of snubber(s) and associated hardware shall be accomplished in accordance with Attachment 6.

3.2 ROUTINE OBSERVATIONS

Inspection personnel performing inspections shall monitor general workmanship conditions in all phases of snubber modification and installation. Observations shall include, but are not limited to:

a. Handling /rigging

b. Housekeeping/storage maintenance

c. In-process modification and installation

d. Exposed machined surfaces are free of rust and foreign material

Observations which are adverse to quality and existing site procedures shall be documented on Storage Surveillance Report in accordance with Reference 1-G.

4.0 WELDING

4.1 WELDING INSPECTION REQUIREMENTS (GENERAL)

Visual welding inspection shall be in accordance with the requirements of this instruction.

QC shall verify that the welder(s) is qualified to perform the work in accordance with the WPS by checking the Welding Matrix, and shall verify that the WPS and filler material listed on the WFML are the same as those listed on the WDC.

4.1.1 Cleanliness (when required)

Cleanliness before fit-up shall be as follows:

a. Before welding, the weld joint shall be free of moisture, dirt, oil, grease and other deleterious foreign materials for an area two inches (2") each side of the joint.

b. The base material shall be mechanically cleaned at least 1/2" inch each side of the weld joint.

4.1.2 Fit-Up (when required)

a. Transition kits with socket couplings shall have end cap fitup with an end gap 1/16" prior to welding as illustrated in Attachment 7.

b. Solid type couplings on snubber transition kits shall be welded in place while maintaining a tolerance of approximately 1/16" variation from the pipe centerline.

c. Welding of the solid end coupling nut to the extension pipe alignment must be maintained within 1/2°.

4.2 WELD SIZES

4.2.1 Forward Bracket Modification (NPSI)

In those cases where the forward bracket is modified to obtain the proper C-C dimension, the weld size for attaching lug and plate for snubber sizes 1/4 thru 10 is shown below:

Snubber Size	Weld Size	Weld Length
1/4	3/16"	3/4" Lg.
1/2	3/16"	3/4" Lg.
1	3/16"	All Around
3	1/4"	All Around
10	5/16"	All Around

In addition the QC Inspector will verify that the lug, when cut, meets the dimensional requirements as shown in Attachment 8.

4.2.2 Transition Kit Modification

In those cases where the mounting plate is furnished as a bulk item and requires attachment by welding to the extension pipe the minimum weld size will be equal to the wall thickness of the pipe.

In those cases where it is necessary to reweld the end coupling nut to the extension pipe for ITT Grinnell snubber transition kits, the following minimum weld sizes shall apply:

Snubber Size	Fillet Weld Size (Min)*
¼,½	1/8"
1	3/16"
3	3/16"
10	1/4"
35	1/2"
100	3/4"

* The weld size need not be larger than the thickness of the coupling.

In those cases where it is necessary to reweld the solid end coupling nut for NPSI snubbers the following fillet weld size shall apply:

Snubber Size	Fillet Weld Size (Min)*
¼,½	3/16"
1	3/16"
3	3/16"
10	1/4"
35	3/8"
100	5/8"

* The weld size shall not be larger than the thickness of the coupling.

4.2.3 Final Weld Inspection

Fillet weld sizes specified in Paragraph 4.2.1 and 4.2.2, shall be the size required along the full length of the weld joint. However, a fillet weld in any single continuous weld may be less than the specified fillet weld dimension by not more than 1/16 inch provided that the total undersize portion of the weld does not exceed 10% of the length of the weld. Individual undersize weld portions shall not exceed 2 inch in length. Oversize fillet welds shall be acceptable provided additional weld does not distort the items being joined together.

Distortion due to welding shall be reported in accordance with Reference 1-D.

The final surface of welds shall be free from defects such as sharp surface irregularities, slag and cracks. Undercut shall not exceed 1/32 inch.

NOTE: Only indications with major dimensions greater than 1/16 of an inch shall be considered relevant.

4.3 WELD REPAIRS

Weld repairs shall meet the acceptance criteria applicable for the original weld.

4.4 FINAL WELD DOCUMENTATION

Actual weld sizes will be recorded on the QC Checklist, Attachment 4.

Welding Operations shall be documented on the VSCMR Attachment 5.

5.0 SNUBBER INSTALLATION AND MODIFICATIONS

5.1 MODIFICATON OF PIPE CLAMPS

The clamps shall be examined for minimum and maximum edge distance at snubber end per Attachment 9. When interference exists between pipe clamps and snubbers, the clamps may be modified within the allowable minimum and maximum edge distances as per Attachment 9.

NOTE: The pin shall be removed prior to modifying the clamp.

5.2 SNUBBER BOLTING MINIMUM ENGAGEMENT

In those cases where the bolts which attach the snubber forward bracket or transition kit to the snubber do not protrude completely through the tapped hole in the snubber flange, the inspection criteria shown in Attachment 10 shall be used to determine if sufficient thread engagement has been obtained.

5.3 MODIFICATION OF NPSI REAR BRACKETS

All rear brackets, for 35 & 100 snubbers, will be checked for the snubber movement range (angle of loading) and the corresponding "X" (Min/Max), "Y" and "Z" dimensions shown in Attachment 11. If the "X" dimension exceeds the maximum allowable, the bracket must be modified to fall within the "X" (Min/Max) range. The modifications may be by thermal means or machining. If thermal cutting is used, the cut edges shall be smoothed by machining. In either case, the bracket pin shall be removed prior to the modification.

NOTE: The interference of size 35 and 100 snubbers with rear brackets for Unit #1 has been evaluated by Engineering during Hot Functional Test (HFT). Required modifications as needed are performed.

5.4 MODIFICATION OF FORWARD BRACKETS FOR SNUBBER SIZES 35 AND 100

Modification of forward brackets for 35 and 100 snubbers shall be done in accordance with Attachment 12.

5.5 MODIFICATION OF SNUBBER TRANSITION KITS (GENERAL)

Shortening or lengthening of snubber transition kits to a length that will render snubber pin to pin dimensions outside maximum lengths specified in Attachment 22 must be approved by Engineering by a design change.

NOTE 1: If the threaded portion of the eyerod bottoms out in the transition kit before the desired adjustment is achieved, the eyerod may be shortened to achieve the necessary adjustment. However, enough threads shall remain to allow full thread engagement in the coupling nut.

NOTE 2: For identification of snubber parts/hardware discussed in this section, see Attachments 1 and 2.

a. For both NPSI and ITT Grinnell snubbers the required transition kit length shall be detemined by measuring the pin to pin (C-C) distance in the field. Then subtract the actual cold setting (AC dimension shown on the design drawing) from the existing pin to pin dimension. The difference between these two dimensions is the transition kit length required to maintain the proper cold setting.

   The C-C dimension provided in the Bill of Material or in the sketch are provided for material take-off purposes only. The maximum C-C dimensions are provided in Attachment 22 for the different size snubbers. Deviation from these dimensions is not permitted unless authorized by a design change.

b. Deviation of more than ±1/8" from the specified cold setting (AC dimension shown on the design drawing) is not permitted unless authorized by a design change.

c. If adjustment of an ITT-Fig. 307 snubber is required for installation, the threaded eye rod in the

transition kit has an adjustment capability of ±3 1/2". For NPSI-SMA snubbers, this adjustment capacity is ±1 3/4". Any further adjustment necessary may be made only by modification of the transition kits.

d. In order to lengthen the transition kit, remove the end coupling by grinding or cutting. Snubber sizes 1/4 through 10 have a transition kit mounting plate which must also be removed.

e. If the mounting plate is damaged during removal, a new one shall be fabricated from SA-36 or SA 515 Grade 65 steel.

f. Replace the pipe portion of the transition kit with a size and grade of pipe selected in accordance with Attachment 13 and cut to length necessary to acheive the required pin to pin dimension.

g. The length of ITT Fig. 306 snubbers can be adjusted only by the use of shim plates placed behind the rear bracket. NPSI-SMF snubbers can be adjusted either by placing shim plates behind the rear bracket, or by trimming the forward bracket in accordance with Paragraph 4.2.1.

h. In those cases where interference problems exist when installing snubbers, they may be mounted 180° (end to end) from the configuration shown on the design drawing.

5.6 MOUNTING OF FORWARD BRACKET OR TRANSITION KIT INTO SNUBBER BODY

For snubber sizes 35 & 100, screw the transition kit or forward bracket into the internal threads at the base of the snubber until it bottoms against the internal dust cover or until the threads meet the minimum thread engagement. For NPSI forward bracket or transition kit, minimum thread engagement is as detailed in Attachment 12. For ITT supplied forward bracket and transition kit, the existing thread length provided on the part is adequate. However, trimming of the thread length for ITT parts is prohibited, unless authorized by Engineering. The thread engagement operation should be completed by hand. If more force is required, remove part and clean all internal and external threads. If after cleaning, tightening is difficult, a strap wrench or other non-marring tool may be used to assist in the tightening operation. However, the parts shall not be forced. After

fully engaging the threads or bottoming, the forward bracket may be unscrewed up to a maxmimum of 1/2 turn to achieve correct orientation of the lugs and pins on each end of the snubber per the pipe support sketch.

CAUTION: Do not unscrew more than 1/2 turn.

5.7 INSPECTION CRITERIA

The following are inspection requirements when inspecting snubbers:

a. To prevent binding within the clamp and/or bracket, snubber shall not be installed with an off-set of more than 5 (five) degrees.

b. Verify that flat washers are installed between the spherical bearing and each clamp half. The spacers may not fit when assembling the rear bracket due to the tolerances. At this time, one or more of the spacers may be deleted. For horizontal brackets if only one spacer is installed, it should be placed on the underside of the spherical bearing when applicable.

NOTE: Minor adjustments of the pipe clamp may be required to facilitate snubber installation.

c. The clamp pin should be long enough to accomodate cotter pins on either side.

d. Verify pinned connections have fully opened cotter pins or split snap rings installed.

e. Verify spherical bearings are tightly staked in the attachment ends.

f. Verify that exposed threaded surfaces are free of excessive rust or foreign material.

g. Verify that spherical bearings are free of foreign material and gimbals freely in it's race.

NOTE: QCI shall document results of cleanliness, and operability of component support parts (i.e., spherical bearings, pins, etc.) on the QC Snubber Checklist in Comments Section.

5.7.1 Relative Angle Adjustment

Due to field conditions, it may be necessary to adjust the alignment between the snubber end cap and the mounting hardware (rear bracket or pipe clamp) in order to allow a full ±5° misalignment tolerance. All adjustments of this type shall be performed in accordance with the following instructions and witnessed by the QCI.

5.7.1.1 Snubber Sizes 1/4 through 10 - See Attachment 14.

1. Remove attachments from the snubber.

2. Place the snubber in a vertical position on a table setting on the snubber housing.

3. While keeping a slight downward hand pressure, on the top to avoid linear movement, use retaining ring pliers to free retaining ring.

4. While maintaining a slight downward hand pressure, slowly turn end cap by hand only to desired rotational position.

   (CAUTION: Do not turn the end cap more than 360°)

5. While maintaining hand pressure, replace retaining ring. Expand and contract arrestor slowly through full stroke to determine that repositioning has not damaged internal components.

5.7.1.2 Snubber sizes 35 & 100 - See Attachment 15.

1. With the assembly cradled in a bench, remove the three indicator tube mounting screws. Extend the snubber sufficiently to expose the telescoping tube.

2. While the telescoping tube is restrained from rotating, loosen the left hand threaded nut (ring). (Nut has been torqued to 150 ± 20 ft. lbs.) Rotate the end cap to the desired position.

   CAUTION: Under no circumstances shall the end cap be rotated more than one complete turn from the bottomed out position.

3. Re-torque the left hand threaded nut to 150 ± 20 ft. lbs.

4. Replace the indicator tube and screws.

5. Mount the transition kit or forward bracket into the internal threads at the base of snubber as detailed in Paragraph 5.6.1.

5.7.2 Snubber Operation

The snubber operation shall be checked to verify the distance of travel to ensure the snubber is in proper working condition.

Snubber Size	¼	½	1	3	10	35	100
Stroke/Length Inches	4	2½	4	5	6	6	6

NOTE: Snubbers with "L" suffix will have an extended stroke length of twice the stroke length shown above.

5.7.3 Reinstallation/Staking of Spherical Bearings

Reinstallation or staking of spherical bearings shall be accomplished in accordance with Attachment 16.

6.0 GENERAL REQUIREMENTS

a. Never interchange NPSI and ITT Grinnel parts or hardware. However, except for the feedwater and mainsteam systems, NPSI and Grinell snubber bodies may be interchanged.

b. It is extremely important that the clamp halves are parallel (see illustration on Attachment 17). Excessive gap at the upper end of the clamp can allow enough space for the spherical bearing to be dislodged from the eye rod end. Flat washers may be installed to fill the gap.

c. At no time shall installed snubbers be used as steps or hand-holds.

NOTE: Pipe clamp assembly information - see Attachment 17-21.

d. When arc welding, do not attach ground to snubber or any part of the snubber which will cause arcing current to pass through snubbers.

e. Do not sandblast snubbers. Snubbers are pre-finished with acceptable corrosion protection.

f. If sandblasting is to be performed on adjacent parts such as unfinished pipe or structure, snubber and bearings on attaching parts must be masked for protection.

g. Use care to align snubber as closely as possible to avoid forces tending to rotate the pipe clamps or induce bending.

h. If a snubber 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, it shall be documented in accordance with Reference 1-D.

i. To avoid driving spherical bearings free or damaging bearings, use care in inserting pins. Pins should be snug but not tight. Light tapping is allowable.

j. Under no circumstances should the snubber housing be twisted relative to the position indicator tube. This may result in a jammed snubber.

7.0 BASE METAL REPAIR

Base metal defects shall be documented in accordance with Reference 1-D.

8.0 TORQUE REQUIREMENTS

Torquing shall be witnessed by QC and documented by signature and date on the QC Checklist. The M&TE number and the torque value shall be recorded on QC Checklist.

Mounting bolts for transition kits or forward brackets shall be torqued as follows:

Snubber Size	¼&½	1	3	10
Torque Value (IN/LB)	22	45	120	440

While torquing these bolts on sized ¼ through 10 snubbers, hold the snubber assembly by the transition kit extension

piece, or by the forward bracket. When holding by the forward bracket, care shall be taken not to damage the spherical bearing.

While holding the snubber assembly by the transition kit extention piece, the eye rod jam nut shall be torqued as follows:

Snubber Size	¼&½	1	3	10	35	100
Torque Value (FT/LB)	40	40	80	100	150	220

9.0 SAFETY WIRING

On NPSI snubbers, sizes 1/4 through 10, the transition kit or forward bracket mounting bolts shall be safety wired by passing a single strand of stainless steel wire through a series of holes in the bolts. The two ends of the wire shall be joined at a point between any two bolts. A pigtail of 1/4" to 1/2" in length with 3 to 6 twists shall be made at the end of the wiring. The pigtail should be bent back and under to prevent it from becoming a snag. Safety wiring shall have sufficient tension so that wire slack is minimal, but wire is not overstressed.

QCI's signature for "Installation Complete" Operation on QC Checklist for Snubber Installation shall provide objective evidence that safety wiring operation has been verified and found satisfactory.

NOTE: In those cases where attachment bolts between forward bracket assembly and snubber assembly are safety wired by the vendor, QCI shall verify that the following conditions exist:

a. Bolts are tight.

b. Lockwire is not damaged.

c. Lockwire is crimped.

If any of the above conditions are unsatisfactory, the bolts shall be retorqued and the new lockwire shall be installed as detailed above.

10.0 FINAL SNUBBER INSPECTION

10.1 SNUBBER INSTALLATION

When the snubber installation is complete and ready for final inspection, Construction shall notify Quality Control and present to the inspector the snubber installation information for review and final inspection . After the snubber is presented to QCI for inspection by Construction, discrepancies identified during inspections that do not require an Engineering evaluation or rework documentation will be identified to the Craft and corrected prior to QCI acceptance.

10.2 DOCUMENTATION

The results of the snubber inspections shall be documented on the QC Checklist (Attachment 4). After completion, the checklist will be transmitted to QES for review of material identification as discussed in Paragraph 5.3. Upon completion of this review, QES shall file the checklist in the respective hanger installation documentation.

10.3 MODIFICATION PACKAGES

Final inspected items requiring modification as a result of the issuance of design change or Item Removal Notice (IRN) shall be reinspected in accordance with the applicable requirements of this procedure.

10.4 REMOVAL/REINSTALLATION OF SNUBBERS (UPON ISSUANCE OF AN "IRN")

10.4.1 Removal of Snubbers

Upon issuance of an "Item Removal Notice" (IRN) by Construction, QCI shall obtain a copy of the original installation checklist for material verification and final inspection information. Prior to removal of any snubber assemblies, QCI shall record the following information on the QC Checklist for Removal and Reinstallation of Snubbers, Attachment 23:

1. Hanger mark number
2. IRN number
3. Snubber serial number
4. Pin-to-pin dimension (snubber fully compressed)
5. Physical damage

After removal of the snubber, QCI shall measure pin-to-pin dimension of snubber in fully compressed state.

Also, QCI responsible for recording the above information shall sign and date the QC checklist.

10.4.2 Reinstallation of Snubbers

Prior to reinstallation of snubber assemblies, QCI shall verify, the snubber that is to be reinstalled, is the same snubber that was removed, snubber operation, and there is no physical damage. Also, QCI shall verify that pin-to-pin dimension of the snubber in fully compressed position has not changed since removal.

QCI shall witness torquing operation of the adjustable eye rod jam nut, when applicable, and record M&TE number and value per Paragraph 8.0.

When reinstallation is complete and acceptable, QCI shall sign and date the checklist. QCI shall forward the completed checklist with a copy of the IRN attached, to the responsible lead for review.

NOTE: Paragraph 10.4 - 10.4.2 shall be performed only if there has been no modifications to the snubber assembly. In case of modification to the snubber assembly, the QC Checklist for Snubber Installation (Attachment 4) shall be used.

10.5 REMOVAL/REINSTALLATION OF SNUBBERS (UPON ISSUANCE OF AN "NCR")

10.5.1 Removal of the Snubber

When snubber is to be removed upon issuance of an NCR requiring rework to snubber bodies (i.e., not requiring modification to transition kit/forward bracket), QCI shall record the pertinent information on the Checklist, Attachment 24.

10.5.2 Reinstallation of the Snubber

Prior to reinstallation of the replacement snubber, QCI shall assure that snubber operates freely and is free of physical damage. Also, QCI shall verify that pin-to-pin dimension of the replacement snubber in the fully compressed position is the same as that of originally removed snubber.

QCI shall witness the torquing operation as applicable and record M&TE number and value, per Paragaph 8.

When reinstallation is complete and acceptable QCI shall sign and date the Checklist and forward it to Lead for review.

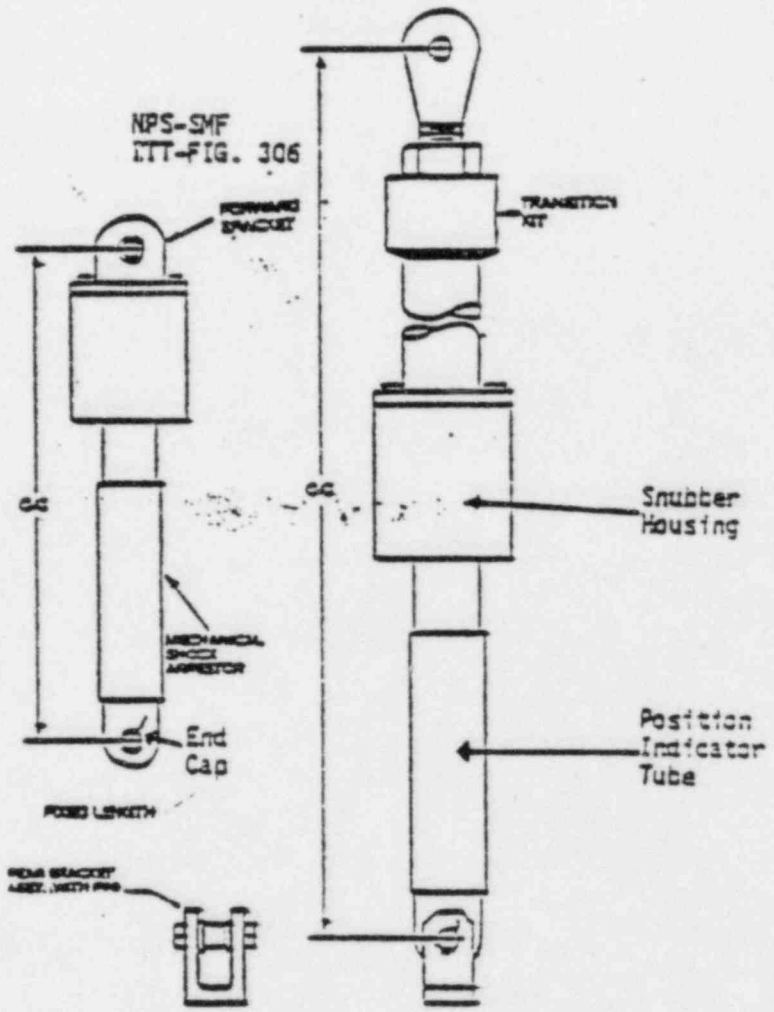
NOTE: In case of modification to forward bracket/ transition kit, the QC Checklist for Snubber Installation (Attachment 4) shall be used.

11.0 REPORTING DEFICIENCIES/NON-CONFORMANCES

Deficiencies/Non-Conformances shall be reported and documented in accordance with Reference 1-B/1-D.

ATTACHMENT 1

1/4 THROUGH 10



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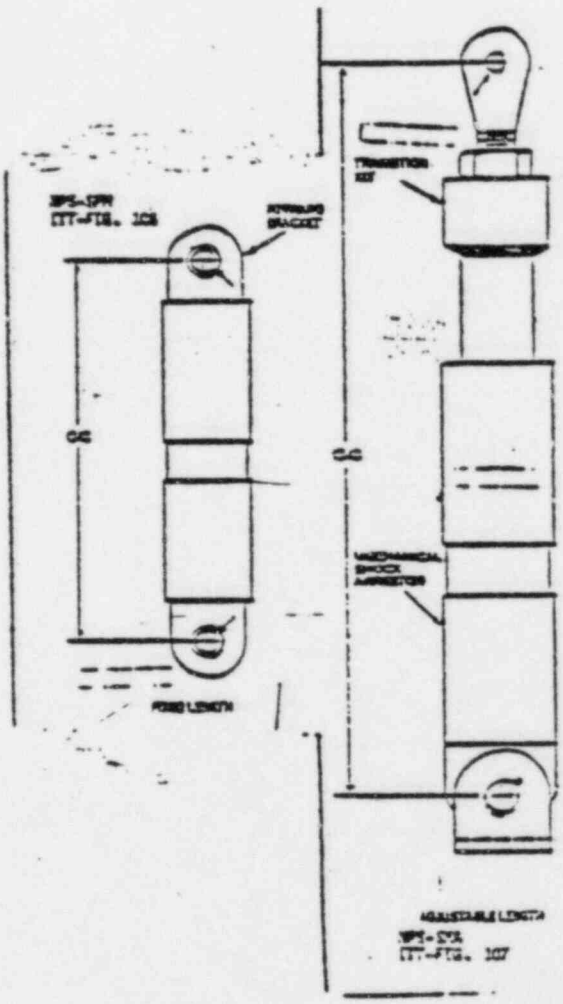
ITT-FIG. 307

ATTACHMENT 2

SNUBBER SIZE 35 & 100



ATTACHMENT 3

SNUBBER INSTALLATION - ANI HOLD POINTS

Pipe Support

MS-1-074-009-S52K	MS-2-026-405-S72K
RC-1-052-012-C41K	MS-2-257-402-S72K
RH-1-026-006-S32K	RC-2-052-E07-C41K
SF-X-003-004-F43K	RH-2-014-401-S32K
SI-1-031-031-Y32K	RH-2-024-401-S22K
SI-1-197-002-S32K	RH-2-027-403-S32K
	SF-2-011-E01-S42K
	SI-2-044-415-S32K
	SI-2-051-415-C42K
	SI-2-072-402-S32K

ATTACHMENT 4

Page _____ of _____

QC CHECKLIST FOR SNUBBER INSTALLATION

QI-QAP-11.1-28A, REV. _____

PARA.	OP. NO.	OPERATION	QCI/DATE	SAT/UNSAT
N/A	1.	Hanger # _____	_____	_____
N/A	2.	Snubber Serial # _____	_____	_____
5.7.2		SNUBBER OPERATION:		
	3.	Snubber Size _____	_____	_____
	4.	Stroke Length _____	_____	_____
8.0	5.	Torque of Transition Kit or Forward Bracket:		
		M T & E _____ VALUE " " _____	_____	_____
8.0	6.	Torque of Adjustable Eye Rod End Jam Nut:		
		M T & E _____ VALUE _____	_____	_____
5.7.1	7.	Torque of Ring Nut (35 & 100 Only)		
		M T & E _____ VALUE _____	_____	_____
5.7.1	8.	Relative Angle Adjustment (If Required)	_____	_____
5.7.2	9.	Re-verify Snubber Operation:		
		Stroke Length _____	_____	_____
3.1.1		MATERIAL I.D. (As Applicable)		
	10.	Forward Bracket _____	_____	_____
	11.	(Bulk) Base Plate _____	_____	_____
	11A.	(Bulk) Forward Bracket Eye _____	_____	_____
	12.	Transition Kit _____	_____	_____
	13.	Adapter Plate _____	_____	_____
	14.	Eye Rod _____	_____	_____
	15.	Coupling Nut _____	_____	_____
	16.	Barrel _____	_____	_____

ATTACHMENT 4 (Continued)

QC CHECKLIST FOR SNUBBER INSTALLATION (Continued) Page ____ of ____

QI-QAP- 11.1-28A , REV. ____

PARA.	OP. NO.	OPERATION	QCI/DATE	SAT/UNSAT
3.1.1	17.	(100 Only) Spherical Bearing Pins ____	____	____
	18.	(35 & 100 Only) Eye Rod Jam Nut ____	____	____
5.6	19.	Verification of Full Thread Engagement of Eye Rod in Coupling Nut	____	____
5.6	20.	C-C Dimension ____	____	____
5.6	21.	A-C Dimension per DWG. ____	____	____
4.4		ACTUAL WELD SIZES (Modifications Only)		
	22.	Transition Kit ____	____	____
	23.	Forward Bracket ____	____	____
5.2	24.	Minimum Thread Engagement Complies with Attachment 10.	____	____
	25.	Installation Complete	____	____
	26.	QC Supervision Review	____	____
N/A		NCR ____	____	____

COMMENTS ____

NOTE: ANY OPERATIONS THAT ARE NOT APPLICABLE MUST BE MARKED "NA", INITIALED AND DATED BY THE QCI.

ATTACHMENT 5 (Front)

VENDOR SUPPLIED COMPONENT MODIFICATION RECORD

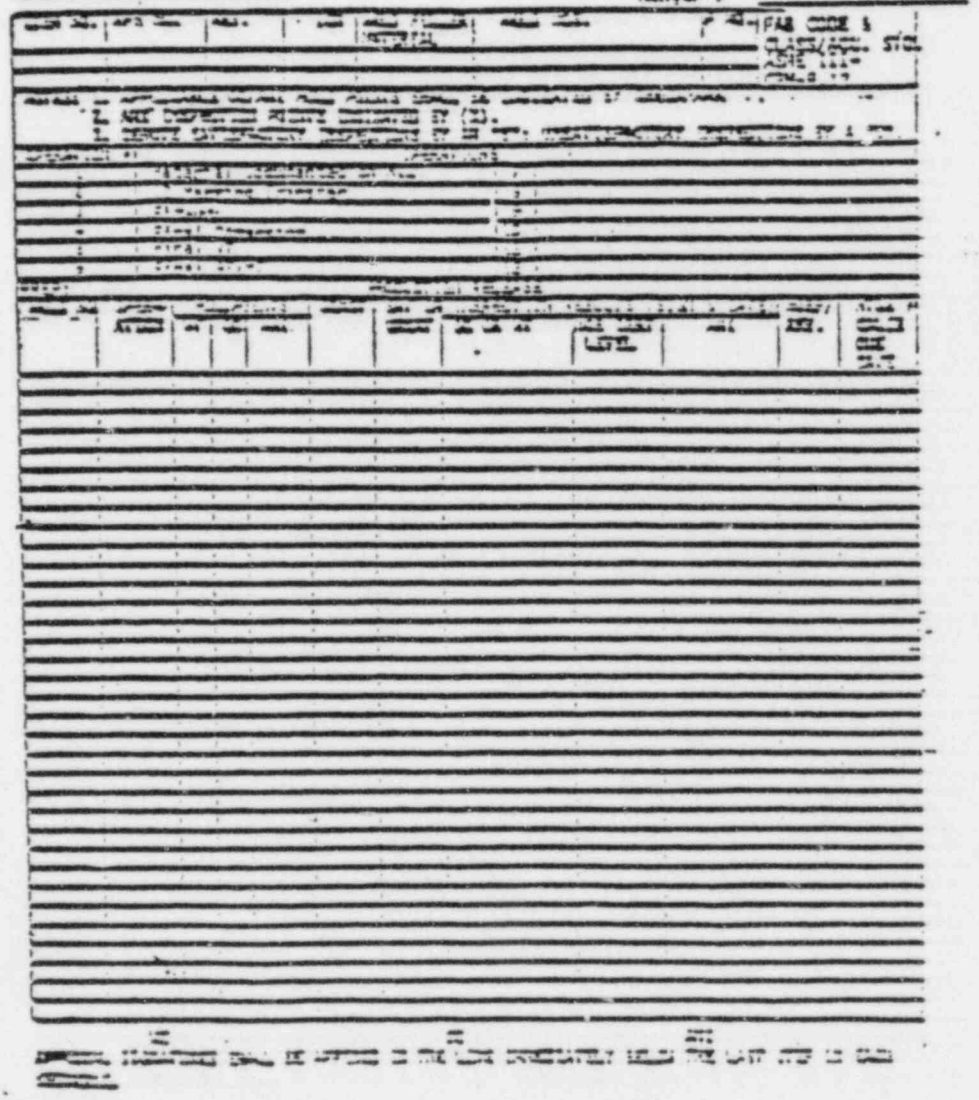
Card Serial #

Component Serial #

Vendor Supplied Component Modification Record

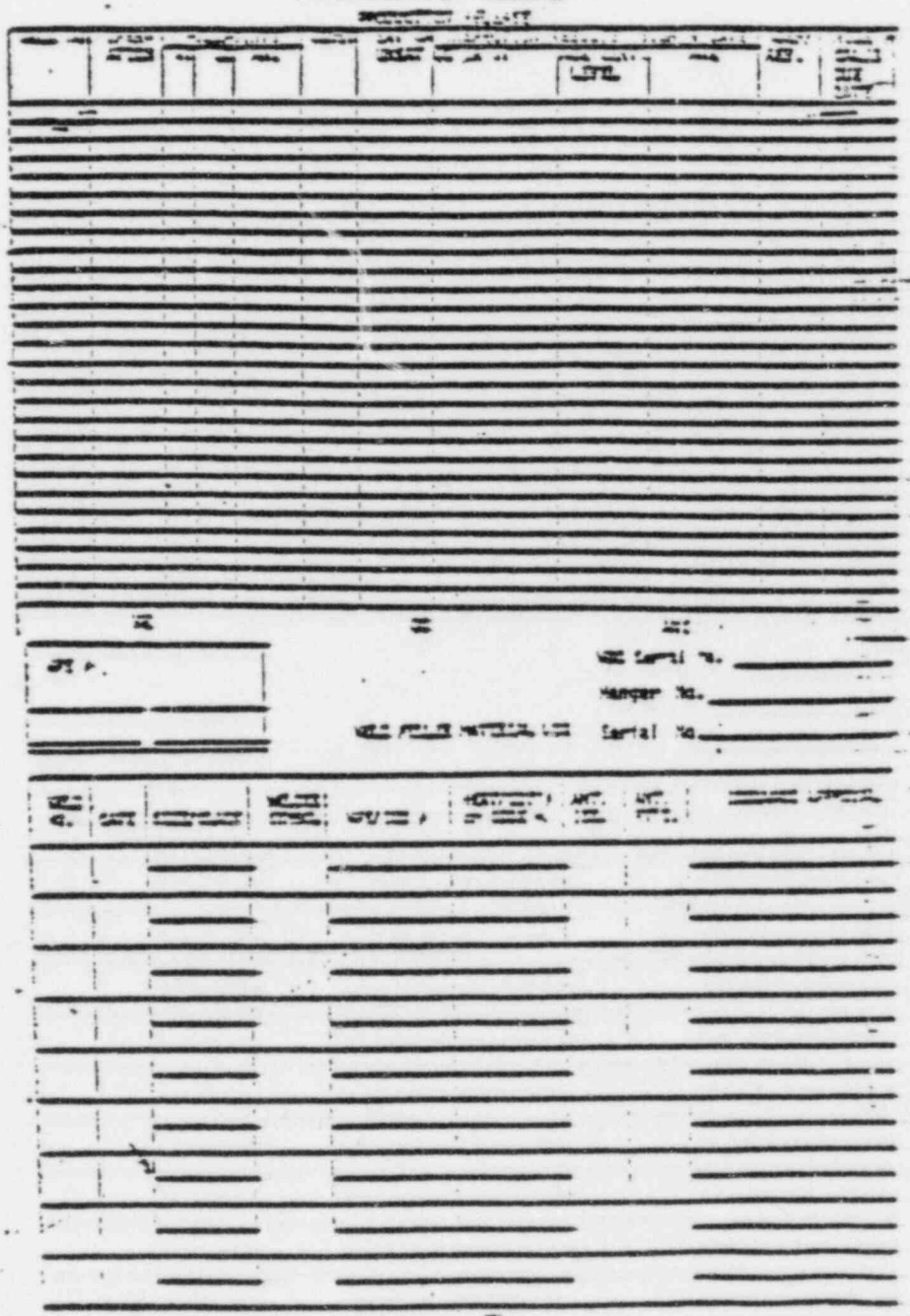
Original Hanger #

Designated Hanger #



ATTACHMENT 5 (Back)

VENDOR SUPPLIED COMPONENT MODIFICATION RECORD



ATTACHMENT 6

1.0 GENERAL

1.1 PURPOSE AND SCOPE

This instruction provides the inspection and verification requirements for material or items to be salvaged from Vendor supplied and B&R fabricated snubbers assemblies, ASME Class 1, 2, and 3 and subsequently used in the fabrication of Class 1, 2 and 3 supports.

2.0 INSTRUCTION

2.1 SALVAGING

Never interchange NPSI and ITT Grinnel parts or hardware. However except for the feedwater and mainsteam systems, NPSI and Grinnel snubber bodies may be interchanged.

Snubbers and associated hardware may be used on component supports other than those for which they are designated, provided requirements of this instruction are met.

When an item is salvaged for use on a support other than the one for which it was designated, the original support mark and serial number; or mark, MIC or heat number; or mark and heat code shall remain distinguishable on the item.

If the vendor fabricated snubber assembly with ASME Code plates are salvaged and used on supports other than those for which they are designated, the Code plate(s) shall remain attached to the item if one or more welds remain. When all vendor welds are removed, the code plate(s) shall be removed, provided the original support number is transferred to the vendor part. Authorization to remove name plates which are shown on the drawing shall be provided by Engineering on the appropriate design change. Construction shall transmit the Code plate(s) to QC by a 3-part memo. QC will subsequently transmit the Code plate(s) to the Owner.

For B&R fabricated snubber assemblies that are to be salvaged which contain welds and these welds are to be salvaged, Welding Engineering is responsible for providing the documentation (WDC, WFML, etc.) necessary for QC to accept these welds. This documentation shall become part of the new snubber data package.

ATTACHMENT 6 (Continued)

2.2 LOCATION OF SALVAGED SUPPORTS

When B&R fabricated and vendor supplied snubber assemblies, either Code stamped or not, are designated for salvage and returned to the warehouse, these assemblies shall be reinspected by receiving QC in accordance with Paragraph 2.3.

B&R fabricated and vendor supplied snubber assemblies that are to be salvaged need not be returned to the warehouse. ASME Field QCI shall reinspect the salvaged items in accordance with Paragraph 2.4.

2.3 SALVAGED MATERIAL RELEASED FROM WAREHOUSE

Upon receipt of Material Requisitions (MR) from the warehouse for salvaged snubber assemblies/parts, the Receiving Inspector shall verify the following:

a. The MR identifies the intended use of the material or parts.

b. The MR identifies the original mark or support number from which it was salvaged if the part being salvaged is a Code stamped part.

c. All material, parts, or assemblies are identified by a unique mark or assembly number traceable to the original support identification for vendor supplied Code stamped parts.

d. B&R fabricated snubber assemblies parts or materials and B&R bulk exhibit a heat number which is traceable to an available material certification.

e. All vendor supplied snubber parts, materials, or assemblies are traceable to an available material certification.

Upon completion of the above verification, the Receiving Inspector will sign and date the MR.

ATTACHMENT 6 (Continued)

2.4 INSPECTION AFTER RELEASE TO FIELD

Once salvaged parts, materials, and/or assemblies are in the field for the construction, Quality Control shall perform the following verifications:

a. All vendor supplied, Code stamped, support parts or assemblies exhibit the unique identification number as shown on the corresponding MR.

b. All B&R fabricated snubber parts, and bulk material exhibit the heat number as shown on the MR, if released from the warehouse.

If the snubber part was not returned to the warehouse, the original MR shall be referenced on the QC Checklist.

Upon verification, the QC Inspector shall assure that the above applicable information is recorded on the appropriate form. QC acceptance shall be documented by signature and date in the Comment Section of the QC Checklist for Snubber Installation.

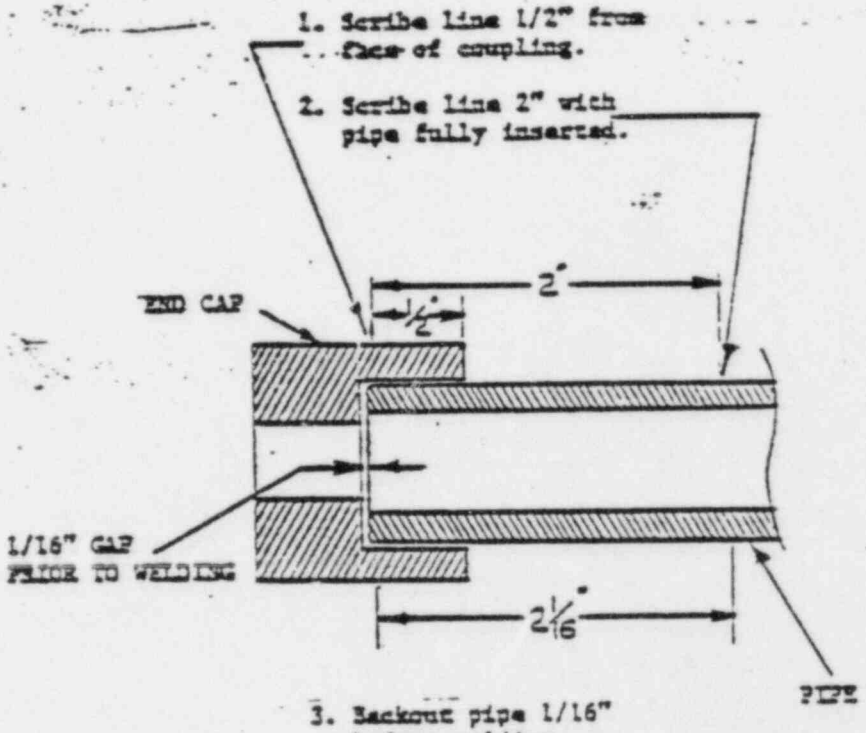
2.5 MATERIAL RE-CLASSIFICATION

When a salvaged snubber or part is to be used on a higher Code Class than it was originally supplied for, it shall be evaluated in accordance with Reference 1-E.

NOTES: 1) No evaluation is needed when a salvaged snubber or part is to be used on a lower Code class than it was originally supplied for.

ATTACHMENT 7

NPSI SOCKET TYPE COUPLING END CAP FITUP



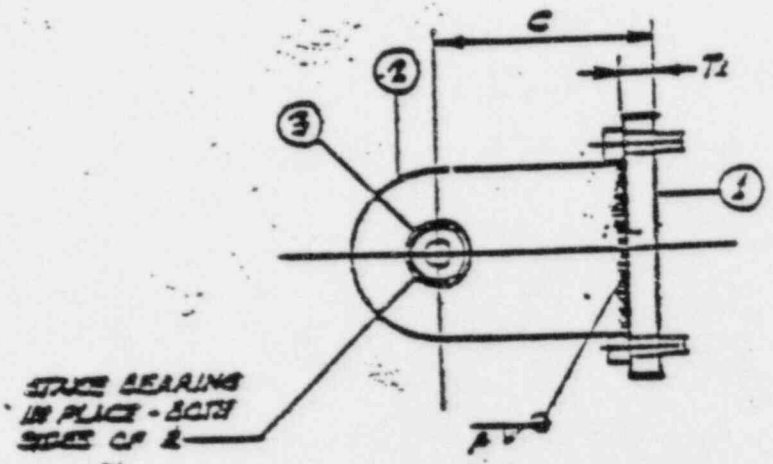
3. Backout pipe 1/16" before welding.

4. Measure 2 1/16" from scribe mark on end cap to scribe mark on pipe in order to achieve 1/16" end gap.

ATTACHMENT 8

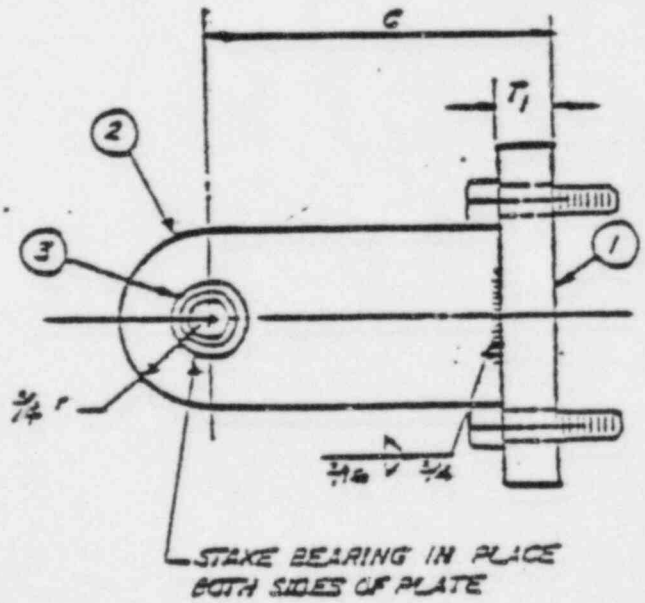
FORWARD BRACKET MODIFICATION
(DIMENSIONAL REQUIREMENTS)

Smubber sizes 1, 3, and 10



C MIN.	C MAX.	SIZE
1 3/8	9 11/16	1
2	11 1/32	3
2 3/8	14 1/16	10

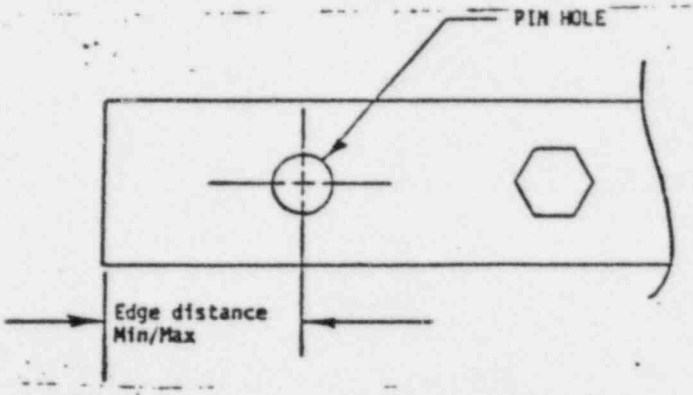
Smubber sizes ½ and ½



C MIN	C MAX
1 1/8	8 3/16

ATTACHMENT #9

PIPE CLAMP EDGE DISTANCE



	NPSI		IPT	
SNUBBER SIZE	MIN. EDGE DISTANCE	MAX. EDGE DISTANCE	MIN. EDGE DISTANCE	MAX. EDGE DISTANCE
¼,½	½"	5/8"	½"	5/8"
1	3/4"	1"	5/8"	15/16"
3	15/16"	1 ¼"	15/16"	1 3/16"
10	1 ¼"	1 9/16"	1 ¼"	1 9/16"
35	2"	2 3/8"	1 13/16"	* 2 13/16"
100	4"	4 9/16"	3"	3 7/16"

* If the snubber end cap hub protrudes, the 2 13/16" edge distance must be reduced by the amount the hub extends beyond the snubber body. Engineering shall be notified if such a reduction exceeds the minimum edge distance.

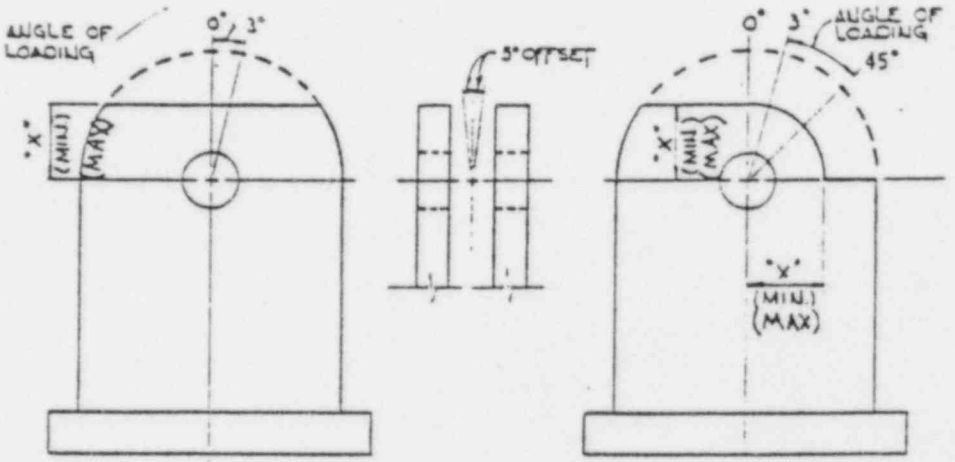
ATTACHMENT 10

SNUBBER BOLTING MINIMUM ENGAGEMENT

Snubber Size SMS	Minimum Thread Engagement
1/4 - 1/2	3/16"
1	5/16"
3	5/16"
10	9/16"
35	Not Applicable
100	Not Applicable

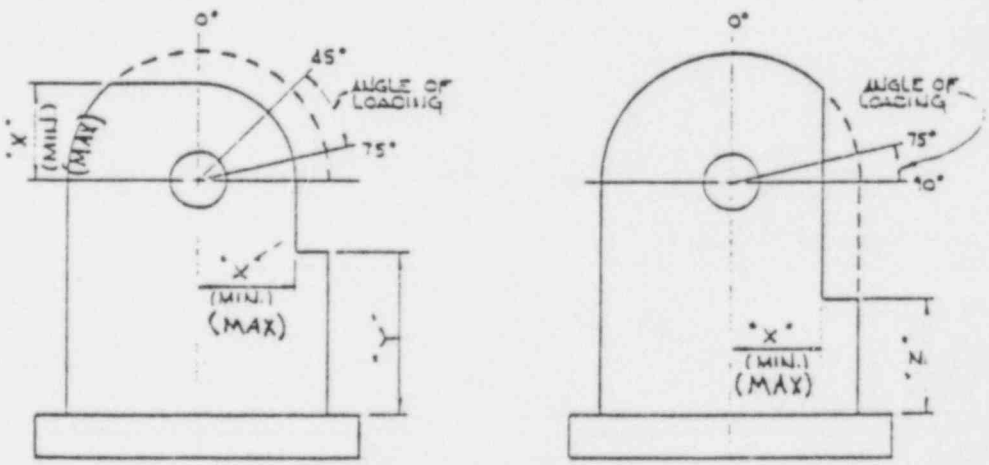
ATTACHMENT 11

FIELD MODIFICATION OF SIZE 35 AND 100
SNUBBER REAR BRACKETS



ANGLE OF LOADING 0° to 3°

ANGLE OF LOADING 3° to 45°



ANGLE OF LOADING 45° to 75°

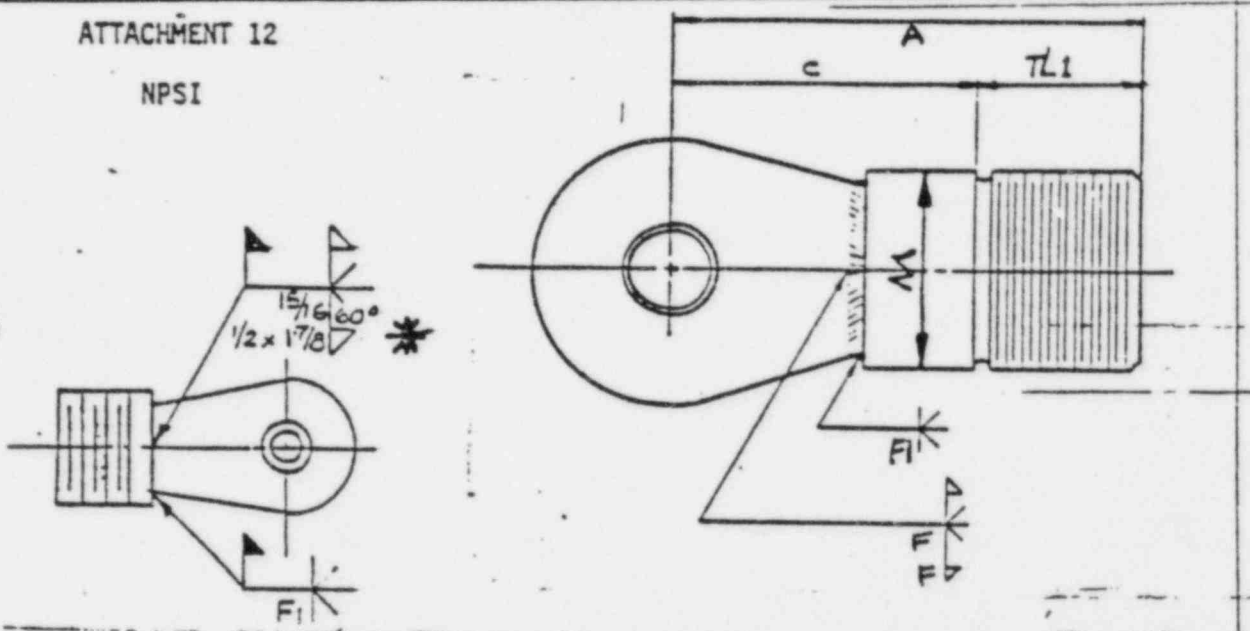
ANGLE OF LOADING 75° to 90°

SNUBBER SIZE	X (MIN.)	X (MAX)	Y	Z
35	2 3/4	2 1/4	2 1/4	3/4
100	3 1/4	3 1/4	3 1/4	2

NOTE:
1. REMOVE PIN PRIOR TO MODIFYING REAR BRACKET.
2. ALL THE DETAILS SHOWN ABOVE INCLUDE 3° OFFSET.

ATTACHMENT 12

NPSI



SIZE	A		C		TL1 **
	MIN	MAX	MIN	MAX	
35	4 1/2	22 15/16	3 1/8	21 13/16	1 1/8 ± 1/16
100	7 7/16	31 3/8	5 3/4	29 11/16	1 5/8 ± 1/16

SMFB Sizes	M (MIN)	F	F_1
35, 35L, 35XL	3 1/2	3/8	-
100,100L,100XL	4 1/2	3/4	-
35, 35L, 35XL	2 7/8	3/8	3/16
100,100L,100XL	3 5/8	*	5/16

NOTES: 1. STAKE BEARING IN PLACE, BOTH SIDES.
2. A = C + TL1
3. MATERIAL OF FORWARD BRACKET EYE AND THREADED ADAPTER IS SA-36.

** Required thread engagement for forward bracket or transition kit.

ATTACHMENT 13

NPSI TRANSITION KIT PIPE SIZING GUIDE

Snubber Size	Pipe Size
¼	1" Sch. 40
½	1" Sch. 40
1	1¼" Sch. 40
3	1½" Sch. 40
10	2" Sch. 80
35	4" Sch. 80
100	6" Sch. 120

Pipe material shall be SA-106, Grade B, unless otherwise specified by design.

ITT GRINNELL TRANSITION KIT PIPE SIZING GUIDE

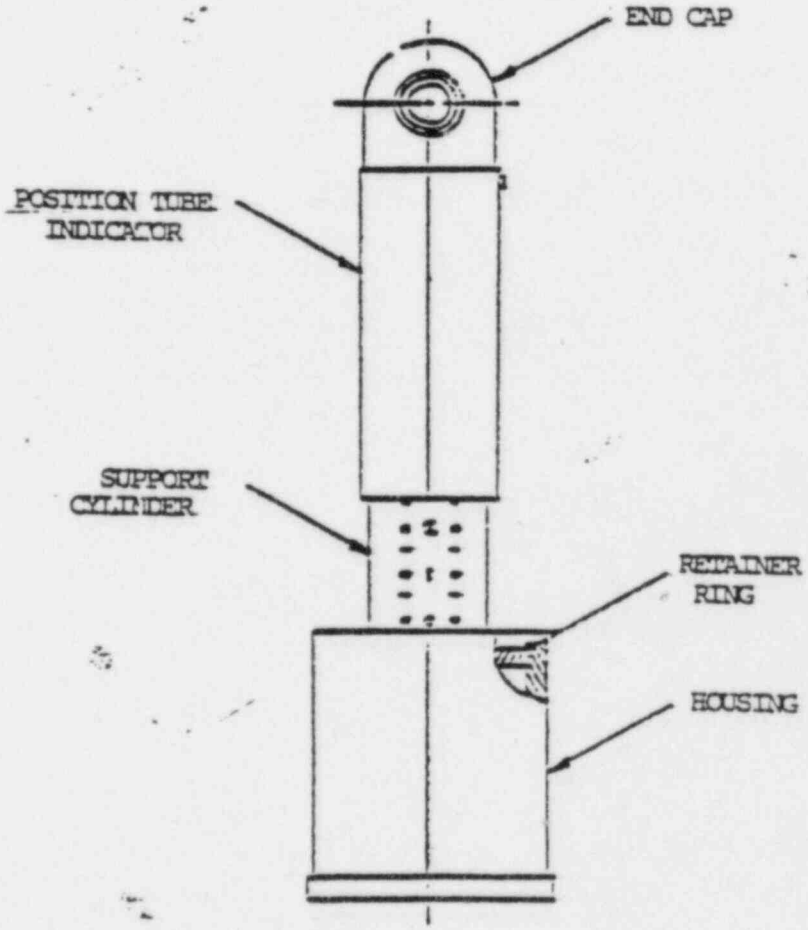
Snubber Size	Pipe Size
¼	1" Sch. 40
½	1" Sch. 40
1	1" Sch. 80
3	2" Sch. 40
10	2½" Sch. 40
35	4½" O.D. x 8" Wall
100	5-9/16" O.D. x 1" Wall

Pipe material shall be SA-53, Grade B, or SA-106, Grade B.

ATTACHMENT 14

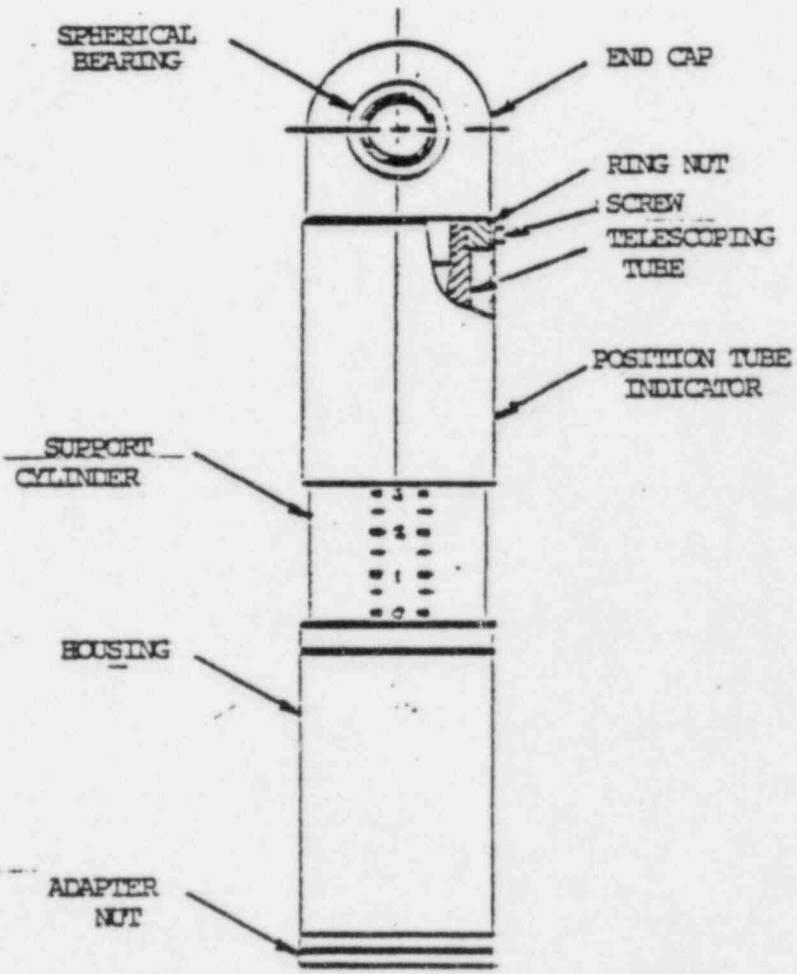
MECHANICAL SHOCK ARRESTOR

SIZES 1/4 through 10



ATTACHMENT 15

MECHANICAL SHOCK ARRESTOR



ATTACHMENT 16

1.0 GENERAL

1.1 PURPOSE AND SCOPE

This attachment provides the inspector with the inspection criteria to be used when inspecting the restaking of spherical bearings.

2.0 INSTRUCTION

2.1 SPHERICAL BEARING STAKING INSPECTION

Spherical bearings that are loose in the eye rod or snubber ends or have become dislodged require restaking prior to installation. Prior to commencement of the staking operation, construction personnel will notify QC. This notification gives the QC Inspector an opportunity to monitor the staking operation. Upon completion of the staking operation, the QC Inspector shall inspect the eye rod (or snubber end) to verify the following:

a. The eye rod hole is not deformed;

b. The bearing race is centered in the eye rod hole and should be staked approximately 1/16" from the edge. However, this dimension is not critical as long as the bearing meets the conditions in C, D and E below.

c. The bearing shall be free from rust, dirt and other foreign material;

d. The bearing gimbal moves freely in its race.

e. The race is secured within the eye rod.

2.2 DOCUMENTATION

Spherical bearing restaking shall be documented on an Inspection Report (See Table 1 of this Attachment) and on the MWDC. The support mark number shall be recorded in the "Identification No." block.

Completed documentation shall be reviewed and transmitted to Quality Engineering Systems for filing in respective hanger document package.

2.3 NONCONFORMANCES

All nonconforming conditions shall be reported in accordance with Paragraph 11.0 of this procedure.

ATTACHMENT 16 (Continued)

TABLE 1

COMANCHE PEAK STEAM ELECTRIC STATION

INSPECTION REPORT

SHEET 1 OF 1

IR-#

ITEM DESCRIPTION | IDENTIFICATION NO. | SYSTEM/STRUCTURE DESIGNATION

SPEC. NO. | REV. | PROC. SEC. & REV. & CHANGE NO. QI-QAP-11.1-28A | TRAVELER OR TEST & EVAL. REPT. NO.

☐ IN PROCESS INSPECTION ☐ PIPE INSTALLATION VERIFICATION ☐ INSTALLATION INSPECTION ☐ FINAL INSPECTION ☐ SPECIAL INSPECTION

UNDER PROCEDURE

☐ INSPECTION COMPLETED, ALL APPLICABLE ITEMS SATISFACTORY

☐ INSPECTION COMPLETED, UNSATISFACTORY ITEMS LISTED BELOW

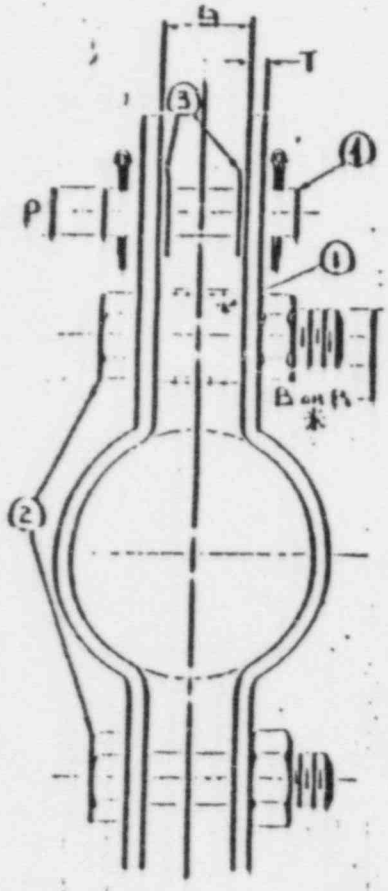
QC INSPECTOR _____ DATE _____

ITEM NO.	INSPECTION ATTRIBUTES	SAT	UNSAT	DATE	QC SIGNATURE
	A. Eye rod hole not deformed				
	B. Bearing race center and staked				
	C. Bearing free from dirt, rust, foreign material				
	D. Bearing gimbals freely				
	E. Record support mark number (Identification number, Item 3)				

REMARKS (CODE, SPECS, ETC.)

RELATED NCR NO. | L.R. CLOSED ☐ | DATE | SIGNATURE _____ QC INSPECTOR

NPSI CLAMP SPACER SIZE



① CLAMP, SPACER

CLAMP SIZE	SPACER LENGTH G **	SPACER LENGTH G ***	BOLT SIZE & SPACER SIZE 3/4"ϕ	1"ϕ	1 1/4"ϕ	1 1/2"ϕ	1 3/4"ϕ	2"ϕ	2 1/2"ϕ	3"ϕ
SPC-06-XXX	11/16"	1"	006 TO 040	050 TO 080	100 TO 180	200 TO 360				
08	11/16"	1"	008 TO 040	050 TO 080	100 TO 180	200 TO 360				
10	1"	1 1/2"		120 TO 035	140 TO 100	120 TO 260	280 TO 360			
12	1 1/4"	1 1/4"			120 TO 050	060 TO 100	120 TO 180	200 TO 360		
14	1 1/4"	1 3/4"			020 TO 050	060 TO 100	120 TO 180	200 TO 360		
20	1 7/8"	2 1/4"			030 TO 050	060 TO 160	180 TO 240	260 TO 360		
24	2"								010 TO 220	110 TO 360
36	3 1/8"								120 TO 220	240 TO 360
MATERIAL			1"ϕ S/40	1 1/4"ϕ S/40		1 1/2"ϕ S/40		2"ϕ S/40	3"ϕ S/40	

* B = BOLT DIA 3/4"ϕ THRU 1 1/4"ϕ (STUDS MAY BE SUBSTITUTED)
R = STUD DIA 1 1/2"ϕ THRU 3"ϕ

** NPSI PRESENT DESIGN
*** NPSI DESIGN FOR CLAMP SHIPPED PRIOR TO 8'79

ATTACHMENT 18

NPSI CLAMP BOLTS & STUDS SIZE

② CLAMP BOLTS & STUDS

CLAMP SIZE	APPROX. LENGTH & BOLT SIZE								
	3/4"ϕ	1"ϕ	1¼"ϕ	1½"ϕ	1¾"ϕ	2"ϕ	2½"ϕ	3"ϕ
	BOLTS							
SPC-08-XXX	3½"	3½"	4"	5½"				
SPC-10-XXX	3½"	3½"	4½"	5½"				
SPC-12-XXX		4"	5"	6"				
SPC-14-XXX			5½"	6½"	8"			
SPC-20-XXX			6"	7"	8½"	10"		
SPC-24-XXX				7½"	9"	11"	15"	210-340
SPC-36-XXX				8½"	10"	11½"	16"	210-340
	STUDS							
SPC-08-XXX								
SPC-10-XXX								
SPC-12-XXX				5½"	6"			
SPC-14-XXX				6"	6½"	8"		
SPC-20-XXX				6½"	7"	8½"	10"	
SPC-24-XXX				7"	7½"	9"	11"	210-340
SPC-36-XXX				8"	8½"	10"	11½"	210-340

B: BOLT DIA ¾"ϕ THRU 1¼"ϕ (STUDS MAY BE SUBSTITUTED)
R: STUD DIA 1½"ϕ THRU 3"ϕ

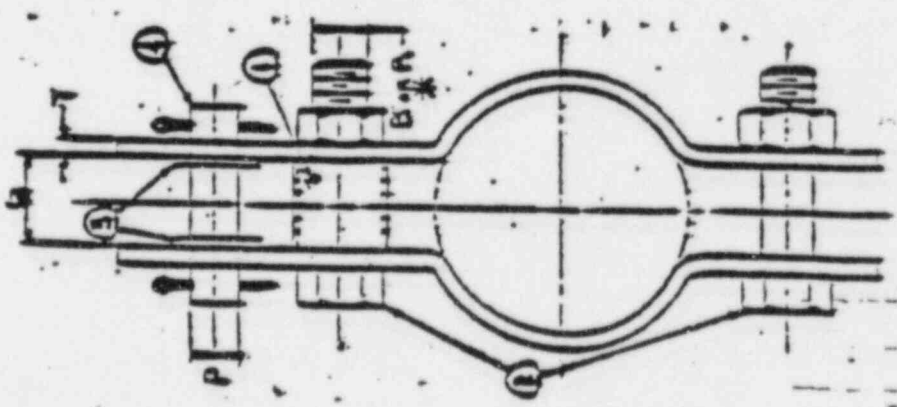
* NPSI PRESENT DESIGN
** NPSI DESIGN FOR CLAMP SHIPPED PRIOR TO 8/79

ATTACHMENT 19

NPSI BEARING SPACER/WASHER SIZE

(3) BEARING SPACERS

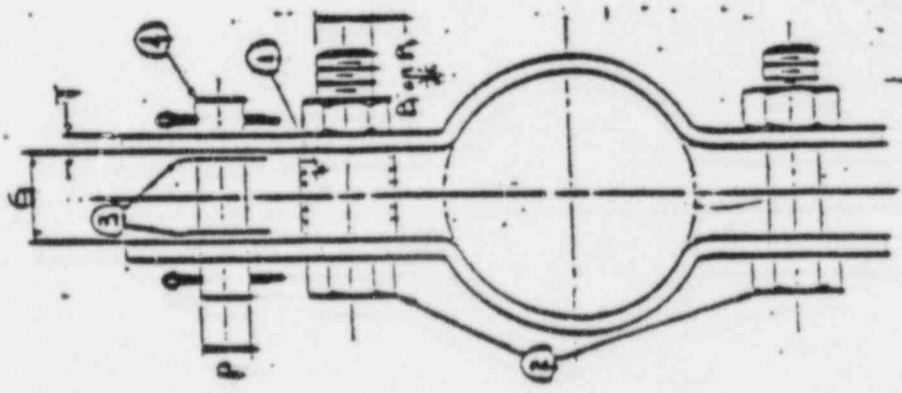
CLAMP SIZE	SPACER LENGTH
SPC-06-XXX	AS DESCRIBED IN PARA. 5.7a
08	
10	
12	
14	
20	
24	
36	



ATTACHMENT 20

NPSI CLAMP PINS SIZE

④ CLAMP PINS		
CLAMP SIZE	PIN SIZE 'B'	'L' PIN LENGTH
BMC-06-XXX		AS DESCRIBED IN PARA 5.7 b
08	3/8" ϕ	
10	1/2" ϕ	
12	3/4" ϕ	
14	1" ϕ	
20	1 1/4" ϕ	
24	1 1/2" ϕ	
36	3" ϕ	



ATTACHMENT 21

ITT GRINNELL CLAMP PART SIZES

Fig. No. & Size	Pipe Size	Load Stud* SA-193 GR B7 Unless Noted	Clamp Bolts* SA307 GR B or ASTM A307 GRA	Spacer ** SA106 GR B or SA-53 GR B	Washers +
Fig. 306/307 Size 1/4 & 1/2	3/4-1 1/4	.374 / .372 Dia.	3/8-16 x 2"	1/2" Sch 40 5/8" Long	.38 ID .561 O.D. .059 Thick
	1 1/2-3 1/2		1/2-13 x 2 1/4		
	4 - 10	3" Long	3/4-10 x 3"	3/4" Sch 40 5/8" Long	
Fig. 306/307 Size 1	3/4-3 1/2	.499 / .497 Dia.	3/4-10 x 3 1/4	3/4" Sch 40 Pipe 1" Long	.53 ID 1.00 O.D. .188 Thk.
	4-8		3/4-10 x 3 1/2		
	10-14	4 5/8" Long	3/4-10 x 3 3/4		
	18-36		3/4-10 x 4"		
Fig. 306/307 Size 3	3/4-6	.999 / .997 Dia.	1-8 x 4 1/2	1" Sch 40 pipe 1 1/8" Long	.781D .125 OD .234 Thk
	8-36	7 1/8" Long	1-8 x 5"		
Fig. 306/307 Size 10	1 1/4-10	.999 / .997 Dia.	1 1/4-7x5"	1 1/4 sch 40 1 1/8" Long	1 1/4 sch 40 .29" Long
	12-36	7 1/8" Long	1 1/4-7-5 1/2		
Fig. 306/307 Size 15	3-8	1.499 / 1.497 x11 3/8" SA564 TP630 age hardened H 1075 T	2-4 1/2x7 1/2	2" Sch 40 2" Long	1 1/2" sch 40 .29" Long
	10-14		2-4 1/2x8		
	16-18		1 1/2-6x7	1 1/2" sch 40 2" Long	
	20-36		1 1/2-6x7 1/2		
Fig. 306/307 Size 100	6	2.499 / 2.497 x17" Lg.	2-4-1/2x8 1/2	2"Sch40 2 1/2 L	2.53 I.D. 3.250 O.D. .125 Thick
	8		1 1/2-6x8	1 1/2" sch 40 2 1/2" Long	
	10-14		1 1/2-6x8 1/2		
	16-24		1 1/2-6x9		
	30-36		1 1/2-6x10		

* Load Stud and Clamp bolt lengths are approximate, however, nuts shall have full thread engagement.

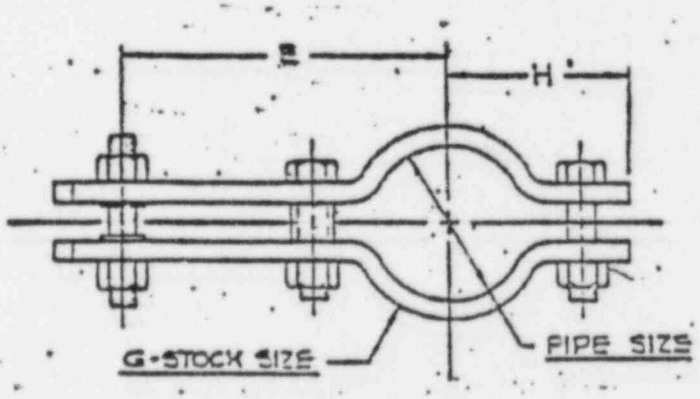
** Tolerance on spacer lengths are ± 1/16".

\+ Tolerance on Washers thicknesses are ± 1/32", I.D.'s and O.D.'s are nominal dimensions, the only consideration is that they fit on the load stud with contact against the ball bearing.

ATTACHMENT 21 (Continued)

ITT CLAMP STOCK SIZES

Pipe Size	FIG. 306/307																		
	Size ½ - ½			Size 1			Size 3			Size 10			Size 35			Size 100		
	E	G	H	E	G	H	E	G	H	E	G	H	E	G	H	E	G	H
Up to ⅜	5 1/8	⅜ x 1 ¼	3 ⅜	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
½ - 1 ⅛	2 ⅜	⅜ x 1	1 ⅝	7	⅜ x 1 ⅜	4 ⅜	7	½ x 2 ⅛	5 ⅜	-	-	-	-	-	-	-	-	-
1 ⅛ - 1 ⅜	2 ⅜	⅜ x 1	1 ½	7	⅜ x 1 ⅜	4 ⅜	7	½ x 2 ⅛	5 ⅜	-	-	-	-	-	-	-	-	-
1 ⅜ - 1 ⅝	2 ⅝	⅜ x 1	1 ⅝	7	⅜ x 1 ⅜	4 ⅜	7	½ x 2 ⅛	5 ⅜	-	-	-	-	-	-	-	-	-
1 ⅝ - 1 ⅞	4 ⅛	½ x 1 ½	2 ⅜	7	⅝ x 1 ⅜	4 ⅜	7	½ x 2 ⅛	5 ⅜	8 ⅛	⅜ x 2 ½	6 ½	-	-	-	-	-	-
2 - 2 ⅛	5 ⅛	⅜ x 1 ¼	3 ⅛	7	⅜ x 1 ⅜	4 ⅜	7	½ x 2 ⅛	5 ⅜	8 ⅛	⅜ x 2 ½	6 ½	-	-	-	-	-	-
2 ⅛ - 2 ⅜	5 ⅜	½ x 1 ½	3 ⅛	7	⅜ x 1 ⅜	4 ⅜	7	½ x 2 ⅛	5 ⅜	8 ⅛	⅜ x 2 ½	6 ½	-	-	-	-	-	-
3 - 3 ⅜	5 ⅝	½ x 1 ½	3 ⅝	7	⅜ x 1 ⅜	4 ⅜	7	½ x 2 ⅛	5 ⅜	8 ⅛	⅜ x 2 ½	6 ½	-	-	-	-	-	-
3 ⅜ - 4 ⅛	6 ⅛	½ x 1 ½	3 ⅝	7	⅜ x 1 ⅜	4 ⅜	7	½ x 2 ⅛	5 ⅜	8 ⅛	⅜ x 2 ½	6 ½	11 ⅜	1 x 5	9 ⅝	-	-	-
4 ⅛ - 4 ⅝	6 ½	⅝ x 2	4 ⅝	7 ¼	½ x 1 ½	5 ⅛	7 ¼	⅝ x 2 ½	5 ¾	8 ⅜	⅜ x 2 ½	6 ⅜	11 ⅜	1 x 5	9 ⅝	-	-	-
4 ⅝ - 5 ⅞	7 ¼	⅝ x 2	5 ⅛	7 ¾	½ x 1 ½	5 ¼	7 ¾	⅝ x 2 ½	6 ⅞	9 ⅛	¾ x 3	7 ⅛	11 ⅜	1 x 5	9 ⅝	-	-	-
5 ¼ - 6 ⅛	8 ⅜	⅝ x 2	5 ⅝	8 ⅜	½ x 2	6 ¼	8 ⅜	¾ x 3	7 ¼	10	¾ x 4	7 ⅜	11 ⅜	1 x 5	9 ⅝	16 ⅞	1 ½ x 7	12 ¾
6 ¼ - 8 ⅛	9 ⅜	¾ x 2	7	9 ⅜	½ x 2 ½	7 ⅜	9 ⅜	¾ x 3	8 ⅜	11 ¼	¾ x 5	8 ⅜	12 ⅝	1 x 7	10 ⅜	15 ¼	1 ½ x 8	11 ⅜
8 ¼ - 10 ⅛	10 ½	¾ x 2	8 ⅝	10 ½	⅝ x 2 ½	8 ⅞	10 ½	¾ x 4	9 ⅜	12 ⅜	¾ x 6	10 ⅛	14 ¼	1 ¼ x 6	12 ⅜	16 ¼	1 ½ x 9	12 ¾
10 ⅛ - 12 ⅜	-	-	-	11 ⅞	⅜ x 2 ½	9 ¼	11 ⅞	¾ x 5	10 ½	15 ⅜	1 x 5	11 ½	15 ⅜	1 ¼ x 6	13 ⅜	17 ¼	1 ½ x 9	13 ¾
12 ⅜ - 14 ⅛	-	-	-	12 ⅝	⅜ x 2 ½	10 ⅜	12 ⅝	¾ x 5	11 ⅜	14 ½	1 x 5	12 ⅛	16	1 ¼ x 7	14 ⅛	18	1 ½ x 10	15 ⅜
14 ⅛ - 16 ⅛	-	-	-	13 ⅜	⅝ x 3	11 ⅞	13 ⅞	¾ x 5	12 ¾	15 ¼	1 x 5	13 ⅜	17 ½	1 ½ x 8	14 ⅝	19	1 ¾ x 9	14 ⅞
16 ⅛ - 18 ⅛	-	-	-	14 ⅝	¾ x 3	12 ¾	14 ⅝	¾ x 5	13 ⅜	16 ¾	1 x 6	14 ¼	18 ¼	1 ½ x 9	15 ⅛	20	1 ¾ x 10	15 ⅞
18 ⅛ - 20 ⅛	-	-	-	15 ¾	¾ x 3	13 ⅝	15 ¾	⅞ x 5	14 ⅞	17 ¾	1 x 7	15 ⅝	19 ¼	1 ½ x 8	16 ⅛	21	1 ¾ x 11	16 ⅞
20 ⅛ - 24 ⅛	-	-	-	16 ½	¾ x 4	15 ⅛	15 ⅝	⅞ x 5	16 ⅜	19 ⅞	1 x 7	17 ⅜	21 ¾	1 ½ x 9	18 ⅛	23	1 ¾ x 12	18 ⅞
24 ⅛ - 30 ⅛	-	-	-	21 ¼	¾ x 4	18 ¾	21 ¼	⅞ x 6	19 ⅜	23	1 x 7	20 ⅜	25	1 ½ x 10	22 ⅝	26 ¼	2 x 12	22
30 ⅛ - 36 ⅛	-	-	-	29	¾ x 5	21 ⅜	24	¾ x 7	22 ⅞	26 ½	1 x 7	23 ⅝	28 ⅛	1 ½ x 10	25 ⅝	29 ¼	2 x 12	35



ATTACHMENT 22

N.P.S.I. SHOCK ARRESTOR-ADJUSTABLE (SMA)

SIZE	½	½	1	3	10	35	100
MAX CC* INCHES	66	66	66	86	100	120	120

N.P.S.I. SHOCK ARRESTOR-FIXED (SMF)

SIZE	½	½	1	3	10	35	100
MAX CC* INCHES	19½	17¾	22-7/8	28-7/8	34½	48-7/8	61-3/4

GRINNELL SHOCK ARRESTOR-FIXED (FIG. 306)

SIZE	½	½	1	3	10	35	100
MAX C-C* INCHES	12-3/16	9-5/16	14-9/16	19-1/8	23-5/16	30	35-13/16

GRINNELL SHOCK ARRESTOR-ADJUSTABLE (FIG. 307)

SIZE	½	½	1	3	10	35	100
MAX CC* INCHES	62	62-3/4	62	61½	72	117	117

* SNUBBER SET AT MID-RANGE OF STROKE

ATTACHMENT 23

QC CHECKLIST FOR REMOVAL
AND REINSTALLATION OF SNUBBERS

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REMOVAL:

PARA.	OP.NO.	OPERATION
10.4.1	1.	Hanger # _____
10.4.1	2.	IRN # _____
10.4.1	3.	Snubber Serial # _____
10.4.1	4.	Pin to Pin Dimension (Snubber Fully Compressed) _____
10.4.1	5.	Physical Damage _____
		QCI/DATE _____

REINSTALLATION:

PARA.	OP.NO.	OPERATION
10.4.2	1.	Snubber Serial # _____
10.4.2	2.	Snubber Operation _____
10.4.2	3.	Physical Damage _____
10.4.2	4.	Pin to Pin Dimension (Snubber Fully Compressed) _____ . _____
10.4.2	5.	Torque of Adjustable Eye Rod Jam Nut
		M&TE _____ VALUE _____
	6.	Reinstallation Complete QCI _____ DATE _____
	7.	QC Supervision Review _____ DATE _____
		NCR: _____
		COMMENTS: _____

ATTACHMENT 24

QC CHECKLIST FOR REMOVAL
AND REINSTALLATION OF SNUBBERS

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REMOVAL:

PARA.	CP.NO.	OPERATION
10.5.1	1.	Hanger# _____
10.5.1	2.	NCR# _____
10.5.1	3.	Snubber Serial# _____
10.5.1	4.	Pin to Pin Dimension (Snubber Fully Compressed) _____
	5.	Physical Damage _____
		QCI/DATE _____

REINSTALLATION: TRANSITION KIT#_____
FORWARD BRACKET#_____

PARA.	CP.NO.	OPERATION
10.5.1	1.	Replacement Snubber Serial#_____
10.5.1	2.	Snubber Operation_____
10.5.1	3.	Physical Damage_____
10.5.1	4.	Pin to Pin Dimension (Snubber Fully Compressed) _____
10.5.1	5.	Torque of Adjustible Eye Rod Jam Nut
		M&TE_____ VALUE _____
	6.	Reinstallation Complete QCI_____DATE_____
	7.	QC Supervision Review_____Date_____
		NCR#_____CLOSURE DATE_____
		COMMENTS:_____Torque of mounting bolts
		M&TE_____ VALVE_____
		LOCK WIRE INSTALLED_____
		TRANSITION KIT _____
		FORWARD BRACKET_____