EVALUATION RESEARCH CORPORATION

COMANCHE PEAK RESPONSE TEAM

QUALITY INSTRUCTION FOR ISSUE-SPECIFIC ACTION PLAN VII.c

PROCEDURE NO.: QI-029

REVISION NO.: 3

EFFECTIVE DATE: 06/27/86

REINSPECTION OF LARGE BORE PIPE SUPPORTS-NON RIGID

Prepared by: _____ Date: 6/25/86

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Approved by: _____
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Approved by: _____
QA/QC Review Team Leader Date: 6/26/86

1.0 PURPOSE

This procedure provides instructions and accept/reject criteria for the reinspection of Large Bore Pipe Supports - Non-Rigid by the QA/QC Inspection team.

2.0 APPLICABILITY

This procedure applies to the visual reinspection of the safety significant attributes of safety related hardware within the Large Bore Pipe Supports - Non-Rigid Population.

3.0 REFERENCES

3.1 Memo QA/QC-RT-313, "Description Memorandum for Reinspection of Large Bore Pipe Supports-Non-Rigid" identifies the documents used to develop the checklist and procedures, including specific sources for attributes, exclusions and alternate accept/reject criteria.

3.2 CPP-009, "Performance of Reinspection and Documentation Reviews."

3.3 Brown & Root Procedure, QI-QAP-10.2-4B, Revision 3 dated June 2, 1983, "Ultrasonic Examination of HILTI Bolts."

4.0 GENERAL

4.1 Responsibilities

A. QA/QC Discipline Engineers

The QA/QC Discipline Engineers prepare the inspection procedures delineating reinspection requirements and attributes.

B. QA/QC Inspectors

QA/QC Inspectors perform reinspection/verification in accordance with this inspection procedure and record observations and deviations.

4.2 Policy

Activities performed under this procedure shall conform to the policies contained in the latest Comanche Peak Response Team Program Plan and Issue-Specific Action Plan VII.c.

5.0 INSTRUCTION (Notes 27, 28, 31, 32, 33, 34, 35)

Attachment 6.1, Reinspection Checklist shall be used by the inspector to document Inspection Results in accordance with Reference 3.2.

5.1 Support Identification

5.1.1 Verify support is permanently marked with the support
(1) mark number. Integral attachments shall also be marked. Identification can be accomplished by die stamping, vibro etching or nameplate securely fastened to support structure. (Note 16)

5.2 Support Location and Orientation

5.2.1 Verify support location and orientation, as dimensioned
(2) on design drawing and BRHL (Brown & Root Hanger Location) drawings. Dimensioning to support shall be from a specific point on the pipe (elbow, tee, valve) or from surveyor reference points. Location Tolerances are given in Section 5.2.2.

5.2.2 Tolerances on location and orientation are:
(2)

A. Dead Weight Supports

1. Location axially shall be ±12 inches for Unit 2. Unit 1 and common shall be ±2 inches.

2. Angularity shall be ±1 degree for Unit 2 (±5 degrees for Unit 1 and Common,) or as noted on design drawing.

B. Seismic Restraints (Restraints, Anchors, Guides, etc.)

1. The location shall be within ±(2 X pipe wall thickness* + 2 inches) from drawing location for Unit 2. Unit 1 and Common shall be ± 2 inches.
* Nominal pipe wall thickness, t_n as supplied by QA/QC Discipline Engineer on Reinspection Checklist.

2. Angularity shall be ±1 degree for Unit 2, ±5 degrees for Unit 1 and common or as noted on design drawing.

5.3 Configuration (Note 10)

5.3.1 Verify all installed components are listed in the
(3A) Bill of Materials on the design drawings (DWG) or component modification card (CMC).

5.0 INSTRUCTION (Cont'd)

5.3 Configuration (Cont'd)

A. Standard catalog items can be verified by checking actual nominal dimensions against dimensions given on the typical inspection drawings (Attachment 6.21).

B. Springs, struts and snubbers can be verified by checking the model no./catalog code against the Bill of Materials on the DWG/CMC.

C. Structural components can be verified by checking the appropriate nominal dimensions.

D. ITT Grinnell Components in Unit 1 and Common, can be verified by checking actual nominal dimensions against dimensions given in Attachment 6.26.

5.3.2 (3B) Determine the material identification, i.e., heat number or vendors unique identifier, by recording the item no., description, and appropriate identification on Attachment 6.11. Items with no identification or identification not distinguishable shall be clearly indicated. This information is required for documentation review only.

5.3.3 (3C) Verify component installation is in accordance with the design drawing/component modification card and is within tolerances listed in 5.3.4. Skewed member attachment points shall be based on centerline of skewed member and not the center of the "foot print" created by the physical attachment. (Notes 32, 33)

5.3.4 (3C) All dimensions shall be per DWG/CMC except for tolerances noted below:

A. Bolt Hole Location

1. Baseplates

° From centerline of support attachment to centerline of bolt ± 1/4 inch.

° When shown on the DWG/CMC, the edge distance from the centerline of bolt to the edge of the baseplate shall be considered the minimum.

° If edge distance is not shown on the DWG/CMC the dimension shown in Table 5.3-1 shall be considered the minimum.

5.0 INSTRUCTION (Cont'd)

5.3 Configuration (Cont'd)

2. Structural Members

- Centerline of bolt location shall be ± 1/4 inch.
- When shown on the DWG/CMC, the longitudinal edge distance shall be considered a minimum.
- When not shown on the DWG/CMC, the edge distance shown in Table 5.3-1 shall be considered the minimum.

B. Attachments to baseplates ± 1/4 inch.

C. Component member length ± 1/2 inch.

D. Component member locations ±1 inch (other than baseplates)

E. Reference (REF) dimensions ±2 inches.

F. "Cut-to-Suit" shall mean that an item can be installed so as to make an assembly correct provided length does not exceed that on the bill of materials.

G. "Cut-to-Fit" shall indicate an optional operation that may or may not be required. If this statement appears on an "AS-BUILT" drawing and no operation has taken place, an out-of-scope observation shall be generated. A copy of the out-of-scope shall be included with the package.

5.3.5 Verify that the clearances meet the following criteria: (3D)

A. Box Frame Supports

1. Where design shows 1/16 inch on both sides, the total dimensional tolerance shall be 1/8" ± 1/16" (e.g. 0" on one side with 1/8" ± 1/16" on the other, 1/16" ± 1/32" on both sides or any combination).*

2. Where design shows 0" inch on one side and 1/16 inch on the other side, the sum of both gaps may not exceed 1/8 inch or be less than 1/32 inch.*

3. Where design shows clearances greater than 1/4 inch, the dimension shown is the minimum.

5.0 INSTRUCTION (Cont'd)

5.3 Configuration (Cont'd)

4. Dead weight supports shall be 0" in the gravity direction with no tolerance allowed at that portion. All other tolerances remain for balance of clearances.

5. Dead weight supports are identified by a "D" at the end of the support mark number or are spring type supports.

* Where design shows 0" on the bottom (in the gravity direction) then it shall be such with no allowable variation.

B. Welded and Bolted U-Guides (Note 25)

1. Maximum accumulative clearance: 3/16 inch (in one direction)

2. Minimum accumulative clearance: 1/32 inch (in one direction)

C. Shear Lugs (integral attachment)

1. Where design shows 1/16 inch clearance between shear lug and the restraining member, the total clearance for both sides of the restraint shall range from 0 inch to 3/16 inch. All lugs on each side of the restraining member must be aligned within 1/16 inch of each other.

2. The allowable circumferential deviation in the pipe attachment location of the lugs is 1/8 inch.

D. Shims

1. Where shims are used to maintain clearance, the typical shim detail sheets shall be adhered to. (Attachment 6.21.)

E. U-Bolt Type Supports (Note 1)

1. Where zero gap is specified, or no clearance is specified, the U-Bolt should be tight against the pipe. Localized gaps due to different curvatures of pipe and U-Bolt are acceptable.

5.3.6 (3E) Verify, where required by DWG/CMC, baseplates attached to floors are grouted.

5.3.7 (3F) Verify wall and ceiling baseplates fit flush against the mating surfaces. The following is acceptance criteria where baseplates are not flush.

5.0 INSTRUCTION (Cont'd)

5.3 Configuration (Cont'd)

A. The gap between the plate and concrete for a maximum of 20% of the plate perimeter may exceed 1/16 inch, but at no point shall the gap exceed 1/2 inch.

B. The gap on wall and ceiling plates may be grouted using cement or epoxy grout.

C. Gaps greater than 1/16 inch shall be shimmed using steel shims around or adjacent to the Hilti or Richmond anchors.

5.4 Bolting (Note 2)

5.4.1 (4A) Verify all bolts, studs or threaded rods have full thread engagement in the nut or plate or meet minimum thread engagement specified on the DWG/CMC. (Note 18)

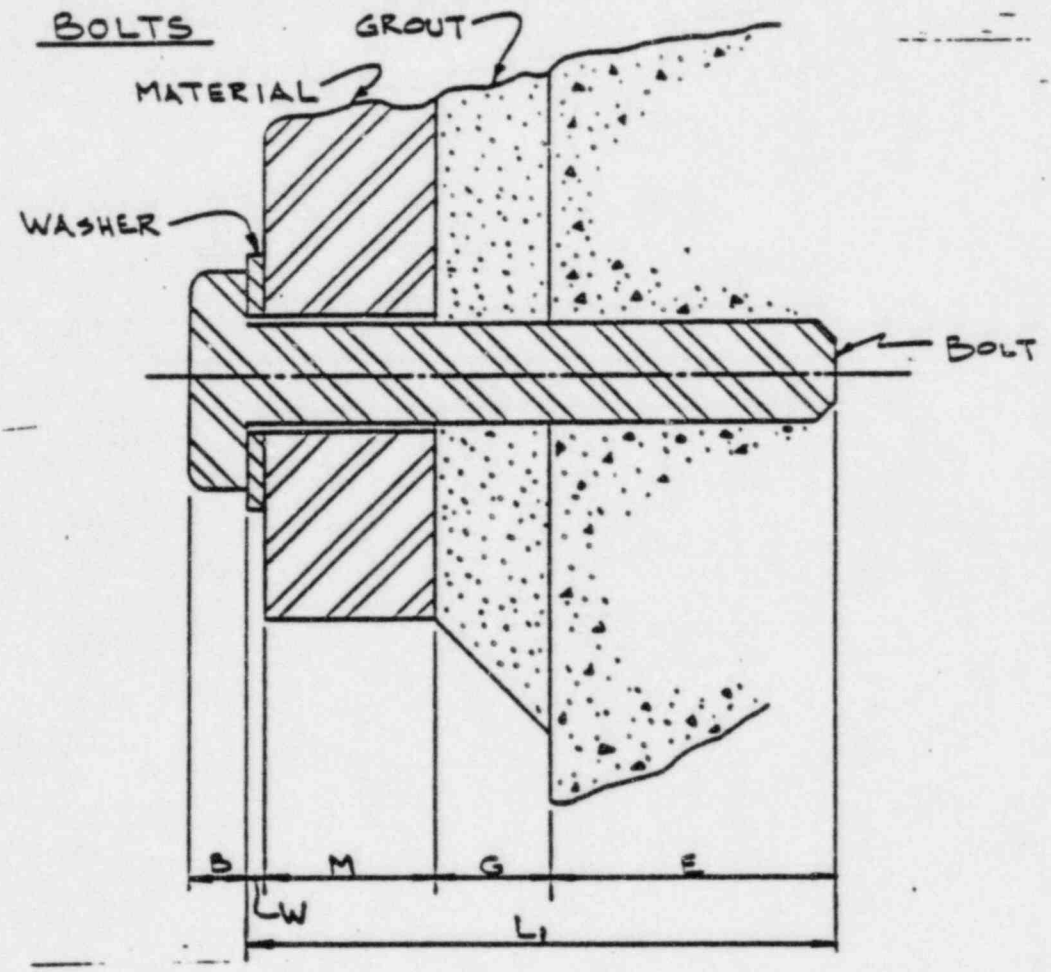
5.4.2 (4B) Verify surfaces of bolted parts in contact with the bolt or nut shall have a slope of no more than 1:20 with respect to a plane normal to the bolt axis. Verify a beveled washer has been used where the slope is greater than 1:20 (Attachment 6.20).

5.4.3 (4C) Verify the thread engagement for Richmond inserts is at least 2 times the bolt diameter plus 1/8 inch. Thread engagement shall be calculated as shown below using bolt length given in Bill of Materials: (Note 17)

NOTE: Should length not be given in bill of materials, an ultrasonic examination shall be performed in accordance with Reference 3.3 (Brown & Root shall perform UT and provide a copy of the results to the inspector for inclusion in the Verification Package). Once ultrasonic examination is complete, record actual length on Inspection Checklist, and initiate a Deviation Report.

5.0 INSTRUCTION (Cont'd)

5.4 Bolting (Cont'd)



R I C H M O N D I N S E R T S O N L Y

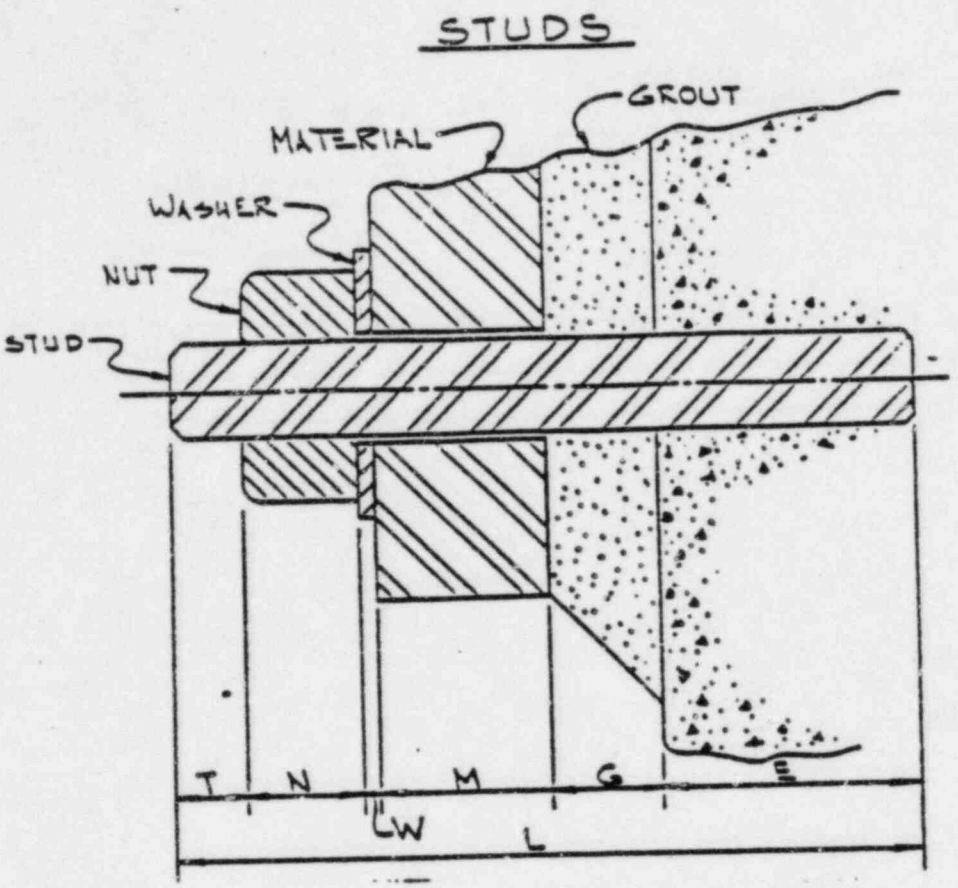
Thread engagement (E) = L_1 - (W+ M + G)

Where:

B = thickness of bolt head, in.
W = thickness of washer stack, in.
M = thickness of material, in. (i.e., baseplate, tube steel, etc.)
G = thickness of grout, in. (where applicable)
L_1 = bolt length, in. (from Bill of Materials)

5.0 INSTRUCTIONS (Cont'd)

5.4 Bolting (Cont'd)



RICHMOND INSERTS ONLY

Thread engagement (E) = L - (T + N + W + M + G)
Where:
T = extension from top of nut, in.
N = thickness of nut, in.
W = thickness of washer stack, in.
M = thickness of material, in. (i.e., baseplates)
G = thickness of grout, in. (where applicable)
L = bolt length, in. (from Bill of Materials)

5.4.4 (4F) Verify nuts or bolts in Richmond inserts are snug tight. The stud shall not rotate. (Note 3, 19)

5.4.5 (4F) Verify friction-type bolted connections (used on removable supports) with SA-193 Gr. B7 bolts are tightened so that the nut(s) cannot be moved by hand.* (Note 19)

* No Wrench

5.0 INSTRUCTION (Cont'd)

5.4 Bolting (Cont'd)

5.4.6 (4D) Verify all threaded fasteners, except SA-193 and SA-325 bolting materials and Hilti bolts, are provided with locking devices as shown on the design drawing.

When not specified on DWG/CMC the locking device will be one of the following:

- lock nuts
- jam nuts
- drilled and wired nuts
- upset threads (where upset threads are not visible they can be identified by 5 or 6 point star stamp). At least 2 adjacent thread cross-sections shall be deformed in 2 places approximately 180° apart. Record the distance from top of nut to upset thread on Inspection Checklist.

5.4.7 (4F) Verify standard U-bolts used with a single strut or snubber are torqued to the level specified on the DWG/CMC. The tolerance on the torque shall be the calibration of the torque wrench used. Where no torque is specified, verify that nut(s) cannot be moved by hand. (Note 19)

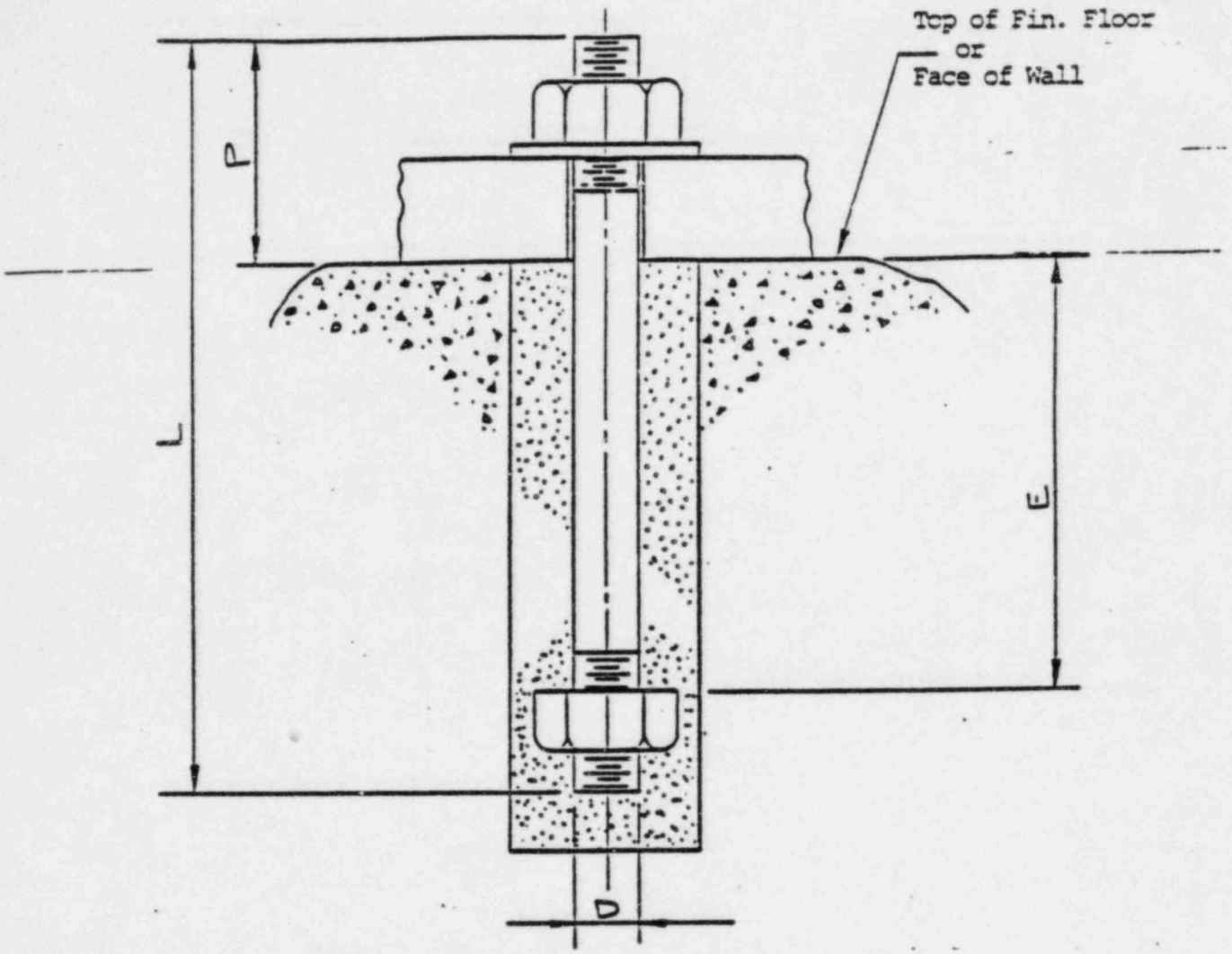
5.4.8 (4F) Verify standard U-bolts are torqued to requirements specified on DWG/CMC. Where no torque is specified, verify that U-bolt is sufficiently tightened so it cannot be moved by hand. (Note 19)

5.4.9 (4E) Verify the nuts on U-bolts are installed on the side of the plate as shown on the DWG/CMC.

5.4.10 (4G) Identify bolts less than 1-1/2 diameters edge distance and record dimension from bolt centerline to edge of plate on Attachment 6.5 for later review.

5.0 INSTRUCTION (Cont'd)

5.4 Bolting (Cont'd)



Typical Detail for "Grout-In" Bolts

5.4.11 Grout-In Anchor

(4H) A. Verify nominal bolt diameter equals 1½".

B. Measure the projection, P. Calculate the embedment length, E, from the bolt length, L, given in the Bill of Materials, using the following equation:

$$E = L-(P+2)$$

Verify that E is 24" as a minimum.

C. Ensure no gap exists between the washer and member or washer and nut.

5.0 INSTRUCTION (Cont'd)

5.5 Integral Attachment Welds (Note 29)

5.5.1 Location, Size and Profile
(5A)
(5B) A. Verify weld configuration (fillet welds only) and
(5C) location as shown on the drawing.

B. Verify the weld size* and length meets or exceeds the minimums specified. For fillet welds, refer to Attachment 6.7. (Note 12)
* For Bevel Welds, the weld size is verified by assuring the joint is welded flush.

5.5.2 Butt weld Reinforcements
(5D)

A. Verify height of reinforcement complies with Attachment 6.8 (Note 14)

5.5.3 Undercut
(5E)

A. Verify undercut does not exceed 1/32". Record undercut, regardless of size on Inspection Checklist. This information is required for verification of minimum wall during documentation review.

5.5.4 Surface of welds
(5F)

A. Verify surface of welds are sufficiently free of overlap, abrupt ridges and ripples so proper interpretation of radiographic and/or other required NDE could be accomplished.

5.5.5 Offset of Butt Welds
(5G)

A. Verify maximum offset for finished butt welds is not greater than shown in Attachment 6.9, Table B.

B. Verify offsets within tolerances of Attachment 6.9, Table B have been faired to at least 3 to 1 taper over the width of the finished weld.

5.5.6 Cracks, Lack of Fusion, Porosity, Crater cracks
(5H)

A. Verify the welds have no visible cracks, lack of fusion or crater cracks.

B. Verify welds have no porosity or rounded indications which exceed the following:

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

5.0 INSTRUCTION (Cont'd)

5.5 Piping Welds (Cont'd)

2. Rounded indication with dimensions greater than 3/16 inch are unacceptable.

3. Four (4) or more rounded indications in a line separated by 1/16 inch or less from edge-to-edge are unacceptable.

4. Ten (10) or more rounded indications in any six (6) square inches of surface with the major dimension of this area not to exceed six (6) inches with the area taken in the most unfavorable location relative to the indications being evaluated are unacceptable.

5.5.7 Welder ID Symbol
(5I)

A. Determine welder symbol is marked and record such on Attachment 6.10 for later document review. Identify the welder symbol(s) by placing "(I)" after the welder symbol.

5.5.8 Rust (Stainless Steel Only)
(5J)

A. Record and identify on Attachment 6.22 the location of any rust which has developed on welds.

B. Record and identify the location of any rust which has developed on the material within two (2) feet on either side of the weld(s) being reinspected. Use Attachment 6.22.

5.6 Support Welds (NF) (Note 30)

5.6.1 Location, Size and Profile (Note 36)
(6A)
(6B) A. Verify welds are located as shown on drawings.
(6C) Record any welds that are in addition to those specified on the drawings. (Attachment 6.6)

B. Verify weld size* and length meets or exceeds the minimums specified. For fillet welds, refer to Attachment 6.7 (Note 13, 20, 21, 22, 26)
* For Bevel Welds, the weld size is verified by assuring the joint is welded flush.

5.6.2 Butt Weld Reinforcements
(6D)

A. Verify height of reinforcement on each face of butt weld does not exceed the value specified in Attachment 6.8 (Note 14, 23)

5.0 INSTRUCTION (Cont'd)

5.6 Support Welds (Cont'd)

5.6.3 Undercut
(6E)

A. Verify undercut does not exceed 1/32 inch.

5.6.4 Surface of Welds
(6F)

A. Verify surface of welds are sufficiently free of overlap, abrupt ridges and ripples so proper interpretation of radiographic and/or other required NDE could be accomplished.

5.6.5 Offset of Butt Welds
(6G)

A. Verify maximum offset for finished butt welds is not greater than shown in Attachment 6.9, Table A.

B. Verify offsets within tolerances of Attachment 6.9, Table A have been blended uniformly over the width of the finished weld.

5.6.6 Cracks, Lack of Fusion
(6H)

A. Verify no lack of fusion or cracks are visible and that there are not any linear indications in excess of 1/16 inch.

5.6.7 Welder ID Symbol
(6I)

A. Determine if a welder symbol is present (do not remove paint) and record on Attachment 6.10. This information is required for document review only and has no accept/reject criteria.

5.7 Concrete Expansion Anchors (HILTI)

5.7.1 Size/Length
(7A)

A. Verify anchor bolt size. This can be accomplished by using a gauge or rule to distinguish nominal diameter sizes ranging between ¼ and 1-¼ inch diameter in increments of 1/8 inch.

B. Verify anchor bolt length and type by the letter designation stamped on the top of the bolt (Attachment 6.15); remove paint if necessary. Super kwik bolts are identified by a star in addition to the letter designation.

NOTE: Hilti and Super-Kwik Hilti bolts 19 inches and longer may be stamped with numbers to indicate length.

5.0 INSTRUCTION (Cont'd)

5.7 Concrete Expansion Anchors (Cont'd)

C. If length identification is not verifiable or visible, an ultrasonic examination shall be performed in accordance with procedure QI-QAP-10.2-4B. Brown and Root shall perform UT and provide copy of results to the inspector for inclusion in the Verification Package. Once ultrasonic examination is complete, record actual length on Inspection Checklist, and initiate a Deviation Report.

5.7.2 Embedment Length
(7B)

A. Verify that the Hilti anchor bolt embedment plus the nut thickness (from Attachment 6.15) for the anchor being measured is not less then the "Embedment Length" or "Minimum Embedment Length" identified on the drawings; or lacking such information the "Minimum Embedment" identified on Attachment 6.15.*

B. Determine the Hilti anchor bolt embedment by measuring the projected length of the anchor bolt from the structural concrete** surface. Subtract the anchor projected length from the designated anchor length to arrive at the Hilti anchor bolt embedment. The designated anchor length is that shown on Attachment 6.15, unless the stamp is indistinguishable in which case the U.T. recorded length should be used.

*Note: When the letter designation stamped on Hilti bolt is not identified by Attachment 6.15 the Hilti bolt attributes regarding length of Hilti's can conservatively be inspected by using Attachment 6.27.

**Note: In floor and roof areas where topping has been placed, the thickness of the topping shall be taken into account in determining the projected length. In these areas the thickness of the topping shall be added to the measured projected length taken from the concrete surface. The inspector shall ensure that a measurement for topping is provided in the inspection package for all floor or roof slabs. This value may be "0" if the floor or roof has been monolithically placed.

5.0 INSTRUCTION (Cont'd)

5.7 Concrete Expansion Anchors (Cont'd)

5.7.3 Anchor Bolt Spacing
(7C)

A. Verify for each Hilti, center-to-center spacing of adjacent anchors of the same size (not on the same attached fixture) is not less than 10 anchor diameters unless specified on DWG/CMC. For unequal sized bolts, the minimum spacing (unless shown on DWG/CMC) is as shown on Attachment 6.16.

B. Verify spacing of each Hilti to existing Richmond inserts, concrete edges, abandoned holes, Hilti anchors or embedded anchor bolts that have been cut off meet the minimum spacing requirements specified in Attachment 6.17 unless shown on design documents.

NOTE: Any items covered by baseplate/equipment base will be checked by document review.

C. Verify that the minimum distance of each Hilti anchor to any adjacent embedded plate meets the following requirements of Attachment 6.18.

1. Attachments located within 12 inches of a Hilti anchor bolt shall have spacing as shown on Attachment 6.18.

2. For embedment plates without any attachment within 12 inch clearance distance, the anchor may be as close as practical to the edge of the plate without damage to the plate.

5.7.4 Anchor Bolt Angularity
(7D)

A. Verify each Hilti anchor installed has its long (longitudinal) axis within 6° from the perpendicular of the surface it is set into. Attachment 6.19 gives inspection requirements.

5.7.5 Concrete Damage
(7E)

A. Verify structural concrete surrounding the fixture is not broken or spalled as a result of installing the Hilti anchor. If spalling exists, verify the depth does not exceed the following:

5.0 INSTRUCTION (Cont'd)

5.7 Concrete Expansion Anchors (Cont'd)

Hole Size	Maximum Acceptable Spall Depth*
5/8 inch and under	½ inch
3/4 inch to 1¼ inch inclusive	3/4 inch

* If the area in question includes a 2-inch topping the maximum spall depth may be increased to the depth of topping.

5.7.6 Anchor Bolt Nut Engagement and Bearing (7F)

A. Verify nut of each Hilti anchor has proper engagement such that the end of the anchor bolt is not lower than the top of nut, unless otherwise shown on DWG/CMC.

B. Verify nut and washer of each Hilti anchor has proper bearing and that a minimum of one washer (standard or plate) has been provided. The washer shall completely cover the hole in the base plate. A level gauge shall be used for determining if the gap is less than 1:20 (Attachment 6.20).

C. Verify no visible weld has been made to anchor bolt or nut.

D. Verify that nut for each anchor has not bottomed out. Use thread length in Attachment 6.15 and measured projection to determine acceptance.

5.8 Component Support Catalog Items (Attachment 6.21, Note 24) DWG/CMC.

5.8.1 Snubbers (Note 5) (8A)

1. Angularity

Verify snubbers are installed within a tolerance of ±1 degree of the angle shown on the DWG/CMC for Unit 2 (±5 degrees for Unit 1 and common)

5.0 INSTRUCTION (Cont'd)

5.8 Component Support Catalog Items (Cont'd)

2. Jam Nut Torque

Verify torque of eye-rod jam nut of extension piece for ITT-fig. 307 snubbers as follows: (Note 19)

	Standard Pipe Clamps						
Snubber size	1/4	1/2	1	3	10	35	100
Torque Value (ft-lbs)	40	40	40	80	100	150	220

Verify torque of load stud jam nut, using a calibrated torque wrench, as follows: (Note 4, 19)

	Standard Pipe Clamps						
Snubber size	1/4	1/2	1	3	10	35	100
Torque Value (ft-lbs)	20	20	65	145	280	485	1050

	NPS Super Stiff Clamps (SSC)						
SSC Size	06	08	10	14	20	24	36
Lock Nut Torque (ft-lbs)	15	40	80	170	520	1000	3300

Western Pipe Clamps
Torque values are listed on DWG/CMC

3. Parallelism

Verify pipe clamp halves are parallel. For acceptance criteria see Attachment 6.12. Measure and record the dimensions on Attachment 6.12.

4. Pin-To-Pin Cold Setting

Verify C-C dimensions do not exceed those given in Table 5.8-2 (page 25) and are within ± 1/8 inch of the A-C dimension shown on DWG/CMC for Unit 2 only.

5. Bearing Spacers

Verify rear bracket/pipe clamp has installed bearing spacers. It is acceptable to have one spacer. The resultant gap shall be less than the thickness of the thinnest installed spacer.(Note 6, 37)

5.0 INSTRUCTION (Cont'd)

5.8 Component Support Catalog Items (Cont'd)

6. Thread Engagement

Verify minimum thread engagement of bolting in adapter plate. Measure and record plate thickness and depth of bolt recess for bolts which have less than full threaded engagement in the plate (Attachment 6.13).

Snubber sizes 1/4 and 1/2 are inaccessible for this inspection. When these sizes are encountered, enter "N/A" on the reinspection checklist and note the snubber size in remarks.

Acceptance criteria is as follows:

Snubber size	1	3	10	35	100
Thread Engagement	5/16"	5/16"	9/16"	N/A	N/A

7. Safety Wire

Verify safety wire is installed, is not damaged and is crimped. (Except for size 35 and 100 which do not utilize safety wire.)

8. Eye Rod Threads

Verify exposed eye rod threads are free of extraneous material with the exception of paint.

9. Eye Rod Thread Engagement

Verify eye rod thread engagement through the sight hole or by star stamp. The star stamp indicates upset threads.

10. Binding/Offset

Verify eye rod ends are free of binding within the clamp and/or bracket. Maximum allowable offset is 5 degrees or that shown on DWG/CMC.

11. Fasteners

Verify all fasteners, spacers and cotter pins are in place and secure.

12. Spherical Bearings

Verify spherical bearing has not become dislodged and is free of extraneous material.

5.0 INSTRUCTION (Cont'd)

5.8 Component Support Catalog Items (Cont'd)

5.8.2 Sway Struts (Note 5)
(8B)

1. Hardware

Verify sway strut assembly contains all of the necessary hardware as follows:

A. Rear bracket (building attachment portion of the strut)

- NPSI - Includes bracket, connecting pin, bearing spacers and two cotter keys. (Notes 6, 8)

- ITT Grinnell - Similar to NPSI except the connecting pin may be secured with locking rings rather than cotter keys.

B. Strut Clamp (Notes 6, 7, 8)

- NPSI - Includes the clamp halves, two identical stud or bolt assemblies, clamp spacer, connecting pin, bearing spacers and two cotter keys.

- ITT Grinnell - Similar to NPSI except that the connecting pin (clamp load stud) is threaded on both ends and is secured with nuts.

2. Rear Bracket Orientation

Verify the rear bracket lugs are oriented in accordance with the design drawing.

3. Angularity

Verify strut is installed ± 1 degree of angle shown on DWG/CMC for Unit 2, ±5 degrees for Unit 1 and Common.

4. Spherical Bearing

Verify spherical bearing has not become dislodged and is free of extraneous material.

5. Eye Rod Threads

Verify exposed eye rod threads are free from extraneous material with the exception of paint.

5.0 INSTRUCTION (Cont'd)

5.8 Component Support Catalog Items (Cont'd)

6. Eye Rod Thread Engagement

Verify eye rod thread engagement through the sight hole or by star stamp. The star stamp (5 or 6 pt.) indicates upset threads.

7. Eye Rod Jam Nut

Verify eye rod jam nut (1 on NPSI and 2 on ITT Grinnell) are snug tight. (Note 3, 19)

8. Binding/Offset

Verify eye rod ends are free of binding within the clamp and/or bracket. Maximum allowable offset is 5 degrees or that shown on DWG/CMC.

9. Fasteners

Verify all fasteners, spacers and cotter pins are in place and secure.

10. Bearing Spacer(s)/Vertical Load Pin

Verify when strut pin is installed in the vertical position and only one spacer is in place, the spacer is on the bottom.

11. Bearing Spacers

Verify rear bracket/pipe clamp has installed bearing spacers. It is acceptable to have one spacer. The resultant gap shall be less than the thickness of the thinnest installed spacer. (Note 6)

12. Torque of Load Stud

Verify torque of load stud jam nut where provided, using a calibrated torque wrench, as follows: (Note 4, 19)

NPS Super Stiff CLamps (SSC)

SSC Size	06	08	10	14	20	24	36
Lock Nut Torque (FT-LBS)	15	40	80	170	520	1000	3300

Western Pipe Clamps

Torque Values are listed on DWG/CMC

5.0 INSTRUCTION (Cont'd)

5.8 Component Support Catalog Items (Cont'd)

13. Parallelism

Verify pipe clamp halves are parallel. For acceptance criteria see Attachment 6.12. Measure and record the dimensions shown on Attachment 6.12.

5.8.3 Spring Can/Constant Support (Note 5)
(8C)

1. Size

Verify factory size code on the name plate is the same as shown on DWG/CMC.

2. Travel Stops

Verify that travel stop is installed except for those supports in Unit 1 and common. (These supports have gone through HFT.) Where travel stops have been removed, verify that spring/constant support is not obstructed to move throughout its vertical travel range. (Note 9)

3. Beam Attachment

Verify location and orientation of beam attachment.

4. Support Rod

Verify support rod has no slack and is fully engaged.

5. Threads

Verify threads are free of extraneous material with the exception of paint.

6. Thread Engagement

Verify rod thread engagement in support load coupling. Load coupling is provided with a sight hole.

7. Angularity

Verify load coupling and lower rod assembly are not more than 5 degrees from the vertical unless specified on DWG/CMC.

8. Fasteners

Verify all fasteners are in place and secure.

5.0 INSTRUCTION (Cont'd)

5.8 Component Support Catalog Items (Cont'd)

5.8.4 Low Friction Bearing Plates
(8D)

1. Location

Verify low-friction bearing plates are installed in the location shown on DWG/CMC.

2. Plate Type

Verify Lubron AE-40 or AE-30 plate is used for supports in the reactor building.

3. Lubricant

Verify machined surface is evenly coated with lubricant. (This is approximate; do not use measuring device, visual inspection only)

4. Corners

Verify for plates which have rounded corners that the radius does not penetrate the bonded lubricant.

5.9 Modified Component Support Catalog Items (9.0)

Using weld inspection criteria in Section 5.6 of this QI, perform the following inspections: (Note 38, 39)

A. NPSI Sway Struts (9A)

1. Adjustable Sway Struts (i)

For NPSI Adjustable Sway Struts verify the following fillet weld sizes are met as a minimum:*

Strut Size	06	08	10	12	14	20	24	36
Weld Size	3/16"	3/16"	3/16"	1/4"	1/4"	5/16"	3/8"	5/8"

*Weld sizes are the minimum, but need not be larger than the thickness of the collar.

2. Fixed Sway Struts (ii)

For NPSI Fixed Sway Struts verify the following fillet weld sizes are met as a minimum:*

Strut Size	SRF-06	SRF-08	SRF-10	SRF-14	SRF-20	SRF-24	SRF-36
Weld Size	3/16"	3/16"	3/16"	1/4"	5/16"	3/8"	5/8"

5.0 INSTRUCTION (Cont'd)

5.9 Modified Component Support Catalog Items (Cont'd)

*Weld sizes are the minimum, but need not be larger than the thickness of the collar.

B. ITT Grinnell Sway Struts (9B)

For ITT Grinnell Sway Struts verify the following fillet weld sizes are met as a minimum:*

Strut Size	A-C	1-3	4-6	7	8
Weld Size	3/16"	5/16"	3/8"	5/8"	3/4"

*Weld sizes are the minimum, but need not be larger than the thickness of the collar.

C. Snubber Transition Kits (9C)

For ITT Grinnell and NPSI Snubber Transition Kits, verify the following fillet weld sizes are met as a minimum:*

Snubber Size	1/4 - 1/2	1	3	10	35	100
Weld Size	3/16"	3/16"	3/16"	1/4"	3/8"	5/8"

*Weld sizes need not be larger than the thickness of the coupling.

D. NPSI Forward Snubber Brackets for sizes 1/4 through 10 (9D)

1. Bracket Dimensions (i)

Verify C-C dimension of the forward bracket meets the requirements of the following:

2. Forward Bracket Welds (ii)

Verify lug and mounting plate are welded together using the minimum weld sizes below:

SMF	1/4	1/2	1	3	10
Weld Size	3/16"	3/16"	3/16"	1/4"	5/16"
Weld Lgth	3/4"LG	3/4"LG	ALL AROUND		

3. Distortion (iii)

Verify that there is surface contact between the mounting plate and it's attachment point on the snubber.

E. NPS Forward Snubber Brackets for Sizes 35 & 100 (9E)

1. Bracket Dimensions (i)

Verify C-C dimension of the forward bracket meets the requirements of Attachment 6.23.

2. Forward Bracket Welds (ii)

Verify welds on Forward Bracket welds meet minimum requirements of Attachment 6.23.

F. Dual Spring Can Assemblies

1. Assembly Dimensions (i)

Verify assembly dimensions are in accordance with Attachment 6.24 including those of added components.

2. Weld Sizes

Verify assembly weld sizes meet the minimum requirements given in Attachment 6.24.

NOTES:

1. U-Bolt type supports shall mean springs, struts, snubbers or frames utilizing a U-Bolt.

2. For standard marking identification of bolting see Attachment 6.25.

3. Snug tight is the tightness attained by a few impacts on an impact wrench or the full effort of a man using an ordinary spud wrench.

4. In order to verify torque, the load nut must be held in place and torque applied to jam nut.

5. On dual snubber/strut/spring can installation, inspector shall identify snubbers/struts/spring can and associated components with an A and B when referencing inspection results.

6. If there is more than one spacer thickness used, or if the spacer thickness is not in accordance with Attachment 6.14, record the thickness of each installed spacer and the resultant gap to the nearest 1/32" on Attachment 6.14.

7. The support may utilize a second rear bracket as a pipe attachment instead of a pipe clamp.

8. Cotter keys shall be fully open to the extent that they cannot become dislodged from the pin or bolt they are securing. They should be the maximum size the cotter pin hole will permit, but only large enough to remain in place after opening.

9. HFT is Hot Functional Testing.

10. Where Bill of Material gives letter designations for component parts, refer to Attachment 6.21 for description and dimensions.

11. DELETED

12. Unequal leg size convex fillet welds are acceptable provided the smaller leg meets or exceeds the minimum specific size. For concave fillet welds with unequal legs the theoretical throat must be determined.

13. Single flare bevel and fillet (non-continuous, single sided) welds are exempt from length inspection as weld length required cannot be determined from design drawings.

    This covers those welds described above which may or may not require weld wrap around. Types of connections involved includes tube steel to tube steel and tube steel to structural members (plate, wide flanges, etc.).

NOTES: (Cont'd)

13. (Cont'd)
For those types of welds and connections described above, the inspector shall indicate in the remarks column for the decision point "size" that "Length of wrap-around welds is exempt - see QA/QC PDR 4."

Should the component support structure contain only single flare bevel and fillet (non-continuous, single sided) welds; then there is no accept/reject criteria for weld length. In addition to referencing QA/QC PDR 4 in the remarks column, a note stating that "No length criteria given for support welds" shall also be applied.

14. The surface of the reinforcement of butt welded joints may be flush with the base material or may have uniform crowns.

15. DELETED

16. Integral attachment is defined as that portion of a component support which is welded to, cast or forged integral with a pressure retaining component. (NF-1131.2 and NF-3128.1)

17. Threaded engagement as applied to Richmond inserts is measured from the face of the insert washer into the insert.

18. Acceptable thread engagement of a standard nut used as a jam nut is a minimum of 75% of the standard nut depth.

19. ONLY ON BOLTED CONNECTIONS WHICH HAVE NOT BEEN PAINTED.

20. For fillet welds on skewed angles greater than 135°, the inspector shall not be concerned with weld size, unless machining is called for. In this case, the weld is considered a normal fillet weld and must meet the size required on the drawings.

21. For fillet welds on skewed angles between 60 and 135°, the weld size is shown on the drawing by verifying that "s" dimension shown in Attachment 6.21.

22. For fillet welds on skewed angles between 45 and 60°, not inclusive, the weld size "s" shall be verified by measuring the "d" dimension as shown in Attachment 6.21.

23. The maximum weld crown on flare V-groove welds and flare bevel welds shall be 3/16 inch but in no case cause distortion in adjoining members.

24. Use Attachment 6.21 for NPSI component support catalog items. For ITT Grinnell Components and Western Pipe Clamps used in Unit 2, refer to DWG/CMC. For Grinnell parts used in Unit 1 and Common, refer to Attachment 6.26.

NOTES: (Cont'd)

25. Measurement shall be from top to bottom and from side to side. A U-Guide shall mean a U-Bar or U-Bolt used as a guide on a rigid frame. Clearances should be specified on drawing.

26. For fillet welds on skewed angles between 29 and 44° the weld size "S" shall be verified by measuring the "d" dimension as shown in Attachment 6.21.

27. The inspection attribute number from the checklist is shown in parenthesis adjacent to appropriate inspection requirement.

28. In the course of inspection the inspector shall note any item not covered by reinspection/verification which appear out of the ordinary as related to the construction of the inspected item or surrounding area. Note such in the remarks column of inspection checklist and initiate an out-of-scope observation. This observation shall be listed on package Table of Contents and stored with the package in records.

29. Prior to start of inspection, assure that welds are clean of any paint or foreign material which would impede an adequate visual inspection. When it is necessary to measure weld dimensions, such dimensions should be determined as accurately as practical using standard weld inspection tools.

30. Prior to start of inspection, assure that welds are clean of any foreign material which would impede and adequate visual inspection. Coatings need not be removed unless the inspector judges that excessive or uneven coating application would impede an adequate inspection of the weld. Coatings may then be removed with the concurrence of the Level III Inspector. When it is necessary to measure weld dimensions, such dimensions should be determined as accurately as practical using standard weld inspection tools.

31. Inspectors shall record the tool code (Attachment 6.4), Serial Number and Calibration due date, as applicable, on Attachment 6.3.

32. Dimensions shall be measured to the nearest 1/16", unless otherwise specified.

33. Angles shall be measured to the nearest degree.

34. If additional space is required in the remarks column of Reinspection Checklist, use Attachment 6.2.

35. Inaccessible items shall be identified in the remarks column of Reinspection Checklist.

36. Type 2 skewed welds need not be inspected for size and profile. (Attributes 6B & 6C)

NOTES: (Cont'd)

37. The forward bracket of the snubber normally is at the pin of the clamp. Where two rear brackets are used, the inspector shall identify the brackets by "F" or "R" on the drawing and record the applicable information on Attachment 6.14.

38. The inspector shall inspect all welds delineated in this section as applicable to the modified component supports. The individual field welds made are not readily identifiable so vendor as well as field welds shall be subject to the same reinspection.

39. Where a deviation exists, the inspector shall include in the deviation report the location of the deviation. (i.e. identify which end of the component, use a sketch if required).

Table 5.3-1

Bolt Ø	Min. Edge Distance
3/8"	9/16"
1/2"	3/4"
5/8"	7/8"
3/4"	1"
1"	1 1/4"
1 1/4"	1 5/8"
1 1/2"	1 7/8"
1 3/4"	2 3/16"
2"	2 1/2"

Table 5.8-2

Type	SNUBBER SIZE 1/4	1/2	1	3	10	35	100
	MAXIMUM PIN-TO-PIN (C-C) INCHES*						
A	12 3/16	9 5/16	14 9/16	19 1/8	23 5/16	30	35 13/16
B	62	62 3/4	62	61 1/4	72	117	117
C	19 1/2	17 1/4	22 7/8	28 7/8	34 1/4	48 7/8	61 3/4
D	66	66	66	68	100	120	120

* With snubber set at midstroke.

TYPE A - ITT Grinnell - Fixed
TYPE B - ITT Grinnell - Adjustable
TYPE C - NPSI - Fixed
TYPE D - NPSI - Adjustable

6.0 ATTACHMENTS

6.1 Reinspection Checklist

6.2 Supplemental Remarks

6.3 Inspection Tools Used

6.4 Inspection Tools and Codes

6.5 Bolt edge distance

6.6 Additional Welds

6.7 Fillet Weld Size

6.8 Butt Weld Height Reinforcement

6.9 Butt Weld Offset

6.10 Welder Identification

6.11 Material Identification

6.12 Pipe Clamp Halves Parallelism

6.13 Snubber adapter plate thread engagement

6.14 Bearing Spacer Gap (informational)

6.15 Hilti Anchor Designation and Setting Requirements

6.16 Minimum Spacing Between Hilti Expansion Anchors

6.17 Minimum Anchor Clearances

6.18 Minimum Clearances to Embedded Plates

6.19 Anchor Angularity

6.20 Nut Bearing

6.21 Typical Inspection Drawings

6.22 Location of Rust

6.23 Modification of Forward Brackets

6.24 Modification of Dual Spring Can Assemblies

6.25 Standard Marking Identification of Bolting

6.26 ITT Grinnell Components

6.27 Hilti Length Designations

COMANCHE PEAK RESPONSE TEAM
CHECKLIST

POPULATION DESC LARGE BORE PIPE SUPPORTS NON-RIGID (LBSN)	VERIFICATION PKG NO. I-S-LBSN	PAGE 1 OF 8
QUALITY INSTRUCTION QI-029	[X] REINSPECTION	[ ] UNIT 1
EQUIPMENT MARK/TAG NO.	[ ] DOCUMENTATION REVIEW	[ ] UNIT 2 [ ] COMMON

ATTRIBUTE	VERIFICATION ACCEPT	VERIFICATION REJECT	VERIFICATION DATE	REMARKS
1. Identification				
2. Location and Orientation				tn=
3. Configuration				
A. Components				
B. Materials	N/A	N/A		(For Documentation Review Only)
C. Installation				
D. Clearance				
E. Grouting for Baseplates/Floors				
F. Grouting for Baseplates/Walls and Ceilings				
4. Bolting				
A. Engagement				
B. Surface Contact				
C. Richmond Insert				
D. Locking Devices				

PREPARED BY:		APPROVED BY:	
DISCIPLINE ENGR.	DATE	LEAD DISCIPLINE ENGR.	DATE
INSPECTED BY:		APPROVED BY:	
INSPECTOR	DATE	LEAD INSPECTOR	DATE

CPP-307.1A, Revision 1

COMANCHE PEAK RESPONSE TEAM CHECKLIST				
POPULATION DESC LARGE BORE PIPE SUPPORTS NON-RIGID (LBSN)	VERIFICATION PKG NO. I-S-LBSN-			PAGE 2 OF 8
ATTRIBUTE	VERIFICATION			REMARKS
	ACCEPT	REJECT	DATE	
4. Bolting (Cont'd) E. U-Bolts				
F. Torque				
G. Edge Distance	N/A	N/A		(For Information Only)
H. Grout-In Anchors				
5. Integral Attachment Welds A. Location				
B. Size				
C. Profile				
D. Reinforcement				
E. Undercut				u=
F. Surface Condition				
G. Offsets				
H. Cracks/Fusion				
I. Welder ID	N/A	N/A		(For Information Only
J. Rust				
6. Support Welds (NF) A. Location				
B. Size				
C. Profile				
D. Reinforcement				
E. Undercut				
F. Surface				
G. Offsets				

CP2 007.1B, Revision 3

COMANCHE PEAK RESPONSE TEAM
CHECKLIST

POPULATION DESC LARGE BORE PIPE SUPPORTS NON-RIGID (LBSN)	VERIFICATION PKG NO. I-S-LBSN-			PAGE 3 OF 8
ATTRIBUTE	VERIFICATION			REMARKS
	ACCEPT	REJECT	DATE	
6. Support Welds (Cont'd) H. Cracks/Fusion				
I. Welder ID	N/A	N/A		(For Information Only)
7. Concrete Expansion Anchors				
A. Size/Length				
B. Embedment Length				
C. Bolt Spacing				
D. Angularity				
E. Concrete Damage				
F. Nut Engagement/ Bearing				
8. Component Support Catalog Items A. Snubber				
1. Angularity				
2. Jam Nut Torque				
3. Parallelism				
4. Pin-to-Pin/ Cold Setting				
5. Bearing Spacers				
6. Thread Engagement				
7. Safety Lock Wire				
8. Eye Rod Threads				

[illegible].13, Revision 0

COMANCHE PEAK RESPONSE TEAM CHECKLIST				
POPULATION DESC LARGE BORE PIPE SUPPORTS NON-RIGID (LBSN)	VERIFICATION PKG NO. I-S-LBSN			PAGE 4 OF 8
ATTRIBUTE	VERIFICATION			REMARKS
	ACCEPT	REJECT	DATE	
8A. Snubber (Cont'd)				
9. Eye Rod Thread Engagement				
10. Binding/Offset				
11. Fasteners				
12. Spherical Bearing				
B. Struts				
1. Hardware				
2. Rear Bracket Orientation				
3. Angularity				
4. Spherical Bearing				
5. Eye Rod Threads				
6. Eye Rod Thread Engagement				
7. Eye Rod Jam Nut				
8. Binding/Offset				
9. Fasteners				
10. Bearing Spacers Vertical Load Pin				
11. Bearing Spacer(s)				
12. Torque of Load Stud				
13. Parallelism				

CPP-007.13, Revision 0

COMANCHE PEAK RESPONSE TEAM CHECKLIST				
POPULATION DESC LARGE BORE PIPE SUPPORTS NON-RIGID (LBSN)	VERIFICATION PKG NO. I-S-LBSN			PAGE 5 OF 8
ATTRIBUTE	VERIFICATION			REMARKS
	ACCEPT	REJECT	DATE	
C. Spring/Can Constant Support 1. Size				
2. Travel Stops				
3. Beam Attachment				
4. Support Rod				
5. Threads				
6. Thread Engagement				
7. Angularity				
8. Fasteners				
D. Low Friction Bearing Plates 1. Location				
2. Plate Type				
3. Lubricant				
4. Corners				
9. Modified Component Support Catalog Items				
A. NPSI Sway Struts 1. Adjustable Struts (1) Weld Size				
Profile				Per 5.6.1
Reinforcement				Per 5.6.2

COMANCHE PEAK RESPONSE TEAM CHECKLIST				
POPULATION DESC LARGE BORE PIPE SUPPORTS NON-RIGID (LBSN)	VERIFICATION PKG NO. I-S-LBSN			PAGE 6 OF 8
ATTRIBUTE	VERIFICATION ACCEPT	REJECT	DATE	REMARKS
9. Modified Component Support Catalog Items (Cont'd) Undercut				Per 5.6.3
Surface of Weld				Per 5.6.4
Offset				Per 5.6.5
Cracks, Lack of Fusion				Per 5.6.6
2. Fixed Sway Struts (ii) Weld Size				
Profile				Per 5.6.1
Reinforcement				Per 5.6.2
Undercut				Per 5.6.3
Surface of Weld				Per 5.6.4
Offset				Per 5.6.5
Cracks, Lack of Fusion				Per 5.6.6
B. ITT Grinnell Sway Struts Weld Size				
Profile				Per 5.6.1
Reinforcement				Per 5.6.2
Undercut				Per 5.6.3
Surface of Weld				Per 5.6.4
Offset				Per 5.6.5
Cracks, Lack of Fusion				Per 5.6.6

CPSES-207.1B, Revision 4

COMANCHE PEAK RESPONSE TEAM CHECKLIST				
POPULATION DESC LARGE BORE PIPE SUPPORTS NON-RIGID (LBSN)	VERIFICATION PKG NO. I-S-LBSN			PAGE 7 OF 8
ATTRIBUTE	VERIFICATION			REMARKS
	ACCEPT	REJECT	DATE	
9. Modified Component Support Catalog Items (Cont'd) C. Snubber Transition Kits Weld Size				
Profile				Per 5.6.1
Reinforcement				Per 5.6.2
Undercut				Per 5.6.3
Surface of Weld				Per 5.6.4
Offset				Per 5.6.5
Cracks, Lack of Fusion				Per 5.6.6
D. NPSI Forward Bracket Size 1/4 - 10 1. Bracket Dimensions (i)				
2. Bracket Welds (ii) Weld Size				
Profile				Per 5.6.1
Reinforcement				Per 5.6.2
Undercut				Per 5.6.3
Surface of Weld				Per 5.6.4
Offset				Per 5.6.5
Cracks, Lack of Fusion				Per 5.6.6
Distortion (iii)				

C27-007.12, Revision 0

COMANCHE PEAK RESPONSE TEAM
CHECKLIST

POPULATION DESC LARGE BORE PIPE SUPPORTS NON-RIGID (LBSN)	VERIFICATION PKG NO. I-S-LBSN			PAGE 8 OF 8
ATTRIBUTE	VERIFICATION			REMARKS
	ACCEPT	REJECT	DATE	
9. Modified Component Support Catalog Items (Cont'd) E. NPSI Forward Bracket Size 35 and 100 Bracket Dimensions(i)				
Forward Bracket Welds (ii)				
Weld Size				
Profile				Per 5.6.1
Reinforcement				Per 5.6.2
Undercut				Per 5.6.3
Surface of Weld				Per 5.6.4
Offset				Per 5.6.5
Cracks, Lack of Fusion				Per 5.6.6
F. Dual Spring Can Assemblies 1. Assembly Dimensions(i)				
2. Weld Sizes (ii)				
Weld Size				
Profile				Per 5.6.1
Reinforcement				Per 5.6.2
Undercut				Per 5.6.3
Surface of Weld				Per 5.6.4
Offset				Per 5.6.5
Cracks, Lack of Fusion				Per 5.6.6

CPP-007.13, Revision 0

SUPPLEMENTAL REMARKS

VERIFICATION PACKAGE NO. _____

ATTRIBUTE (No./Description)	REMARKS

_____ _____

INSPECTOR DATE

VERIFICATION PACKAGE NO. I-S-LBSN

INSPECTION TOOLS USED

ATTRIBUTE	TOOL CODE(s)	SER. #/CALIB. DUE DATE
1. Identification		
2. Location & Orientation		
3. Configuration		
A. Components		
B. Materials		
C. Installation		
D. Clearance		
E. Baseplates		
4. Bolting		
A. Engagement		
B. Surface Contact		
C. Richmond Insert		
D. Locking Devices		
E. U-Bolts		
F. Torque		
G. Edge Distance		
H. Grout-in Anchors		
5. Piping Welds		
A. Location		
B. Size		
C. Profile		
D. Reinforcement		
E. Undercut		
F. Surface Condition		
G. Offsets		
H. Cracks/Fusion		
I. Welder Id.		

INSPECTOR DATE

VERIFICATION PACKAGE NO. I-S-LBSN

INSPECTION TOOLS USED

ATTRIBUTE	TOOL CODE(s)	SER. #/CALIB. DUE DATE
6. Support Welds		
A. Location		
B. Size		
C. Profile		
D. Reinforcement		
E. Undercut		
F. Surface Condition		
G. Offsets		
H. Cracks/Fusion		
I. Welder ID		
7. Concrete Expansion Anchors		
A. Size/Number		
B. Embedment Length		
C. Bolt Spacing		
D. Angularity		
E. Concrete Damage		
F. Nut Engagement/Bearing		
8. Component Support Catalog Items		
A. Snubber		
B. Sway Strut		
C. Spring Can/Constant Support		
D. Low Friction Bearing Plate		
9. Modified Component Support Catalog Items		
A. Weld Size		
B. Profile		
C. Reinforcement		
D. Undercut		
E. Surface of Weld		
F. Offset		
G. Cracks, Lack of Fusion		

INSPECTOR _____ DATE _____

INSPECTION TOOL AND CODES

CODE	TOOL
AF	Angle Finder
BL	Bubble Level
BS	Boroscope
BW	1/32", 1/16", /32", 1/8" Wire
CG	Contour Gauge
DF	Dry Film Thickness Gage
FG	Feeler Gages
FL	Flashlight
FM	Fibre Metal Fillet Gages
GG	GAL Fillet Gages
HL	Hi-Low Gage
MG	Magnifying Glass
MI	Micrometers
MM	Mirror
MN	Magnet
PB	Plum Bob
PR	Protractor
SC	Slide Caliper
SR	6" Rule
ST	Steel Tape Measure
TG	Taper Gage
TW	Torque Wrench
UD	Undercut Gage (Dial)
UP	Undercut Gage (Pit)
VC	Vernier Caliper
VT	Visual Inspection

VERIFICATION PACKAGE NUMBER _____

HANGER MARK NUMBER/DRAWING NUMBER _____

BOLT EDGE DISTANCE (Informational)

BOLT DIAMETER(inches)	EDGE DISTANCE(inches)

_____ _____
Inspector Date

COMANCHE PEAK REVIEW
INSPECTION CHECKLIST

VERIFICATION PACKAGE NO. _____

HANGER MARK NO. _____

ADDITIONAL WELDS

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ _____
Inspector Date

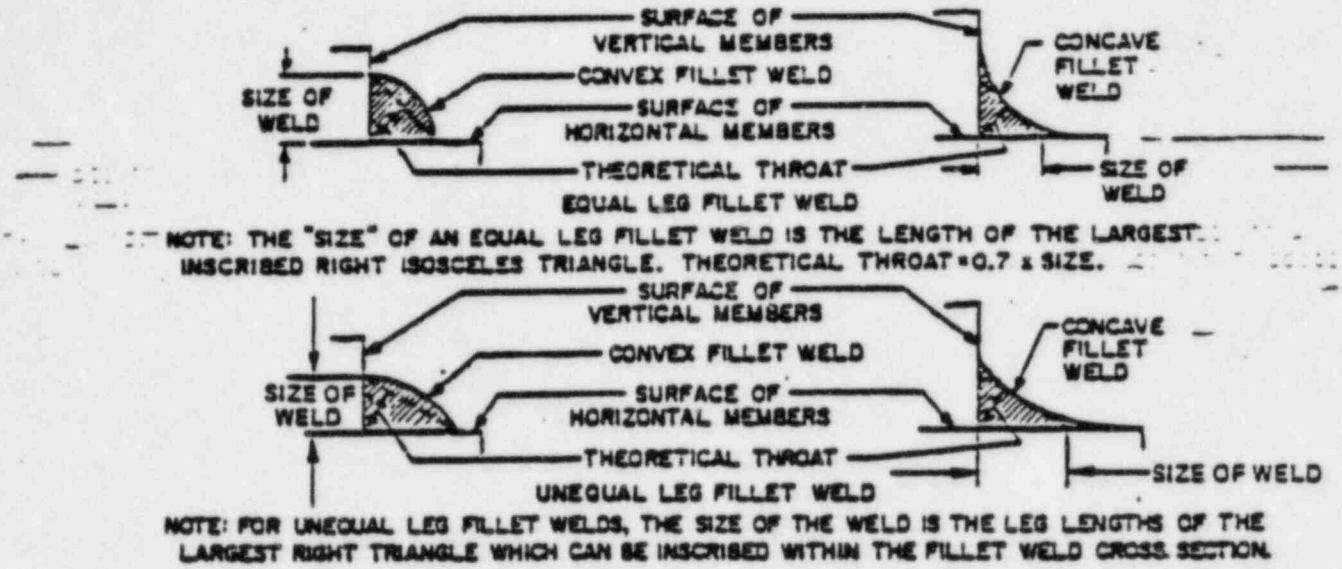


FIG. NF-4427-1 SIZE OF FILLET WELDS

CONCAVITY

If the profile of the fillet weld is concave, verify the minimum theoretical throat per the table below is attained.

Fillet Size(s)	Minimum Theoretical Throat
1/8"	0.88" (*3/32)
3/16"	0.133" (*5/32)
1/4"	0.177" (*3/16)
5/16"	0.221" (*1/4)
3/8"	0.265" (*9/32)
7/16"	0.309"(*5/16)
1/2"	0.354" (*3/8)
5/8"	0.442" (*15/32)
3/4"	0.530" (*17/32)
7/8"	0.617" (*5/8)
1"	0.707" (*23/32)

* denotes conversion

COMANCHE PEAK REVIEW TEAM
INSPECTION CHECKLIST
BUTT WELD HEIGHT REINFORCEMENT

PIPING

For double welded butt joints and single welded butt joints the reinforcement shown shall apply to the outside surface. The reinforcement shall be measured from the higher of the abutting surfaces involved.

Nominal Thickness Inches	Maximum Reinforcement Inches
Up to 1/8, incl.	3/32
Over 1/8 to 3/6, incl.	1/8
Over 3/16 to 1/2, incl.	5/32
Over 1/2 to 1, incl.	3/16
Over 1 to 2, incl.	1/4
Over 2	The greater of 1/4 in. or 1/8 times the width of the weld in inches.

REINFORCEMENT OF BUTT WELDS (NF)

The height of reinforcement on each face of the weld shall not exceed the following thickness:

Nominal Thickness Inches	Maximum Reinforcement Inches
Up to 1, incl.	3/32
Over 1 to 2, incl.	1/8
Over 2 to 3, incl.	5/32
Over 3 to 4, incl.	7/32
Over 4 to 5, incl.	1/4
Over 5	5/16

COMANCHE PEAK REVIEW TEAM
INSPECTION CHECKLIST

TABLE A

MAXIMUM ALLOWABLE OFFSET IN
FINAL WELDED JOINTS

Section Thickness In Inches	Direction of Joints	
	Longitudinal	Circumferential
Up to 1/2, incl.	1/4t	1/4t
Over 1/2 to 3/4 incl.	1/8 in.	1/4t
Over 3/4 to 1-1/2, incl.	1/8 in.	3/16 in.
Over 1-1/2 to 2, incl.	1/8 in.	1/8t
Over 2	Lesser of 1/16t or 3/8 in.	Lesser of 1/8t or 3/4 in.

*t - nominal thickness of the thinner section of the joint.

TABLE B

MAXIMUM ALLOWABLE OFFSET IN FINAL BUTT WELDED JOINTS

Section Thickness Inches	Maximum Allowable Offset
Up to 3/4, incl.	1/4t*
Over 3/4	3/16 incl.

*t = nominal thickness of the thinner section of the joint.

COMANCHE PEAK REVIEW TEAM
INSPECTION CHECKLIST

WELDER IDENTIFICATION

VERIFICATION PACKAGE NO. _____

HANGER MARK NO. _____

WELDER IDENTIFICATION

_____

_____

_____

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_____

_____ _____
Inspector Date

COMANCHE PEAK REVIEW TEAM

INSPECTION CHECKLIST

VERIFICATION PACKAGE NO. _____

HANGER MARK NO./DRAWING NO. _____

MATERIAL IDENTIFICATION

ITEM NO.	DESCRIPTION	IDENTIFICATION INFORMATION

_____ _____

Inspector Date

COMANCHE PEAK REVIEW TEAM

INSPECTION CHECKLIST

VERIFICATION PACKAGE NO. _____

HANGER MARK NO./DRAWING NO. _____

PIPE CLAMP HALVES PARALLELISM

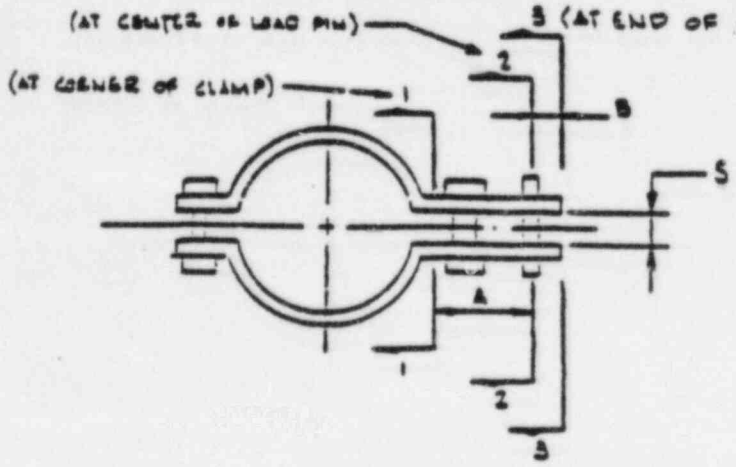
ENTER ALL DIMENSIONS, TO NEAREST 1/32", IN INCHES

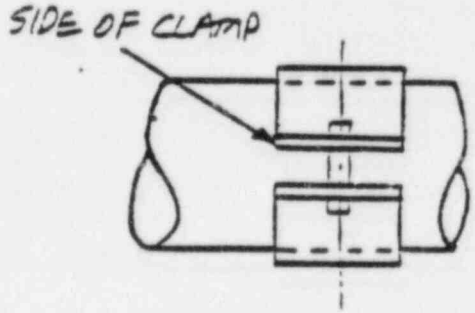
	1	2	3
S1			
S2			
A			
B			

S1 and S2 dimensions are taken at opposite sides of the clamp.

* Comments: _____

"S" dimensions on the same side of the clamp at points 1, 2 and 3 shall be within 1/16" of each other to be acceptable. Also, the clamp shall be not more than 1/16" out of parallel from side to side at points 1, 2 and 3 to be acceptable.





_____ Inspector

_____ Date

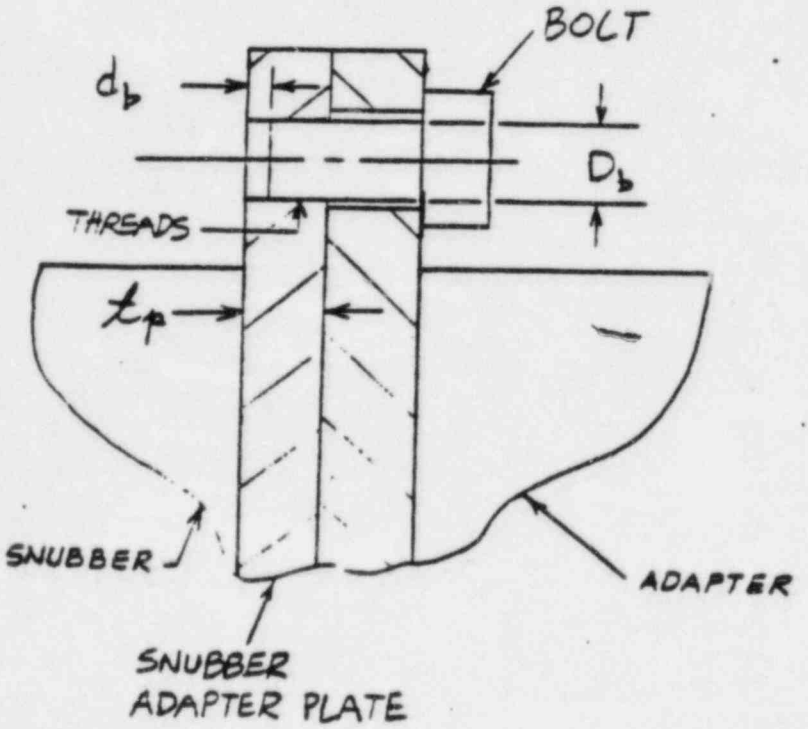
COMANCHE PEAK REVIEW TEAM
INSPECTION CHECKLIST

VERIFICATION PACKAGE NO._____

HANGER MARK NO./DRAWING NO._____

SNUBBER SERIAL NO._____

SNUBBER ADAPTER PLATE BOLT THREAD ENGAGEMENT LENGTH



t_p - nominal thickness of snubber adapter plate.

D_b - nominal bolt diameter.

d_b - depth of recess

BOLT	tp	D_b	d_b
1			
2			
3			
4			

_____ _____
Inspector Date

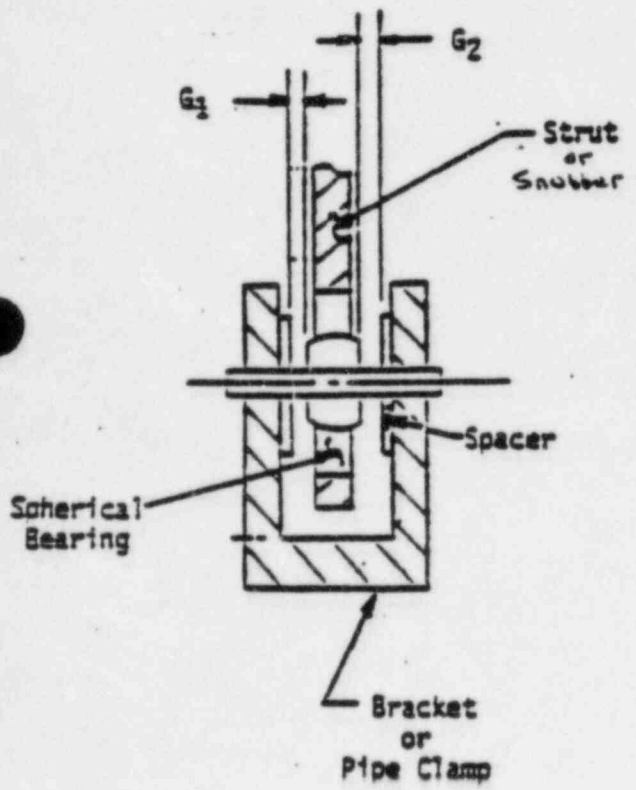
COMANCHE PEAK REVIEW TEAM
INSPECTOR CHECKLIST

VERIFICATION PACKAGE NO._____

HANGER MARK NO./DRAWING NO._____

SNUBBER/STRUT SERIAL NO. _____

SPHERICAL BEARING GAP - SWAY STRUTS AND SNUBBERS



FORWARD BRACKET/PIPE CLAMP

SPACER NOMINAL THICKNESS	NUMBER OF SPACERS INSTALLED ON EACH SIDE OF SPHERICAL BEARING	
	SIDE G	SIDE G_2

RESULTANT GAP =

G1 + G2 = RESULTANT GAP

_____ _____
Inspector Date

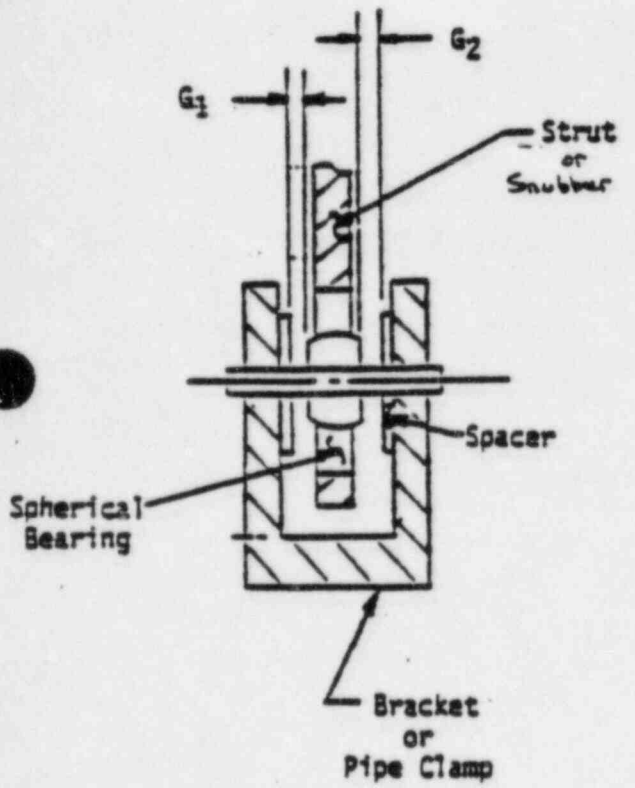
COMANCHE PEAK REVIEW TEAM
INSPECTOR CHECKLIST

VERIFICATION PACKAGE NO. _____

HANGER MARK NO./DRAWING NO. _____

SNUBBER/STRUT SERIAL NO. _____

SPHERICAL BEARING GAP - SWAY STRUTS AND SNUBBERS



REAR BRACKET

SPACER NOMINAL THICKNESS	NUMBER OF SPACERS INSTALLED ON EACH SIDE OF SPHERICAL BEARING	
	SIDE G	SIDE G_2

RESULTANT GAP = _____

G1 + G2 = RESULTANT GAP

_____ _____
Inspector Date

COMANCHE PEAK REVIEW TEAM
INSPECTOR CHECKLIST

VERIFICATION PACKAGE NO._____

HANGER MARK NO./DRAWING NO._____

SPHERICAL BEARING GAP - SWAY STRUTS AND SNUBBERS

SPACER THICKNESSES

XRB SIZE	*SPACER THICKNESS EACH
06	1/8"
08	1/16"
10	3/32"
12/14	3/32"
20	11/32"
24	5/16"
36	13/32"

SPC PIPE CLAMP SIZE	*SPACER THICKNESS EACH
06	5/32"
08	3/32"
10	1/8"
12/14	3/16"
20	3/8"
24	3/8"
36	1/4"

*Nominal Dimensions

NOTE: Rear Brackets for struts and snubbers may be designated SRRB or SMRB, but the size no. only is important. Size 06 should be used for snubber sizes ¼ and ½.

HILTI ANCHOR DESIGNATION AND SETTING REQUIREMENTS

Stamp on Anchor	Actual Bolts Sizes	Minimum Embedment (Before Torque) KWIK	Super Kwik	Length of Threads	Nut Thickness
A.	1/4 x 1 5/8	1 1/8	-	3/4	7/32
B.	1/4 x 2 1/4	1 1/8	-	3/4	7/32
	3/8 x 2 1/8	1 5/8	-	7/8	11/32
C.	3/8 x 2 3/4	1 5/8	-	7/8	11/32
	1/2 x 2 3/4	2 1/4	-	1 1/4	7/16
D.	1/4 x 3	1 1/8	-	3/4	7/32
E.	1/4 x 3 1/2	1 1/8	-	3/4	7/32
	3/8 x 3 1/2	1 5/8	-	1 1/8	11/32
	1/2 x 3 3/4	2 1/4	-	1 1/4	7/16
	5/8 x 3 1/2	2 3/4	-	1 1/2	17/32
F.	3/4 x 4 1/4	3 1/4	-	1 1/2	5/8
G.	5/8 x 4 1/2	2 3/4	-	1 1/2	17/32
	3/4 x 4 1/2	3 1/4	-	1 1/2	5/8
H.	3/8 x 5	1 5/8	-	1 1/8	11/32
I.	1/2 x 5 1/2	2 1/4	-	1 1/4	7/16
	3/4 x 5 1/2	3 1/4	-	1 1/2	5/8
J.	5/8 x 6	2 3/4	-	1 1/2	17/32
	1 x 6	4 1/2	-	2 1/4	27/32
K.	-	-	-	-	-
L.	1/2 x 7	2 1/4	3 1/4	1 1/4	7/16
	3/4 x 7	3 1/4	-	1 1/2	5/8
	1 x 7	4 1/2	-	2 1/4	27/32
M.	-	-	-	-	-
N.	-	-	-	-	-
O.	5/8 x 8 1/2	2 3/4	-	1 1/2	17/32
	3/4 x 8 1/2	3 1/4	-	1 1/2	5/8
P.	1/2 x 9		3 1/4	1 1/4	7/16
	1 x 9	4 1/2	6 1/2	2 1/4	27/32
	1 1/4 x 9	5 1/2	-	3 1/4	1 1/32
Q.	-	-	-	-	-

HILTI ANCHOR DESIGNATION AND SETTING REQUIREMENTS

Stamp* on Anchor	Actual Bolts Sizes	Minimum Embedment (Before Torque) KWIK	Super Kwik	Length of Threads	Nut Thickness
R.	1/2 x 10	2 1/4	-	1 1/4	7/16
	3/4 x 10	3 1/4	-	1 1/2	5/8
S.	-	-	-	-	-
T.	1/2 x 12	-	3 1/4	1 1/4	7/16
	1 x 12	4 1/2	6 1/2	2 1/4	27/32
	1 1/4 x 12	5 1/2	8 1/8	3 1/4	1 1/32
U.	1 x 13 1/2	4 1/2	6 1/2	2 1/4	27/32
	1 1/4 x 13 1/2	5 1/2	8 1/8	3 1/4	1 1/32
V.	-	-	-	-	-
W.	1 x 15	-	6 1/2	2 1/4	27/32
	1 1/4 x 15	5 1/2	8 1/8	3 1/4	1 1/32
X.	1 1/4 x 16 1/2	5 1/2	8 1/8	3 1/4	1 1/32
Y.	-	-	-	-	-
Z.	1 1/4 x 18	5 1/2	8 1/8	3 1/4	1 1/32
DD.	1 1/4 x 22	-	8 1/8	3 1/4	1 1/32
EE.	1 1/4 x 23	-	8 1/8	3 1/4	1 1/32

* Bolts of 19-inch length and greater may be stamped with number corresponding to the bolt length in inches in the same manner instead of the stamped letters as listed above.

MINIMUM SPACING BETWEEN HILTI EXPANSION ANCHORS*

Hilti Anchor Size	1/4" Hilti	3/8" Hilti	1/2" Hilti	5/8" Hilti	3/4" Hilti	1" Hilti	1 1/4" Hilti
1/4	2 1/2	3 1/8	3 3/4	4 3/8	5	6 1/4	7 1/2
5/16	2 13/16	2 7/16	4 1/16	4 11/16	5 5/16	6 9/16	7 13/16
3/8	3 1/8	3 3/4	4 3/8	5	5 5/8	6 7/8	8 1/8
1/2	3 3/4	4 3/8	5	5 5/8	6 1/4	7 1/2	8 3/4
5/8	4 3/8	5	5 5/8	6 1/4	6 7/8	8 1/8	9 3/8
3/4	5	5 5/8	6 1/4	6 7/8	7 1/2	8 3/4	10
7/8	5 5/8	6 1/4	6 7/8	7 1/2	8 1/8	9 3/8	10 5/8
1	6 1/4	6 7/8	7 1/2	8 1/8	8 3/4	10	11 1/4
1 1/4	7 1/2	8 1/8	8 3/4	9 3/8	10	11 1/4	12 1/2

Dimension in inches.

* The minimum spacing outlined in the above chart applies to Hilti anchors detailed on separate adjacent fixtures.

Hilti bolts details on an individual fixture drawing may have less than the minimum spacing tabulated above.

MINIMUM ANCHOR CLEARANCES*

Hilti Anchor Size	MINIMUM DISTANCE TO: Richmond Screw Anchors 1-inch	Richmond Screw Anchors 1 1/2-Inch	Concrete Edge* (Note 1)	Abandoned Hilti Anchors or Holes and Embedded Anchor Bolts that are Cut Off**
1/4	7 5/8	12 1/4	1 1/4	1/2
3/8	8 1/4	12 7/8	1 7/8	3/4
1/2	8 7/8	13 1/2	2 1/2	1
5/8	9 1/2	14 1/8	3 1/8	1 1/4
3/4	10 1/8	14 3/4	3 3/4	1 1/2
1	11 3/8	16	5	2
1 1/4	12 5/8	17 1/4	6 1/4	2 1/2

* Measured Center-to-Center of anchors and anchor center to edge of concrete in inches.

** Minimum spacing between holes covered by this column shall be measured center-to-center and based on size of hole being drilled. (e.g., Pilot hole spacing is based on pilot bit size.)

Hilti bolts may be installed as close as practical to unused Richmond Screw Anchors which have been plugged (i.e., grouted, Richmond Screw-in plug or snap-in plug, etc.).

NOTE 1: Where embedded angles are used for framing water tight door or removable block wall openings, the minimum clearance from center line of Hilti anchor to the opening edge is 5 inches + 5 times the Hilti anchor diameter.

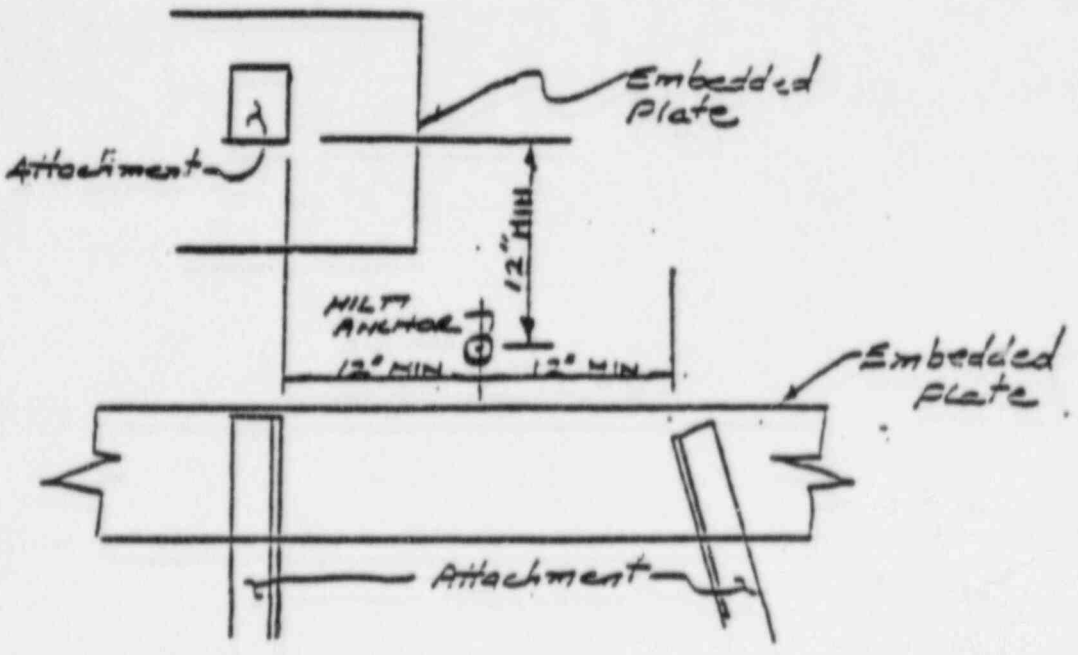
MINIMUM CLEARANCES TO EMBEDDED PLATES

Where the embedded steel plates are occupied by attachments within minimum distances shown below, the minimum clearance to Hilti Anchors shall be as follows:

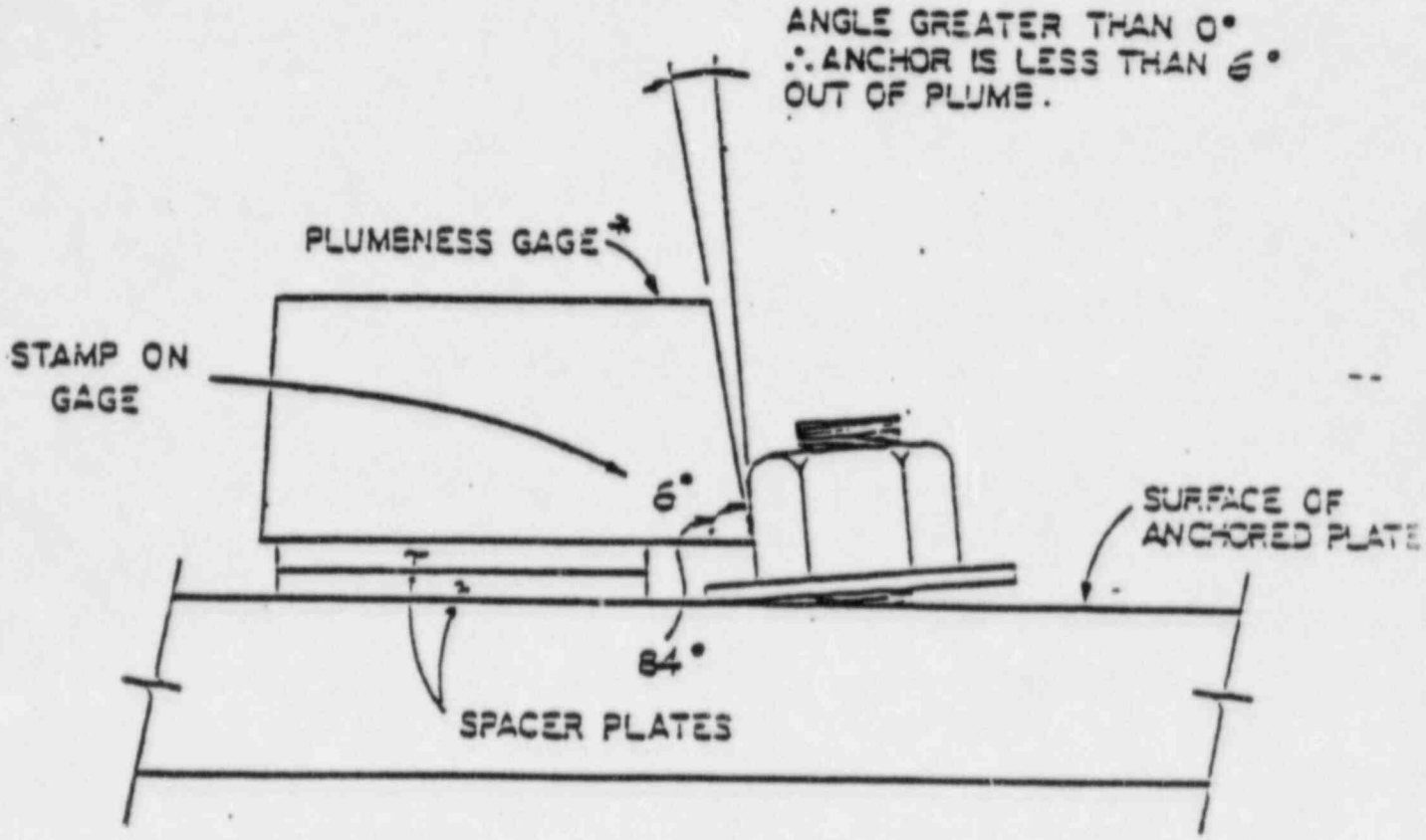
Hilti Anchor Size	Nelson Stud to Hilti Anchor	Edge of Plate to Hilti Anchor
1/4	5 1/4	3 3/4
3/8	5 7/8	4 3/8
1/2	6 1/2	5
5/8	7 1/8	5 5/8
3/4	7 3/4	6 1/4
1	9	7 1/2
1 1/4	10 1/4	8 3/4

Dimensions are in inches.
Distance measured with reference to center of bolts and studs.

Where location of the nearest Nelson Stud can be determined from the "S" stamps on the embedded steel plate, the minimum center-to-center clearance to the Hilti Anchor as shown above shall govern. Where location of the nearest Nelson Stud cannot be so determined, the minimum clearance to Edge of Plate as shown above shall govern.

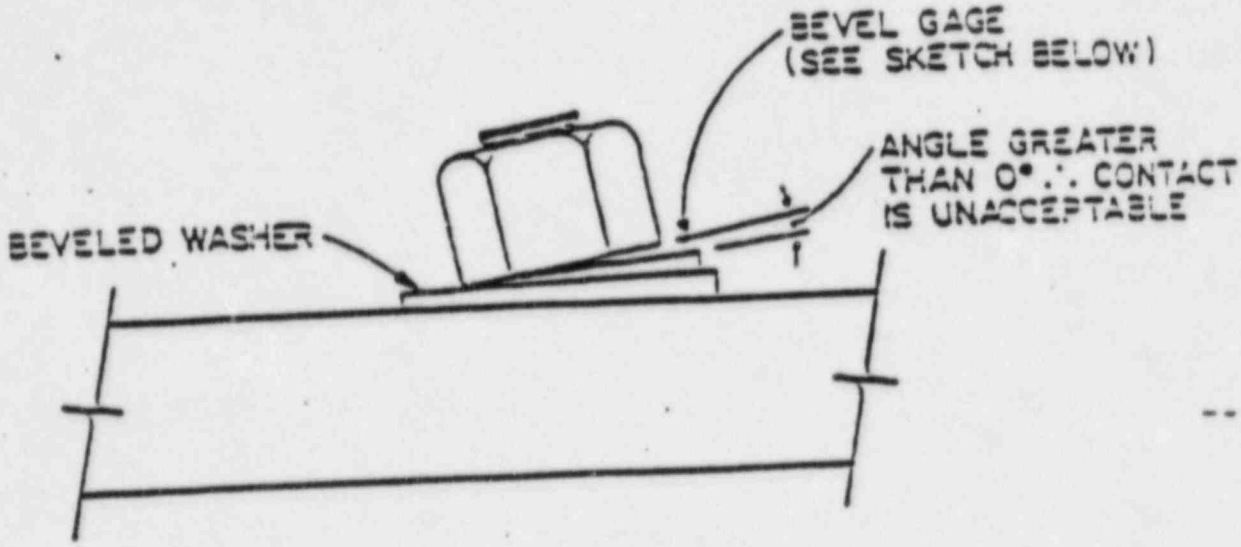


ANCHOR ANGULARITY

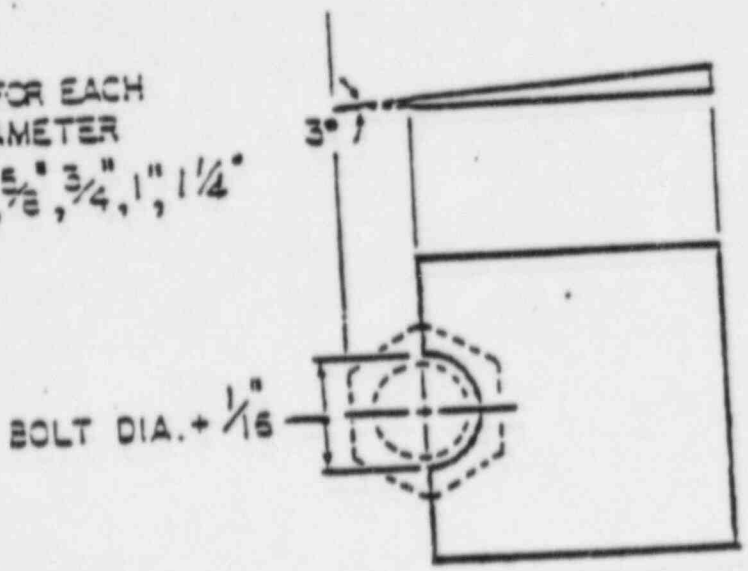


* Use this or other acceptable devise in determining acceptable angularity.

NUT BEARING

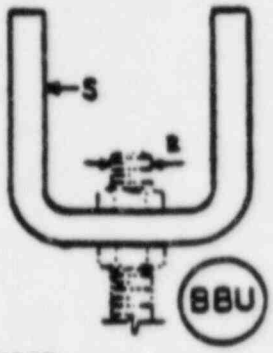


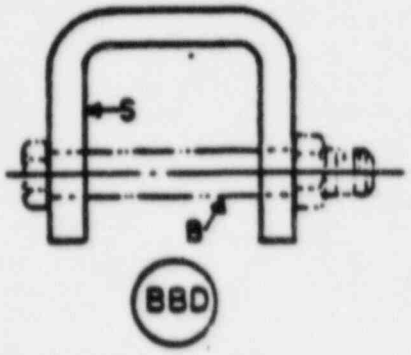
1 GAGE FOR EACH
BOLT DIAMETER
$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1", 1 $\frac{1}{4}$"



TYPICAL INSPECTION DRAWINGS

INDEX





MATERIAL:

BAR	ASME SA-36
BOLT	ASTM A307, SA-307
NUT	ASTM A-563 Grade A
PIN	ASME SA-36

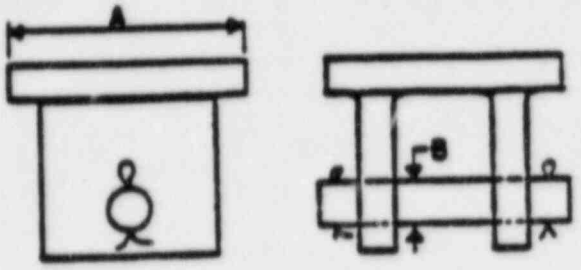
CATALOG CODE (BBU)	ROD SIZE R(IN) ± 1/16	CATALOG CODE (BBD)	BOLT SIZE B(IN) ± 1/16 (See Note 1)	STOCK SIZE S(IN) (See Note 2)
03	3/8	03	1/2	2 x 1/4
04	1/2	04	5/8	2 x 1/4
05	5/8	05	3/4	2 x 1/4
06	3/4	06	7/8	2 1/2 x 3/8
07	7/8	07	1	2 1/2 x 3/8
08	1	08	1 1/8	3 x 1/2
09	1 1/8	09	1 1/4	3 x 1/2
10	1 1/4	10	1 3/8	4 x 5/8
12	1 1/2	12	1 5/8	5 x 3/4
14	1 3/4	14	1 7/8	5 x 3/4
16	2	16	2 1/4	6 x 3/4
18	2 1/4	18	2 1/2	6 x 3/4
20	2 1/2	20	2 3/4	6 x 3/4

NOTES:

1). 1 1/4 and larger are pins with cotter pins.
2). Width Dim. may vary ± 1/8.
Thickness Dim. may vary ± 1/16.

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING WELDED BEAM ATTACHMENT		
DRAWING NO. BBD/BBU	REV. 0	SHT. 1 of 2



MATERIAL:

BAR ASME SA-36
PIN ASME SA-36

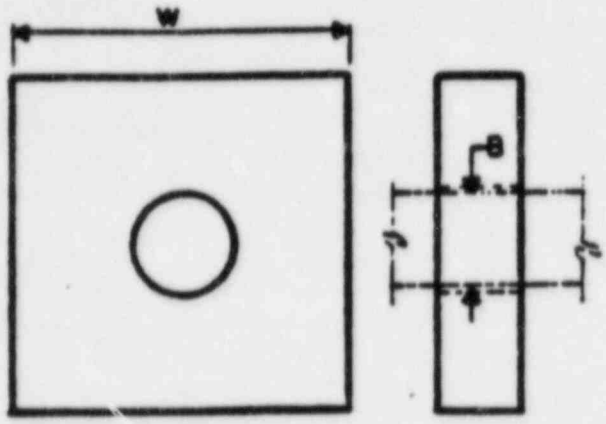
CATALOG CODE (BBD)	B(IN) ± 1/16	A(IN) ± 1/4
22	3	7
24	3 1/4	8
26	3 1/2	8
28	3 3/4	9
30	4	9
32	4 1/4	11
34	4 1/2	11
36	4 3/4	13
38	5	13
40	5 1/4	15

NOTES:

This drawing is for inspection purposes only

TITLE: TYPICAL INSPECTION DRAWING (WELDED BAIL ATTACHMENT)

DRAWING NO.	REV.	SHT.
BBD/BBU	0	1 of 1



MATERIAL:

ASME SA-36

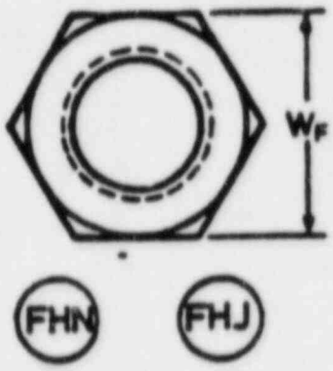
BWA

CATALOG CODE	W(IN) ± 1/8	B(IN) ± 1/16
BWA - 04	2 1/2	5/8
BWA - 05	2 1/2	3/4
BWA - 06	3	7/8
BWA - 07	3	1
BWA - 08	3 1/2	1 1/8
BWA - 09	4	1 1/4
BWA - 10	4 1/2	1 3/8
BWA - 12	5 1/2	1 5/8
BWA - 14	5 1/2	1 7/8
BWA - 16	6 1/2	2 1/4
BWA - 18	6 1/2	2 1/2
BWA - 20	7 1/2	2 3/4
BWA - 22	8	3
BWA - 24	9	3 1/4
BWA - 26	10	3 1/2
BWA - 28	10	3 3/4

NOTES:

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING WELDED ATTACHMENT			
DRAWING NO BWA	REV. 0	SHT 1 of 1	



MATERIAL :

ASTM A - 563 Grade A or
A - 307

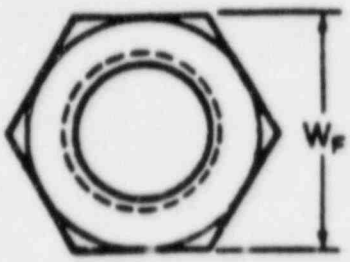
CATALOG CODE (FHJ or FHN)	WIDTH ACROSS FLATS W_F (IN) ± 1/16 unless noted otherwise
1/4	1/2 ± 1/32
3/8	11/16 ± 1/32
1/2	7/8
5/8	1 1/16
3/4	1 1/4
7/8	1 7/16
1	1 5/8
1 1/8	1 13/16
1 1/4	2
1 3/8	2 3/16
1 1/2	2 3/8
1 3/4	2 3/4
2	3 1/8
2 1/4	3 1/2
2 1/2	3 7/8
2 3/4	4 1/4
3	4 5/8
3 1/4	5
3 1/2	5 3/8
4	6 1/8
4 1/2	6 7/8

NOTES :

1) FHJ is approximately half the height of FHN.

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING HEAVY HEX AND HEAVY JAM NUTS		
DRAWING NO. FHJ/FHN	REV. 0	SHT 1 of 1



FXN FXJ

MATERIAL :

ASTM A - 563 Grade A

or

A - 307

CATALOG CODE (FXJ or FXN)	WIDTH ACROSS FLATS W_F (IN) ± 1/16 unless noted otherwise
1/4	7/16 ± 1/32
3/8	9/16 ± 1/32
1/2	3/4
5/8	15/16
3/4	1 1/8
7/8	1 5/16
1	1 1/2
1 1/8	1 11/16
1 1/4	1 7/8
1 3/8	2 1/16
1 1/2	2 1/4
1 3/4	2 5/8
2	3

NOTES :

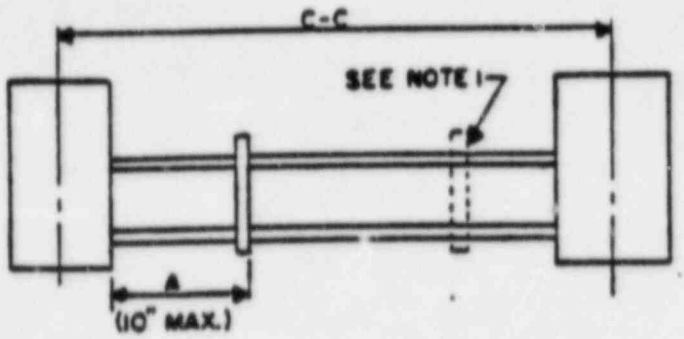
1.) FXN may be used in place of FXN.

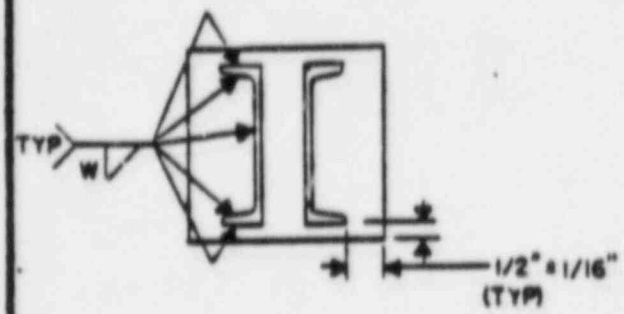
2.) FXJ may be used in place of FXJ.

3.) FXJ is approximately half the height of FXN.

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING HEX AND JAM NUTS		
DRAWING NO. FXJ/FXN	REV. 0	SHT 1 of 1





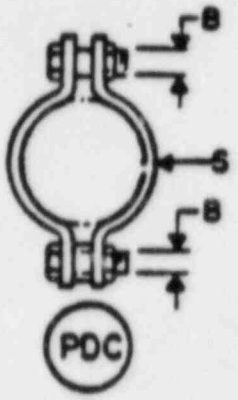
SPRING SIZE	PLATE THK.(IN)	WELD SIZE,W(IN)
0-8	1/2	1/8
9-11	1/2	3/16
12-14	1/2	3/16
15-17	3/4	1/4
18-20	3/4	1/4
21-22	1	3/8

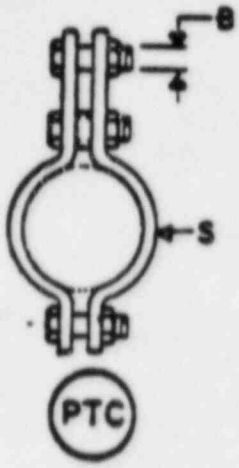
NOTE:

1) Broken line illustrates the placement of the second connecting plate.

This drawing is for inspection purposes only.

TITLE. TYPICAL INSPECTION DRAWING "G"-TYPE SPRING		
DRAWING NO. G-TYPE SPRING	REV. 0	SHT 1 of 1





MATERIAL:

CLAMP -ASME SA-36
BOLT -ASTM A-307
NUT -ASTM A-563 GRADE A

CATALOG CODE (PDC or PTC)	NOM. PIPE SIZE (IN)	STOCK SIZE t x W (IN) (See Note 1)	BOLT B(IN) ± 1/16
004-0104	1/2	1/8 x 1	3/8
006-0104	3/4	1/8 x 1	3/8
006-0205	3/4	1/4 x 1	1/2
010-0104	1	1/8 x 1	3/8
010-0205	1	1/4 x 1 1/4	1/2
012-0104	1 1/4	1/8 x 1	3/8
012-0205	1 1/4	1/4 x 1 1/4	1/2
015-0104	1 1/2	1/8 x 1	3/8
015-0205	1 1/2	1/4 x 1 1/4	1/2
020-0104	2	1/8 x 1	3/8
020-0205	2	1/4 x 1 1/4	1/2
020-0308	2	3/8 x 2	3/4
025-0205	2 1/2	1/4 x 1 1/4	5/8
025-0308	2 1/2	3/8 x 2	3/4
030-0205	3	1/4 x 1 1/4	5/8
030-0308	3	3/8 x 2	3/4
035-0205	3 1/2	1/4 x 1 1/4	5/8
035-0308	3 1/2	3/8 x 2	3/4
040-0205	4	1/4 x 1 1/4	5/8
040-0308	4	3/8 x 2	3/4
040-0410	4	1/2 x 2 1/2	1
040-0512	4	5/8 x 3	1 1/4

NOTES:

1) Thickness, t, may vary ± 1/16.
   Width, W, may vary ± 1/4.

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING
CARBON STEEL PIPE CLAMP

DRAWING NO	REV.	SHT.
PDC/PTC	0	1 of 4

CATALOG CODE (PDC or PTC)	NOM. PIPE SIZE (IN)	STOCK SIZE t x W (IN) (See Note 1)	BOLT B(IN) ± 1/16
050-0205	5	1/4 x 1 1/4	5/8
050-0308	5	3/8 x 2	3/4
050-0410	5	1/2 x 2 1/2	1
050-0512	5	5/8 x 3	1 1/4
060-0308	6	3/8 x 2	3/4
060-0410	6	1/2 x 2 1/2	1
060-0512	6	5/8 x 3	1 1/4
060-0616	6	3/4 x 4	1 1/2
080-0308	8	3/8 x 2	3/4
080--410	8	1/2 x 2 1/2	1
080-0512	8	5/8 x 3	1 1/4
080-0616	8	3/4 x 4	1 1/2
100-0410	10	1/2 x 2 1/2	1
100-0512	10	5/8 x 3	1 1/4
100-0616	10	3/4 x 4	1 1/2
100-0624	10	3/4 x 6	2
120-0410	12	1/2 x 2 1/2	1
120-0512	12	5/8 x 3	1 1/4
120-0616	12	3/4 x 4	1 1/2
120-0624	12	3/4 x 6	2
120-0824	12	1 x 6	2 1/4
140-0410	14	1/2 x 2 1/2	1
140-0512	14	5/8 x 3	1 1/4
140-0616	14	3/4 x 4	1 1/2
140-0624	14	3/4 x 6	1 3/4
140-0824	14	1 x 6	2 1/4
160-0410	16	1/2 x 2 1/2	1
160-0512	16	5/8 x 3	1 1/4
160-0616	16	3/4 x 4	1 1/2
160-0624	16	3/4 x 6	1 3/4
160-0824	16	1 x 6	2 1/4
160-0832	16	1 x 8	2 1/2
180-0512	18	5/8 x 3	1 1/4
180-0616	18	3/4 x 4	1 1/2
180-0624	18	3/4 x 6	1 3/4
180-0824	18	1 x 6	2 1/4
180-0832	18	1 x 8	2 1/2
180-1028	18	1 1/4 x 7	2 3/4
200-0512	20	5/8 x 3	1 1/4
200-0616	20	3/4 x 4	1 1/2
200-0624	20	3/4 x 6	1 1/2
200-0824	20	1 x 6	2
200-0832	20	1 x 8	2 1/8

NOTES:

1) Thickness, t, may vary ± 1/16.
   Width, W, may vary ± 1/4.

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING CARBON STEEL PIPE CLAMP		
DRAWING NO. PDC/PTC	REV. 0	SHT. 2 of 4

CATALOG CODE (PDC or PTC)	NOM. PIPE SIZE (IN)	STOCK SIZE t x W (IN) (See Note 1)	BOLT B(IN) ± 1/16
200-1028	20	1 1/4 x 7	2 3/4
220-0512	22	5/8 x 3	1 1/4
220-0616	22	3/4 x 4	1 1/2
220-0624	22	3/4 x 6	1 1/2
220-0824	22	1 x 6	2
220-0832	22	1 x 8	2 1/4
220-1028	22	1 1/4 x 7	2 1/2
240-0512	24	5/8 x 3	1 1/4
240-0616	24	3/4 x 4	1 1/2
240-0624	24	3/4 x 6	1 1/2
240-0824	24	1 x 6	2
240-0832	24	1 x 8	2 1/4
240-1028	24	1 1/4 x 7	2 1/2
240-1232	24	1 1/2 x 8	3
260-0624	26	3/4 x 6	1 1/2
260-0824	26	1 x 6	1 3/4
260-0832	26	1 x 8	2
260-1028	26	1 1/4 x 7	2 1/2
260-1232	26	1 1/2 x 8	3
280-0624	28	3/4 x 6	1 1/2
280-0824	28	1 x 6	1 3/4
280-0832	28	1 x 8	2
280-1028	28	1 1/4 x 7	2 1/4
280-1232	28	1 1/2 x 8	2 3/4
280-1240	28	1 1/2 x10	3
300-0624	30	3/4 x 6	1 1/2
300-0824	30	1 x 6	1 3/4
300-0832	30	1 x 8	2
300-1028	30	1 1/4 x 7	2 1/4
300-1232	30	1 1/2 x 8	2 3/4
300-1240	30	1 1/2 x10	3
320-0624	32	3/4 x 6	1 1/2
320-0824	32	1 x 6	1 3/4
320-0832	32	1 x 8	2
320-1028	32	1 1/4 x 7	2 1/4
320-1232	32	1 1/2 x 8	2 3/4
320-1240	32	1 1/2 x10	3
340-0624	34	3/4 x 6	1 1/2
340-0824	34	1 x 6	1 3/4
340-0832	34	1 x 8	2
340-1028	34	1 1/4 x 7	2 1/4
340-1232	34	1 1/2 x 8	2 3/4
340-1240	34	1 1/2 x10	3

NOTES:

1) Thickness, t, may vary ± 1/16.
   Width, W, may vary ± 1/4.

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING CARBON STEEL PIPE CLAMP			
	DRAWING NO. PDC/PTC	REV. 0	SHT 3 of 4

CATALOG CODE (PDC or PTC)	NOM. PIPE SIZE (IN)	STOCK SIZE t x W (IN) (See Note 1)	BOLT B(IN) ± 1/16
360-0624	36	3/4 x 6	1 1/2
360-0824	36	1 x 6	1 3/4
360-0832	36	1 x 8	2
360-1028	36	1 1/4 x 7	2 1/4
360-1232	36	1 1/2 x 8	2 1/2
360-1240	36	1 1/2 x10	2 3/4
360-1248	36	1 1/2 x12	3
380-0624	38	3/4 x 6	1 1/2
380-0824	38	1 x 6	1 3/4
380-0832	38	1 x 8	2
380-1028	38	1 1/4 x 7	2 1/4
380-1232	38	1 1/2 x 8	2 1/2
380-1240	38	1 1/2 x10	2 3/4
380-1248	38	1 1/2 x12	3
400-0624	40	3/4 x 6	1 1/2
400-0824	40	1 x 6	1 3/4
400-0832	40	1 x 8	2
400-1028	40	1 1/4 x 7	2 1/4
400-1232	40	1 1/2 x 8	2 1/2
400-1240	40	1 1/2 x10	2 3/4
400-1248	40	1 1/2 x12	3
420-0824	42	1 x 6	1 3/4
420-0832	42	1 x 8	2
420-1028	42	1 1/4 x 7	2 1/4
420-1232	42	1 1/2 x 8	2 1/2
420-1240	42	1 1/2 x10	2 3/4
420-1248	42	1 1/2 x12	3
440-0824	44	1 x 6	1 3/4
440-0832	44	1 x 8	2
440-1028	44	1 1/4 x 7	2 1/4
440-1232	44	1 1/2 x 8	2 1/2
440-1240	44	1 1/2 x10	2 3/4
440-1248	44	1 1/2 x12	3

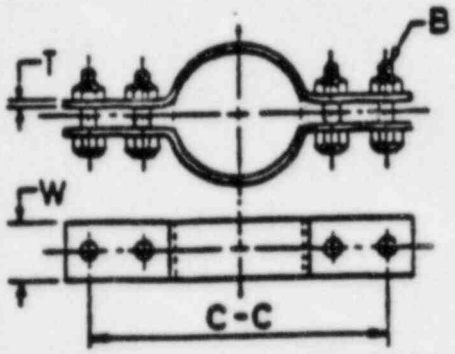
NOTES:

1) Thickness, t, may vary ± 1/16.
   Width, W, may vary ± 1/4.

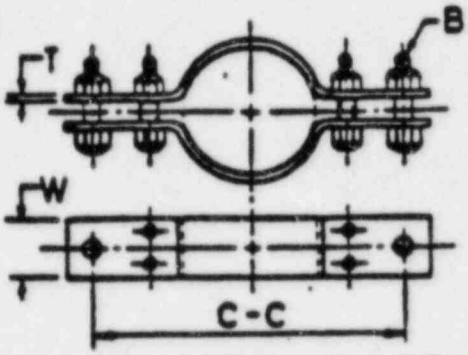
This drawing is for inspection purposes only

TITLE: TYPICAL INSPECTION DRAWING
CARBON STEEL PIPE CLAMP

DRAWING NO.	REV.	SHT
PDC/PTC	0	4 of 4



(STOCK SIZE W = 6" LESS)



(STOCK SIZE W = 8" OVER)

MATERIAL :

CLAMP: SA-36
BOLTS: SA-307 GR.B
OR
A-307 GR.A

PRS

CATALOG CODE	NOM. PIPE SIZE (IN)	THICKNESS T(IN) ± 1/16	WIDTH W(IN) ± 1/4*	BOLT B(IN) ± 1/16
PRS-006-0208	3/4	1/4	2	3/8
PRS-006-0312	3/4	3/8	3	1/2
PRS-006-0316	3/4	3/8	4	1/2
PRS-010-0208	1	1/4	2	3/8
PRS-010-0312	1	3/8	3	1/2
PRS-010-0316	1	3/8	4	1/2
PRS-012-0208	1 1/4	1/4	2	3/8
PRS-012-0312	1 1/4	3/8	3	1/2
PRS-012-0316	1 1/4	3/8	4	1/2
PRS-012-0424	1 1/4	1/2	6	3/4
PRS-015-0208	1 1/2	1/4	2	3/8
PRS-015-0312	1 1/2	3/8	3	1/2
PRS-015-0316	1 1/2	3/8	4	1/2
PRS-015-0424	1 1/2	1/2	6	3/4
PRS-020-0208	2	1/4	2	3/8
PRS-020-0312	2	3/8	3	1/2
PRS-020-0316	2	3/8	8	1/2
PRS-020-0424	2	1/2	6	3/4
PRS-025-0208	2 1/2	1/4	2	3/8
PRS-025-0312	2 1/2	3/8	3	1/2
PRS-025-0516	2 1/2	5/8	4	3/4
PRS-025-0524	2 1/2	5/8	6	3/4

NOTES:

*1.) Width dimension to be checked at clamp end.

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING STANDARD RISER CLAMP		
DRAWING NO. PRS	REV. 0	SHT 1 of 3

CATALOG CODE	NOM. PIPE SIZE (IN)	THICKNESS T(IN)±1/16	WIDTH W(IN)±1/64*	BOLT B(IN)±1/16
PRS-030-0208	3	1/4	2	3/8
PRS-030-0312	3	3/8	3	1/2
PRS-030-0516	3	5/8	4	3/4
PRS-030-0524	3	5/8	6	3/4
PRS-035-0208	3 1/2	1/4	2	3/8
PRS-035-0312	3 1/2	3/8	3	1/2
PRS-035-0516	3 1/2	5/8	4	3/4
PRS-035-0524	3 1/2	5/8	6	1
PRS-040-0208	4	1/4	2	3/8
PRS-040-0312	4	3/8	3	1/2
PRS-040-0516	4	5/8	4	3/4
PRS-040-0624	4	3/4	6	1
PRS-050-0208	5	1/4	2	3/8
PRS-050-0312	5	3/8	3	1/2
PRS-050-0516	5	5/8	4	3/4
PRS-050-0624	5	3/4	6	1
PRS-060-0208	6	1/4	2	1/2
PRS-060-0312	6	3/8	3	5/8
PRS-060-0516	6	5/8	4	3/4
PRS-060-0824	6	1	6	1
PRS-080-0416	8	1/2	4	1/2
PRS-080-0624	8	3/4	6	1
PRS-080-0824	8	1	6	1 1/4
PRS-080-0832	8	1	8	1 1/4
PRS-080-1032	8	1 1/4	8	1 1/2
PRS-100-0416	10	1/2	4	1/2
PRS-100-0824	10	1	6	1
PRS-100-0832	10	1	8	1 1/4
PRS-100-1032	10	1 1/4	8	1 1/2
PRS-120-0516	12	5/8	4	3/4
PRS-120-0824	12	1	6	1
PRS-120-0832	12	1	8	1 1/4
PRS-120-1032	12	1 1/4	8	1 1/2
PRS-120-1232	12	1 1/2	8	1 1/2
PRS-140-0616	14	3/4	4	3/4
PRS-140-0824	14	1	6	1
PRS-140-1024	14	1 1/4	6	1 1/4
PRS-140-1032	14	1 1/4	8	1 1/2
PRS-140-1232	14	1 1/2	8	1 3/4
PRS-160-0824	16	1	6	1
PRS-160-0832	16	1	8	1 1/4
PRS-160-1032	16	1 1/4	8	1 1/2

*SEE NOTE 1

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING
STANDARD RISER CLAMP

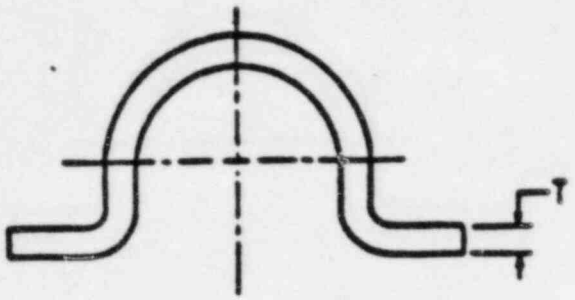
DRAWING NO.	REV.	SHT.
PRS	0	1 of 3

CATALOG CODE	NOM. PIPE SIZE (IN)	THICKNESS T(IN) ± 1/16	WIDTH W(IN) ± 1/4*	BOLT B(IN) ± 1/16
PRS-160-1232	16	1 1/2	8	1 1/2
PRS-160-1240	16	1 1/2	10	1 3/4
PRS-180-0824	18	1	6	1
PRS-180-1032	18	1 1/4	8	1 1/4
PRS-180-1232	18	1 1/2	8	1 1/2
PRS-180-1240	18	1 1/2	10	1 3/4
PRS-200-0824	20	1	6	1
PRS-200-1032	20	1 1/4	8	1 1/4
PRS-200-1240	20	1 1/2	10	1 3/4
PRS-200-1640	20	2	10	2
PRS-220-0824	22	1	6	1
PRS-220-1024	22	1 1/4	6	1 1/4
PRS-220-1240	22	1 1/2	10	1 3/4
PRS-220-1640	22	2	10	2 1/4
PRS-240-0824	24	1	6	1
PRS-240-1032	24	1 1/4	8	1 1/4
PRS-240-1240	24	1 1/2	10	1 3/4
PRS-240-1648	24	2	12	2 1/4

*SEE NOTE 1

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING STANDARD RISER CLAMP		
DRAWING NO. PRS	REV. 0	SHT. 3 of 3



MATERIAL :

SA-36

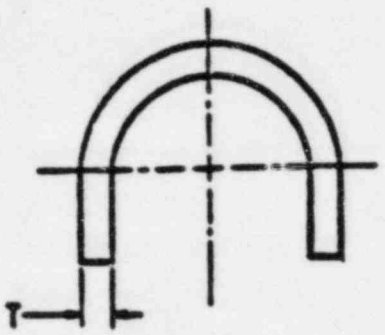
PSG

CATALOG CODE	NOM. PIPE SIZE (IN)	THICKNESS T(IN) ± 1/16	WIDTH W(IN) ± 1/8
PSG-004	1/2	1/4	1 1/4
PSG-006	3/4	1/4	1 1/4
PSG-010	1	1/4	1 1/4
PSG-012	1 1/4	3/8	2
PSG-015	1 1/2	3/8	2
PSG-020	2	3/8	2

NOTES :

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING BOLTED U-GUIDE		
DRAWING NO. PSG	REV. 0	SHT. 1 of 1



PUG

MATERIAL:

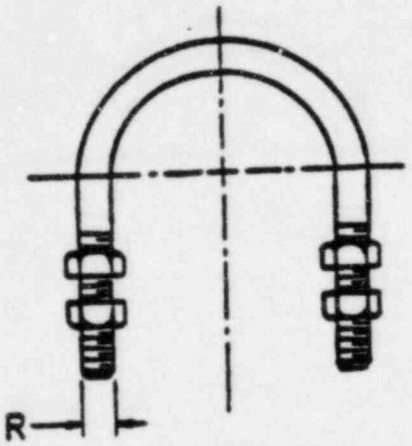
SA-36

CATALOG CODE	NOM. PIPE SIZE (IN)	THICKNESS T(IN) ± 1/16	WIDTH W(IN) ± 1/8
PUG-004	1/2	1/4	1 1/4
PUG-006	3/4	1/4	1 1/4
PUG-010	1	1/4	1 1/4
PUG-012	1 1/4	3/8	2
PUG-015	1 1/2	3/8	2
PUG-020	2	3/8	2

NOTES:

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING WELDED U-GUIDE		
DRAWING NO. PUG	REV. 0	SHT. 1 of 1



MATERIAL :

ROD	ASME	SA-36
NUTS	ASTM	A-563 GRADE A or A-307 (see Note 1)

1

PUS

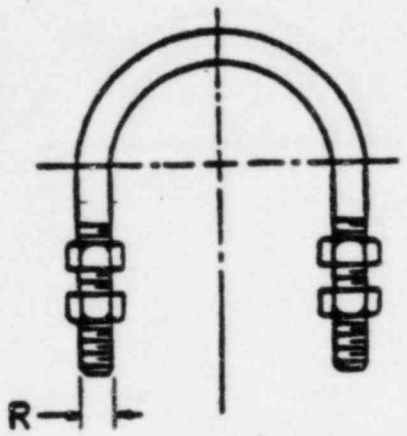
CATALOG CODE	NOM. PIPE SIZE(IN)	R(IN)±1/16
PUS-004	1/2	1/4
PUS-006	3/4	1/4
PUS-010	1	1/4
PUS-012	1¼	3/8
PUS-015	1½	3/8
PUS-020	2	3/8
PUS-025	2½	1/2
PUS-030	3	1/2
PUS-035	3½	1/2
PUS-040	4	1/2
PUS-050	5	1/2
PUS-060	6	5/8
PUS-080	8	5/8
PUS-100	10	3/4
PUS-120	12	7/8
PUS-140	14	7/8
PUS-160	16	7/8
PUS-180	18	1
PUS-200	20	1
PUS-240	24	1
PUS-300	30	1
PUS-360	36	1¼

NOTES :

1) FXN or FHN may be used in place of the nuts that are supplied with PUS.

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING STANDARD U-BOLT			
DRAWING NO. PUS		REV. 1	SHT 1 of 1



PUH

MATERIAL :

ROD ASME SA-36
NUTS ASTM A-563 GRADE A or A-307 (see Note 1)

1

CATALOG CODE	NOM. PIPE SIZE (IN)	R(IN) ± 1/16
PUH-004	1/2	3/8
PUH-006	3/4	3/8
PUH-010	1	5/8
PUH-012	1 1/4	5/8
PUH-015	1 1/2	5/8
PUH-020	2	5/8
PUH-025	2 1/2	3/4
PUH-030	3	3/4
PUH-035	3 1/2	3/4
PUH-040	4	7/8
PUH-050	5	7/8
PUH-060	6	7/8
PUH-080	8	7/8
PUH-100	10	1
PUH-120	12	1
PUH-140	14	1
PUH-160	16	1

NOTES :

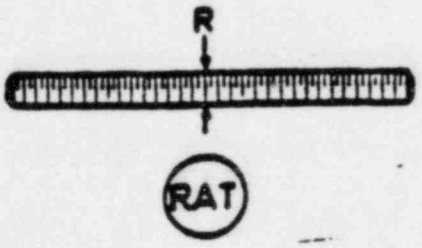
1) FXN or FHN may be used in place of the nuts that are supplied with PUH.

1

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING HEAVY DUTY U-BOLT			
DRAWING NO. PUH		REV. 1	SHT 1 of 1

MATERIAL:
CARBON STEEL



CATALOG CODE (RAT)	ROD SIZE R (IN) ± 1/16
02	1/4
03	3/8
04	1/2
05	5/8
06	3/4
07	7/8
08	1
09	1 1/8
10	1 1/4
11	1 3/8
12	1 1/2

NOTES:

TITLE: TYPICAL INSPECTION DRAWING ALL-THREAD ROD		
DRAWING NO. RAT	REV. 0	SHT 1 of 1

THIS DRAWING IS FOR INSPECTION PURPOSES ONLY

MATERIAL :

REI ASTM A-307 Grade A
ROUND ASTM A-519 or ASME SA-36

CATALOG CODE (RCP)	ROD SIZE R (IN) ± 1/16
03	3/8
04	1/2
05	5/8
06	3/4
08	1
09	1 1/8
10	1 1/4
12	1 1/2
14	1 3/4
16	2
18*	2 1/4
20*	2 1/2
22*	2 3/4
24*	3
26*	3 1/4
28*	3 1/2
30*	3 3/4
32*	4
34*	4 1/4
36*	4 1/2
38*	4 3/4
40*	5

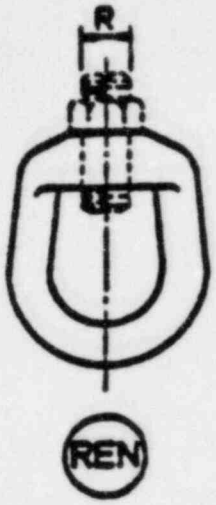
* See Note 1

NOTES :

*1) RCP sizes 18 thru 40 are round shaped.

THIS DRAWING IS FOR INSPECTION PURPOSES ONLY.

TITLE: TYPICAL INSPECTION DRAWING ROD COUPLING			
DRAWING NO. RCP		REV. 0	SHT 1 of 1



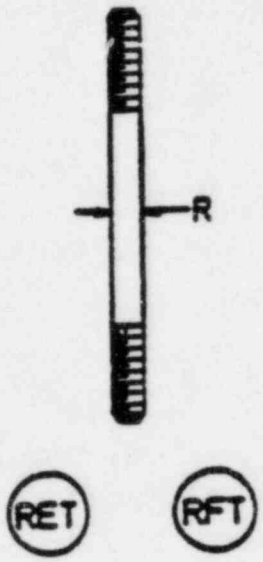
MATERIAL :
ASTM A-668 CLASS C

CATALOG CODE (REN)	ROD SIZE R (IN) ± 1/16
03	3/8
04	1/2
05	5/8
06	3/4
07	7/8
08	1
09	1 1/8
10	1 1/4
12	1 1/2
14	1 3/4
16	2
18	2 1/4
20	2 1/2

NOTES :

THIS DRAWING IS FOR INSPECTION PURPOSES ONLY

TITLE: TYPICAL INSPECTION DRAWING WELDLESS EYE NUT		
DRAWING NO. REN	REV. 0	SHT. 1 of 1



MATERIAL :

ASME SA-36

CATALOG CODE (RET or RFT)	ROD SIZE R (IN) ± 1/16
03	3/8
04	1/2
05	5/8
06	3/4
07	7/8
08	1
09	1 1/8
10	1 1/4
12	1 1/2
14	1 3/4
16	2
18	2 1/4
20	2 1/2
22	2 3/4
24	3
26	3 1/4
28	3 1/2
30	3 3/4
32	4
34	4 1/4
36	4 1/2
38	4 3/4
40	5

NOTES :

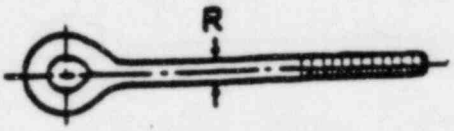
1) RET - END THREADED ROD
   RFT - FULL THREADED ROD

THIS DRAWING IS FOR INSPECTION PURPOSES ONLY.

TITLE: TYPICAL INSPECTION DRAWING END/FULL-THREAD ROD		
DRAWING NO. RET/RFT	REV. 0	SHT 1 of 1

MATERIAL :

ASTM A-668 Class F



RFE

CATALOG CODE (RFE)	ROD SIZE R (IN) ± 1/16
04	1/2
05	5/8
06	3/4
08	1
10	1 1/4
12	1 1/2
14	1 3/4
16	2
18	2 1/4
20	2 1/2

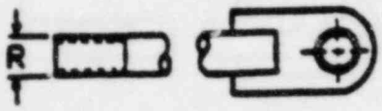
NOTES :

THIS DRAWING IS FOR INSPECTION PURPOSES ONLY.

TITLE: TYPICAL INSPECTION DRAWING FORGED EYE ROD		
DRAWING NO. RFE	REV. 0	SHT 1 of 1

MATERIAL :

ASME SA - 36



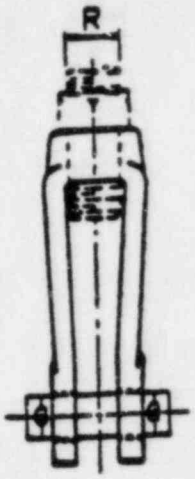
RPE

CATALOG CODE (RPE)	ROD SIZE R (IN) ± 1/16
22	2 3/4
24	3
26	3 1/4
28	3 1/2
30	3 3/4
32	4
34	4 1/4
36	4 1/2
38	4 3/4
40	5

NOTES :

TITLE: TYPICAL INSPECTION DRAWING ROD WITH PLATE EYE			
DRAWING NO. RPE		REV. 0	SHT 1 of 1

THIS DRAWING IS FOR INSPECTION PURPOSES ONLY.



RSC

MATERIAL:

CLEVIS ASTM A-668 Class C
PIN ASME SA-36

CATALOG CODE (RSC)	ROD SIZE R (IN) ± 1/16
03	3/8
04	1/2
05	5/8
06	3/4
07	7/8
08	1
09	1 1/8
10	1 1/4
12	1 1/2
14	1 3/4
16	2
18	2 1/4
20	2 1/2
22	2 3/4
24	3
26	3 1/4
28	3 1/2
30	3 3/4
32	4

NOTES:

THIS DRAWING IS FOR INSPECTION PURPOSES ONLY.

TITLE: TYPICAL INSPECTION DRAWING FORGED STEEL CLEVIS		
DRAWING NO. RSC	REV. 0	SHT 1 of 1

RTB

MATERIAL :
ASTM A-668 Class C

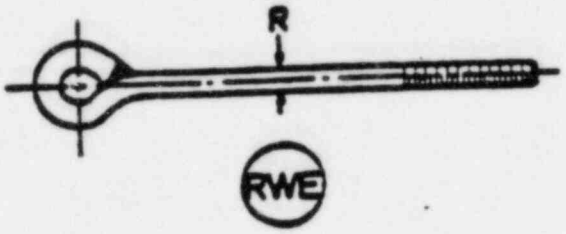
CATALOG CODE (RTB)	ROD SIZE R (IN) ± 1/16
03	3/8
04	1/2
05	5/8
06	3/4
07	7/8
08	1
09	1 1/8
10	1 1/4
12	1 1/2
14	1 3/4
16	2
18	2 1/4
20	2 1/2

NOTES :

THIS DRAWING IS FOR INSPECTION PURPOSES ONLY.

TITLE: TYPICAL INSPECTION DRAWING TURNBUCKLE			
DRAWING NO. RTB		REV. 0	SHT 1 of 1

MATERIAL :
ASME SA-36

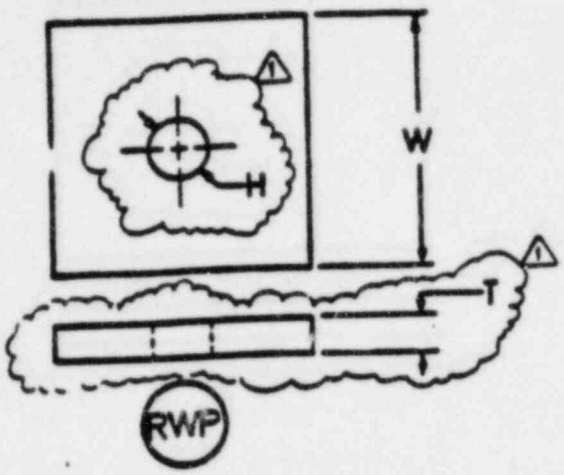


CATALOG CODE (RWE)	ROD SIZE R (IN) ± 1/16
03	3/8
04	1/2
05	5/8
06	3/4
07	7/8
08	1
09	1 1/8
10	1 1/4
12	1 1/2
14	1 3/4
16	2
18	2 1/4
20	2 1/2

NOTES :

THIS DRAWING IS FOR INSPECTION PURPOSES ONLY

TITLE: TYPICAL INSPECTION DRAWING WELDED EYE ROD			
DRAWING NO. RWE		REV. 0	SHT 1 of 1



MATERIAL :

ASME SA-36

CATALOG CODE (W/P)	WIDTH W (IN) ± 1/4"	THICKNESS T (IN) *	HOLE DIAMETER H (IN) **
03	3	1/4	7/16
04	3	1/4	9/16
05	3	3/8	N/A
06	4	3/8	N/A
07	4	1/2	15/16
08	4	1/2	1 1/16
09	4	1/2	1 1/4
10	5	1/2	N/A
12	5	3/4	1 5/8
14	5	3/4	1 7/8
16	5	3/4	2 1/8
18	6	3/4	2 3/8
20	6	3/4	2 3/4
22	6	3/4	3
24	6	3/4	3 1/4
26	7	3/4	3 1/2
28	7	3/4	3 3/4
30		3/4	4

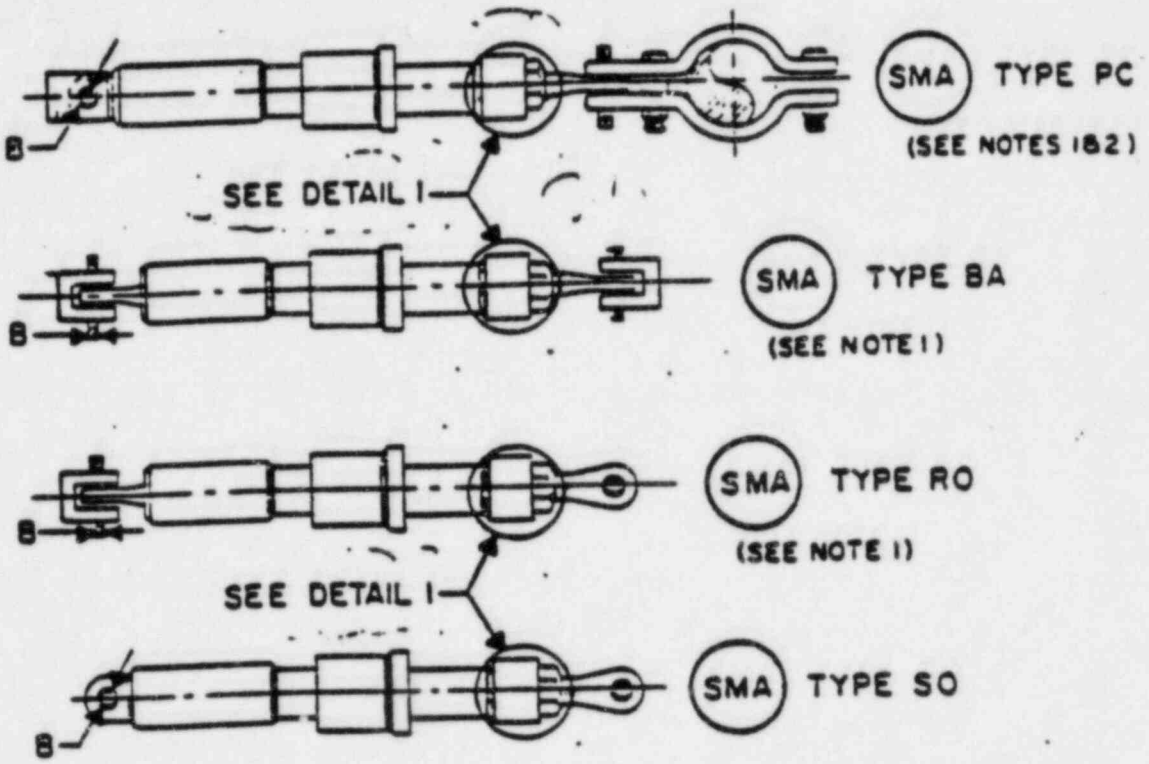
* See Note 1
** See Note 2 and 3

NOTES :

1) ± 1/32" for sizes 03-09; ± 1/16" for sizes 10-30.
2) ± 1/32" for sizes 03-08; ± 1/16" for sizes 09-30.
3) When hole diameter is not specified, it need not be checked.

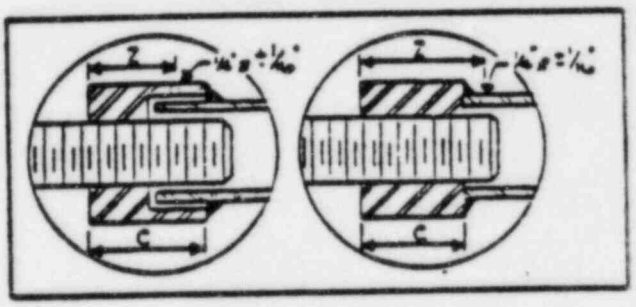
THIS DRAWING IS FOR INSPECTION PURPOSES ONLY.

TITLE: TYPICAL INSPECTION DRAWING WASHER PLATE			
DRAWING NO. W/P		REV. 1	SHT 1 of 1



CATALOG CODE	B(In.) ± 1/16
SMA - 1/4	3/8
SMA - 1/2	3/8
SMA - 1	1/2
SMA - 3	3/4
SMA - 10	1
SMA - 35	1¼
SMA - 100	*2¼-3

*2¼" DIAMETER PIN ON SHOCK ARRESTOR END
3" DIAMETER ON TRANSITION KIT END.



DETAIL 1
(FOR DIMENSIONS SEE SHEET 2 of 3.)

NOTES:

1) FOR REAR BRACKETS, SEE BRH-XRB
2) FOR PIPE CLAMPS, SEE BRH-SPC.
3) SNUBBERS MAY BE INSTALLED 180° (end to end) FROM THE CONFIGURATION SHOWN ON THE DESIGN DRAWING

TITLE: Typical Inspection Drawing Adjustable Length Snubber			
DRAWING NO. SMA		REV. 1	SHT. 1 of 3

	SOCKET TYPE COUPLING		SOLID TYPE COUPLING	
CATALOG CODE	Z(IN)±1/8	C(IN)±1/8	Z(IN)±1/8	C(IN)±1/8
SMA-1/4,1/2	1	1 1/4	1 1/4	13/16
SMA-1	1 1/4	1 1/2	1 1/2	1 1/16
SMA-3	1 1/2	1 3/4	1 3/4	1 5/16
SMA-10	2	2 3/8	2 5/16	1 13/16
SMA-35	3 1/4	3 7/8	3 11/16	3 1/16
SMA-100	4 3/4	5 1/2	5 7/16	4 9/16

4) TRANSITION KIT FIT-UP SHALL CONFORM TO a) THROUGH c).
   a. Transition kits with socket couplings shall be fit up with a pull back of 1/16" prior to welding.
   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. Couplings (solid/socket) must be square relative to the extension pipe.

5) 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.

6) REFER TO THE TABLE BELOW FOR THE FOLLOWING INSPECTION ATTRIBUTES (as applicable):
   a. Weld size for solid end coupling nut.
   b. Transition kit minimum thread engagement.
   c. Transition kit piping size.
   d. Torque requirements for transition kit mounting bolts, and
   e. Torque requirements for the eye rod jam nut.

(see next page)

This drawing is for inspection purposes only.

TITLE: Typical Inspection Drawing Adjustable Length Snubber			
DRAWING NO. SMA		REV. 1	SHT 2 of 3

	SNUBBER SIZE						
	1/4	1/2	1	3	10	35	100
a) WELD SIZE, SOLID CPLG.	3/16"	3/16"	3/16"	3/16"	1/4"	3/8"	5/8"
b) TRANS. KIT MIN. THREAD ENGAGEMENT	3/16"	3/16"	5/16"	5/16"	9/16"	N/A	N/A
c) TRANS. KIT PIPE SIZE AND MIN. SCHEDULE	1" 40	1" 40	1¼" 40	1½" 40	2" 80	4" 80	6" 120
d) MIN TORQUE FOR TRANS. KIT MOUNTING BOLTS (in/lbs)	22	22	45	120	440	N/A	N/A
e) MIN. TORQUE FOR EYE ROD JAM NUT (ft-lbs.)	40	40	40	80	100	150	220

7) TO CHECK RELATIVE ANGLE ADJUSTMENT, PERFORM THE FOLLOWING:

1. SNUBBER SIZES 1/4 THRU 10:
   - aa) Attachments removed from snubber.
   - bb) Snubber in vertical position, setting on snubber housing.
   - cc) Remove retaining ring.
   - dd) Turn end cap by hand (not more than 360 degrees).
   - ee) Replace retaining ring.
   - ff) Fully stroke snubber to determine that the repositioning has not damaged internals.

2. SNUBBER SIZES 35 and 100:
   - aa) Remove indicator tube mounting screws and extend snubber sufficiently to expose the telescoping tube.
   - bb) Restrain telescoping tube and loosen left hand threaded ring nut.
   - cc) End cap rotated to desired position (not more than one complete turn from bottomed out position).
   - dd) Retorque ring nut to 150 ± 20 ft. lbs.
   - ee) Indicator tube and mounting screws replaced.

8) IN ORDER TO VERIFY THE ACCEPTABILITY OF THE STRAIGHTNESS OF THE SIZE 35 SNUBBER TRANSITION KIT TUBE TO SNUBBER CONNECTION, THE FOLLOWING INSPECTION CAN BE PERFORMED.

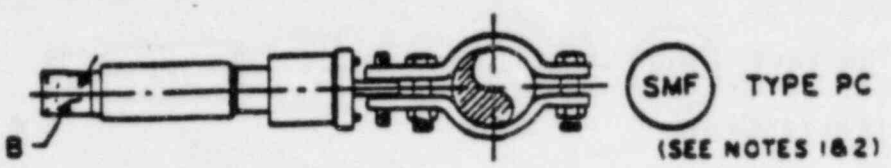
1. SCREW THE TRANSITION KIT INTO A MATING TAPPED HOLE (A SNUBBER CAN BE USED IF NECESSARY).
2. WITH THE THREADS ALMOST FULLY INSERTED, ROTATE THE TRANSITION KIT ONE FULL TURN AND MEASURE THE RADIAL ECCENTRICITY AT A POINT FOUR FEET FROM THE END OF THE SNUBBER UNIT. THE TOTAL ECCENTRICITY SHOULD NOT EXCEED 3/8" (i.e. a variation of ±3/16" from the centerline).
3. AN ECCENTRICITY LESS THAN OR EQUAL TO 3/8" WILL CORRESPOND TO AN ASSEMBLED UNIT WITHIN THE SECTION III APPENDIX K TOLERANCE FOR DEVIATION FROM STRAIGHTNESS.

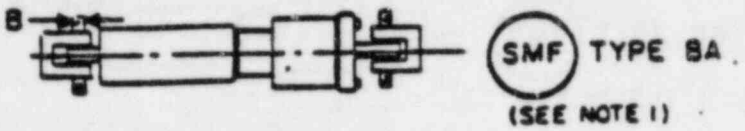
IT IS NOT NECESSARY FOR THE SHOULDER ON THE THREADED END OF THE TRANSITION KIT TO DRAW UP FLUSH TO THE SNUBBER; THEREFORE, IT IS NOT NECESSARY TO CHECK ITS ALIGNMENT WITH THE THREADS.

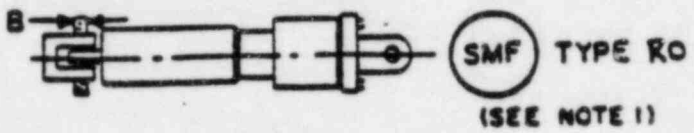
NOTES:

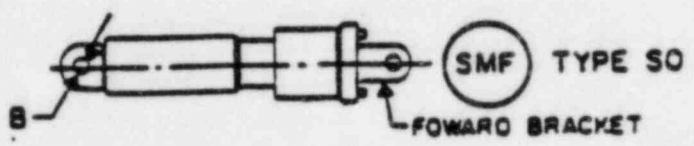
TITLE: Typical Inspection Drawing ADJUSTABLE LENGTH SNUBBER			
DRAWING NO. SMA		REV. 1	SHT. 3 of 3

This drawing is for inspection purposes only.



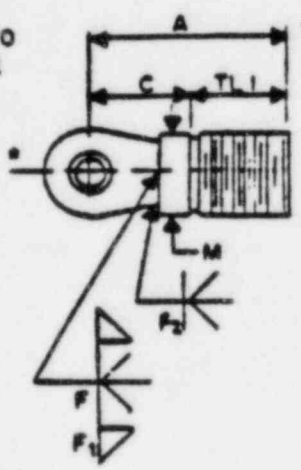






CATALOG CODE	B(In.) ± 1/16
SMF-1/4	3/8
SMF-1/2	3/8
SMF-1	1/2
SMF-3	3/4
SMF-10	1
SMF-35	1½
SMF-100	**2½"-3

* THIS DETAIL APPLIES ONLY TO SMF SIZES 35 AND 100. FOR INFORMATION SEE NOTE 4 (Sheet 2 of 3).



**2½" on shock arrestor end; 3" on forward bracket end.

NOTES:

1.) FOR REAR BRACKETS SEE BRH-XRB
2.) FOR PIPE CLAMPS, SEE BRH-SPC
3.) SNUBBERS MAY BE INSTALLED 180° (end to end) FROM THE CONFIGURATION SHOWN ON THE DESIGN DRAWING.

This drawing is for inspection purposes only.

TITLE: Typical Inspection Drawing Fixed Length Snubber		
DRAWING NO. SMF	REV. 0	SHT 1 of 3

4.)

SIZE	A (IN) MIN(±1/16)	A (IN) MAX(±1/16)	C (IN) MIN.	C (IN) MAX.	TL** (IN)
35	4 1/4	22 15/16	3 1/8	21 13/16	1 1/8 ± 1/16
100	7 3/8	31 7/16	5 3/4	29 11/16	1 5/8 ± 1/16

**REQUIRED THREAD ENGAGEMENT FOR FORWARD BRACKET.

SNUB SIZES	M, MIN (IN)	F (IN)	F1 (IN)	F2 (IN)
35,35L,35XL	2 7/8	3/8	3/8	3/16
	3 1/2	3/8	3/8	0
100,100L,100XL	3 5/8	15/16	1 7/8	5/16
	4 1/2	3/4	3/4	0

5.) IN THOSE CASES WHERE THE FORWARD BRACKET IS MODIFIED TO OBTAIN THE PROPER C-C DIMENSION, THE WELD SIZE AND LENGTH FOR ATTACHING THE LUG TO THE PLATE FOR SNUBBER SIZES 1/4 THROUGH 10 IS SHOWN BELOW. WHEN THE MOUNTING PLATES DISTORT AS THE RESULT OF THIS WELDING, THEY MAY BE HYDRAULICALLY STRAIGHTENED IN A JIG (without heating) TO RESTORE THEM TO THEIR FLAT BEARING CONDITION. IN ADDITION, THE QCI WILL VERIFY THAT THE LUG, WHEN CUT, MEETS THE DIMENSIONAL REQUIREMENTS BELOW. MINIMUM THREAD ENGAGEMENTS AND TORQUE REQUIREMENTS FOR FORWARD BRACKETS ARE ALSO GIVEN BELOW:

		SNUBBER SIZE 1/4	1/2	1	3	10
WELD SIZE X LENGTH		3/16" X 3/4"	3/16" X 3/4"	3/16" X all around	1/4" X all around	5/16" X all around
FORWARD BRACKET DIMENSIONAL REQUIREMENT*	MIN:	1 1/8"	1 1/8"	1 5/8"	2"	2 5/8"
	MAX:	8 7/16"	8 7/16"	9 13/16"	11 13/16"	14 1/16"
MIN. THREAD ENG:		3/16"	3/16"	5/16"	5/16"	9/16"
MIN TORQUE (in/lbs):		22	22	45	120	440

*To be measured from the end of the plate to the center of the eyerod.

This drawing is for inspection purposes only.

TITLE: Typical Inspection Drawing Fixed Length Snubber			
DRAWING NO. SNF		REV. 0	SHT. 2 of 3

6.) IN THOSE CASES WHERE ATTACHMENT BOLTS BETWEEN FORWARD BRACKET ASSEMBLY AND SNUBBER ASSEMBLY ARE SAFETY WIRED BY THE VENDOR, QCI SHALL VERIFY THE FOLLOWING CONDITIONS EXIST:

a) BOLTS ARE TIGHT.

b) LOCKWIRE IS NOT DAMAGED.

c) LOCKWIRE IS CRIMPED.

PRIOR TO INSTALLATION, IF ANY OF THE ABOVE CONDITIONS ARE UNSATISFACTORY, THE BOLTS SHALL BE RETORQUED AND THE NEW LOCKWIRE SHALL BE INSTALLED.

This drawing is for inspection purposes only.

TITLE. TYPICAL INSPECTION DRAWING FIXED LENGTH SNUBBER			
DRAWING NO. SMF		REV. 0	SHT. 3 of 3

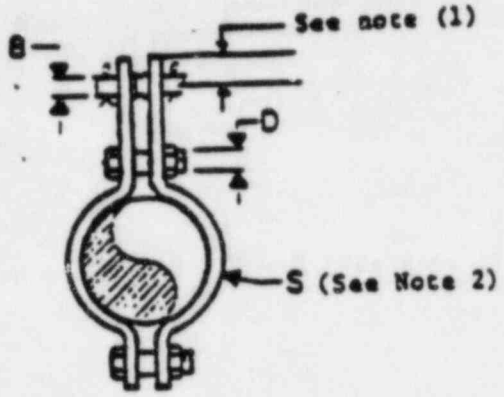
MATERIAL:

PLATE: CARBON STEEL -ASME SA-36

BOLT: CARBON STEEL -ASTM A-307; A-193 Gr.B7

NUT: CARBON STEEL -ASTM A-513 Gr.A; A-194 Gr.2H

PIN: ALLOY STEEL -ASME SA-193 Gr.B7



SPC

CATALOG CODE	NOM. PIPE SIZE (IN)	STOCK SIZE, S(IN) T ± 1/6 x W ± 1/4	BOLT D(IN) ± 1/16	PIN B(IN) ± 1/16
SPC-06-006	3/4	1/4 x2, 1/2 x2	3/4	3/8
SPC-08-006	3/4	1/4 x2, 3/8 x2, 1/2 x2	3/4	1/2
SPC-06-010	1	1/4 x2, 3/4 x2	3/4	3/8
SPC-08-010	1	1/4 x2, 3/8 x2, 3/4 x2	3/4	1/2
SPC-06-015	1½	3/8 x2	3/4	3/8
SPC-08-015	1½	3/8 x2	3/4	1/2
SPC-06-020	2	3/8 x2	3/4	3/8
SPC-08-020	2	3/8 x2	3/4	1/2
SPC-10-020	2	1/2 x2, 1 x 3	1	3/4
SPC-14-020	2	5/8 x4	1¼	1

NOTES:

(1) For snubber applications only, the clamp may be trimmed to the values noted below:

Snubber Size:	¼	½	1	3	10	35	100
Min Edge Dis.	½"	½"	3/4"	15/16"	1½"	2"	4"

(2) When multiple sizes are listed, any of them are acceptable.

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING STRUT/SNUBBER PIPE CLAMP			
DRAWING NO. SPC	REV. 2	SH. 1 of 4	

CATALOG CODE	NOM.PIPE SIZE(IN)	STOCK SIZE, S(IN) (T±1/16xW±1/4)	BOLT D(IN)±1/16	PIN B(IN)±1/16
SPC-06-025	2½	3/8 x2	3/4	3/8
SPC-08-025	2½	3/8 x2	3/4	1/2
SPC-10-025	2½	1/2 x2, 1 x 3	1	3/4
SPC-14-025	2½	5/8 x4	1¼	1
SPC-06-030	3	3/8 x2	3/4	3/8
SPC-08-030	3	1/2 x2½, 3/8x2	3/4	1/2
SPC-10-030	3	1/2 x2½	1	3/4
SPC-14-030	3	5/8 x4	1¼	1
SPC-20-030	3	3/4 x6	1¼	1¼
SPC-06-040	4	3/8 x2,	3/4	3/8
SPC-08-040	4	1/2 x2½, 3/8x2	3/4	1/2
SPC-10-040	4	5/8 x3	1¼	3/4
SPC-14-040	4	5/8 x4	1¼	1
SPC-20-040	4	3/4 x6	1¼	1¼
SPC-06-060	6	1/2 x2½	1	3/8
SPC-08-060	6	1/2 x2½	1	1/2
SPC-10-060	6	5/8 x3	1¼	3/4
SPC-14-060	6	5/8 x4	1½	1
SPC-20-060	6	1 x6	1½	1¼
SPC-06-080	8	1/2 x2½	1	3/8
SPC-08-080	8	5/8 x3, 1/2x2 1/2	1	1/2
SPC-10-080	8	5/8 x3	1¼	3/4
SPC-14-080	8	3/4 x4	1½	1
SPC-20-080	8	1 x6	1½	1¼
SPC-24-080	8	1½ x8	2½	1½
SPC-06-100	10	5/8 x3	1¼	3/8
SPC-08-100	10	5/8 x3	1¼	1/2
SPC-10-100	10	3/4 x4, 5/8 x3	1¼	3/4
SPC-14-100	10	3/4 x4, 3/4 x6	1½	1
SPC-20-100	10	1 x6	1½	1¼
SPC-24-100	10	1½ x8	2½	1½
SPC-06-120	12	5/8 x3	1¼	3/8
SPC-08-120	12	5/8 x3	1¼	1/2
SPC-10-120	12	3/4 x4	1½	3/4
SPC-14-120	12	3/4 x6	1 3/4	1
SPC-20-120	12	1 x8	1½	1¼
SPC-24-120	12	1½ x8	2½	1½
SPC-36-120	12	1½ x12	2	3
SPC-06-140	14	5/8 x3	1¼	3/8
SPC-08-140	14	5/8 x3	1¼	1/2
SPC-10-140	14	3/4 x4	1½	3/4
SPC-14-140	14	3/4 x6	1 3/4	1

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING STRUT/SNUBBER PIPE CLAMP			
DRAWING NO. SPC		REV. 2	SHT 2 of 4

CATALOG CODE	NOM. PIPE SIZE(IN)	STOCK SIZE, S(IN) (T±1/16xW±1/4)	BOLT D(IN)±1/16	PIN B(IN)±1/16
SPC-20-140	14	1 x8	1½	1½
SPC-24-140	14	1½ x8	2½	1½
SPC-36-140	14	1½ x12	2	3
SPC-06-160	16	5/8 x3	1½	3/8
SPC-08-160	16	5/8 x3	1½	1/2
SPC-10-160	16	3/4 x4	1½	3/4
SPC-14-160	16	3/4 x6	1 3/4	1
SPC-20-160	16	1 x8	1½	1½
SPC-24-160	16	1½ x8	2½	1½
SPC-36-160	16	1½ x12	2	3
SPC-06-180	18	5/8 x3	1½	3/8
SPC-08-180	18	5/8 x3	1½	1/2
SPC-10-180	18	3/4 x4	1½	3/4
SPC-14-180	18	3/4 x6	1 3/4	1
SPC-20-180	18	1½ x7,1 1/4x8	1 3/4	1½
SPC-24-180	18	1½ x8	2½	1½
SPC-36-180	18	2 x10,1 1/2x12	2	3
SPC-06-200	20	3/4 x4	1½	3/8
SPC-08-200	20	3/4 x4	1½	1/2
SPC-10-200	20	3/4 x6	1½	3/4
SPC-14-200	20	1 x6	2	1
SPC-20-200	20	1½ x7,1 1/4x8	1 3/4	1½
SPC-24-200	20	1½ x8	2½	1½
SPC-36-200	20	2 x10,1 1/2x12	2	3
SPC-06-220	22	3/4 x4	1½	3/8
SPC-08-220	22	3/4 x4	1½	1/2
SPC-10-220	22	3/4 x6	1½	3/4
SPC-14-220	22	1 x6	2	1
SPC-20-220	22	1½ x7,1 1/4x8	1 3/4	1½
SPC-24-220	22	1½ x8	2½	1½
SPC-36-220	22	2 x10,1 1/2x12	2	3
SPC-06-240	24	3/4 x4	1½	3/8
SPC-08-240	24	3/4 x4	1½	1/2
SPC-10-240	24	3/4 x6	1½	3/4
SPC-14-240	24	1 x6	2	1
SPC-20-240	24	1½ x7,1 1/4x8	1 3/4	1½
SPC-24-240	24	1½ x8	3	1½
SPC-36-240	24	2 x10,1 1/2x12	2	3
SPC-06-260	26	3/4 x4	1½	3/8
SPC-08-260	26	3/4 x6	1½	1/2
SPC-10-260	26	3/4 x6	1½	3/4
SPC-14-260	26	1 x6	2	1

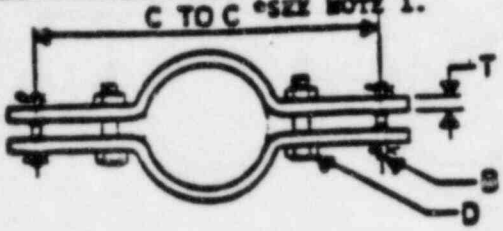
This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING STRUT/SNUBBER PIPE CLAMP			
DRAWING NO. SPC	REV. 2	Sht 3 of 4	

CATALOG CODE	NOM. PIPE SIZE (IN)	STOCK SIZE, S(IN) (T±1/16 x W±1/4)	D(IN) ± 1/16	B(IN) ± 1/16
SPC-20-260	26	1½ x8	2	1¼
SPC-24-260	26	1½ x10	3	1½
SPC-36-260	26	2 x12 ,1 1/2x12	2	3
SPC-06-280	28	3/4 x4	1½	3/8
SPC-08-280	28	3/4 x6	1½	1/2
SPC-10-280	28	1 x6	2	3/4
SPC-14-280	28	1 x6	2	1
SPC-20-280	28	1½ x8	2	1¼
SPC-24-280	28	1½ x10	3	1½
SPC-36-280	28	2 x12 ,1 1/2x12	2	3
SPC-06-300	30	3/4 x4	1½	3/8
SPC-08-300	30	3/4 x6	1½	1/2
SPC-10-300	30	1 x6	2	3/4
SPC-14-300	30	1 x6	2	1
SPC-20-300	30	1½ x8	2	1¼
SPC-24-300	30	1½ x10	3	1½
SPC-36-300	30	2 x12 ,1 1/2x12	2	3
SPC-06-320	32	3/4 x4	1½	3/8
SPC-08-320	32	3/4 x6	1½	1/2
SPC-10-320	32	1 x6	2	3/4
SPC-14-320	32	1 x6	2	1
SPC-20-320	32	1½ x8	2	1¼
SPC-24-320	32	1½ x10	3	1½
SPC-36-320	32	2 x12 ,1 1/2x12	2	3
SPC-06-340	34	3/4 x4	1½	3/8
SPC-08-340	34	3/4 x6	1½	1/2
SPC-10-340	34	1 x6	2	3/4
SPC-14-340	34	1 x6	2	1
SPC-20-340	34	1½ x8	2	1¼
SPC-24-340	34	1½ x10	3	1½
SPC-36-340	34	2 x12 ,1 1/2x12	2	3
SPC-06-360	36	3/4 x4	1½	3/8
SPC-08-360	36	3/4 x6	1½	1/2
SPC-10-360	36	1 x6	2	3/4
SPC-14-360	36	1 x6	2	1
SPC-20-360	36	1½ x8	2	1¼
SPC-24-360	36	1½ x10	3	1½
SPC-36-360	36	2 x12 ,1 1/2x12	2	3

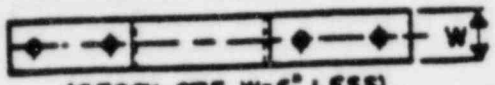
This drawing is for inspection purposes only.

TITLE:	TYPICAL INSPECTION DRAWING STRUT/SNUBBER PIPE CLAMP		
DRAWING NO.	SPC	REV. 2	SHT 4 of 4

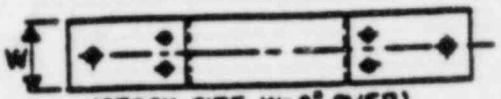


MATERIAL:

PLATE	ASME	SA-36	
BOLT	ASTM	A-307	
NUT	ASTM	A-563	GRADE A
PIN	ASME	SA-193	GRADE B7



(STOCK SIZE W=6" LESS)



(STOCK SIZE W=6" OVER)

SRC

CATALOG CODE	NOM. PIPE SIZE (IN)	THICKNESS T(IN)±1/16	WIDTH W(IN)±1/16	BOLT D(IN)±1/16	PIN B(IN)±1/16
SRC-06-006	3/4	3/8	4	1/2	3/8
SRC-08-006	3/4	3/8	4	1/2	1/2
SRC-06-010	1	3/8	4	1/2	3/8
SRC-08-010	1	3/8	4	1/2	1/2
SRC-06-012	1¼	3/8	4	1/2	3/8
SRC-08-012	1¼	3/8	4	1/2	1/2
SRC-06-015	1½	3/8	4	1/2	3/8
SRC-08-015	1½	3/8	4	1/2	1/2
SRC-06-020	2	3/8	4	3/4	3/8
SRC-08-020	2	3/8	4	3/4	1/2
SRC-10-020	2	1/2	6	3/4	3/4
SRC-14-020	2	1/2	6	3/4	1
SRC-06-025	2½	5/8	4	3/4	3/8
SRC-08-025	2½	5/8	4	3/4	1/2
SRC-10-025	2½	5/8	6	3/4	3/4
SRC-14-025	2½	5/8	6	3/4	1
SRC-06-030	3	5/8	4	3/4	3/8
SRC-08-030	3	5/8	4	1	1/2
SRC-10-030	3	5/8	6	1	3/4
SRC-14-030	3	5/8	6	1	1
SRC-20-030	3	3/4	6	1	1¼
SRC-06-035	3½	5/8	4	3/4	3/8
SRC-08-035	3½	5/8	4	3/4	1/2
SRC-10-035	3½	5/8	6	1	3/4
SRC-14-035	3½	5/8	6	1	1
SRC-20-035	3½	3/4	6	1	1¼

NOTE:

This drawing is for inspection purposes only.

TITLE:	TYPICAL INSPECTION DRAWING STRUT/SNUBBER RISER CLAMP		
DRAWING NO.	SRC	REV. 0	SHT 1 of 1

CATALOG CODE	NOM. PIPE SIZE (IN)	THICKNESS T(IN) ±1/16	WIDTH W(IN) ±1/16	BOLT D(IN) ±1/16	PIN B(IN) ±1/16
SRC-06-040	4	3/4	6	1	3/8
SRC-08-040	4	3/4	6	1	1/2
SRC-10-040	4	1	6	1	3/4
SRC-14-040	4	1	6	1	1
SRC-20-040	4	1	6	1	1¼
SRC-06-050	5	1	6	1	3/8
SRC-08-050	5	1	6	1	1/2
SRC-10-050	5	1	6	1	3/4
SRC-14-050	5	1	8	1¼	1
SRC-20-050	5	1	8	1¼	1¼
SRC-06-060	6	1	6	1	3/8
SRC-08-060	6	1	6	1	1/2
SRC-10-060	6	1	8	1¼	3/4
SRC-14-060	6	1	8	1¼	1
SRC-20-060	6	1	8	1¼	1¼
SRC-06-080	8	1	8	1¼	3/8
SRC-08-080	8	1	8	1¼	1/2
SRC-10-080	8	1	8	1¼	3/4
SRC-14-080	8	1½	10	1 3/4	1
SRC-20-080	8	2	12	2¼	1¼
SRC-24-080	8	2	12	2¼	1½
SRC-06-100	10	1	8	1¼	3/8
SRC-08-100	10	1	8	1¼	1/2
SRC-10-100	10	1	8	1¼	3/4
SRC-14-100	10	1½	10	1 3/4	1
SRC-20-100	10	2	12	2¼	1¼
SRC-24-100	10	2	12	2¼	1½
SRC-06-120	12	1	8	1¼	3/8
SRC-08-120	12	1	8	1¼	1/2
SRC-10-120	12	1	8	1¼	3/4
SRC-14-120	12	1½	10	1 3/4	1
SRC-20-120	12	2	12	2¼	1¼
SRC-24-120	12	2	12	2¼	1½
SRC-16-120	12	2	12	2¼	3
SRC-06-140	14	1	8	1¼	3/8
SRC-08-140	14	1	8	1¼	1/2
SRC-10-140	14	1	8	1¼	3/4
SRC-14-140	14	1½	10	1 3/4	1
SRC-20-140	14	2	12	2¼	1¼
SRC-24-140	14	2	12	2¼	1½
SRC-16-140	14	2	12	2¼	3

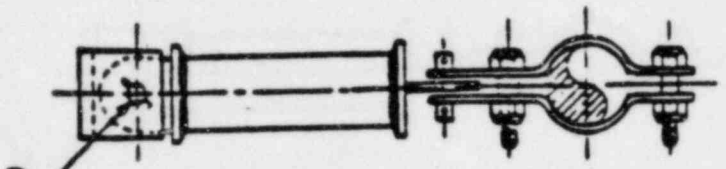
THIS DRAWING IS FOR INSPECTION PURPOSES ONLY.

TITLE: TYPICAL INSPECTION DRAWING STRUT/SNUBBER RISER CLAMP			
DRAWING NO. SRC		REV. 0	SHT 2 of 3

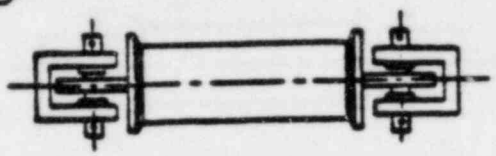
CATALOG CODE	NOM. PIPE SIZE (IN)	THICKNESS T(IN)±1/16	WIDTH W(IN)±1/16	BOLT D(IN)±1/16	PIN B(IN)±1/16
SRC-06-160	16	1	8	1¼	3/8
SRC-08-160	16	1	8	1¼	1/2
SRC-10-160	16	1	8	1¼	3/4
SRC-14-160	16	1½	10	1 3/4	1
SRC-20-160	16	2	12	2¼	1¼
SRC-24-160	16	2	12	2¼	1½
SRC-36-160	16	2	12	2¼	3
SRC-06-180	18	1	8	1¼	3/8
SRC-08-180	18	1	8	1¼	1/2
SRC-10-180	18	1	8	1¼	3/4
SRC-14-180	18	1½	10	1 3/4	1
SRC-20-180	18	2	12	2¼	1¼
SRC-24-180	18	2	12	2¼	1½
SRC-36-180	18	2	12	2¼	3
SRC-06-200	20	1	8	1¼	3/8
SRC-08-200	20	1	8	1¼	1/2
SRC-10-200	20	1	8	1¼	3/4
SRC-14-200	20	1½	10	1 3/4	1
SRC-20-200	20	2	12	2¼	1¼
SRC-24-200	20	2	12	2¼	1½
SRC-36-200	20	2	12	2¼	3
SRC-06-220	22	1	8	1¼	3/8
SRC-08-220	22	1	8	1¼	1/2
SRC-10-220	22	1	8	1¼	3/4
SRC-14-220	22	1½	10	1 3/4	1
SRC-20-220	22	2	12	2¼	1¼
SRC-24-220	22	2	12	2¼	1½
SRC-36-220	22	2	12	2¼	3
SRC-06-240	24	1	8	1¼	3/8
SRC-08-240	24	1	8	1¼	1/2
SRC-10-240	24	1	8	1¼	3/4
SRC-14-240	24	1½	10	1 3/4	1
SRC-20-240	24	2	12	2¼	1¼
SRC-24-240	24	2	12	2¼	1½

This drawing is for inspection purposes only.

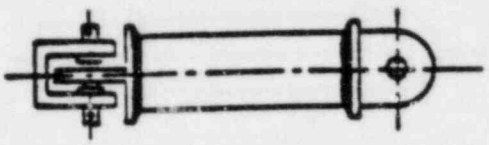
TITLE: TYPICAL INSPECTION DRAWING STRUT/SNUBBER RISER CLAMP			
DRAWING NO. SRC		REV. 0	SHT 3 of 3



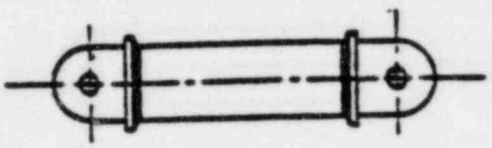
SRF Type PC (See Notes 1, 2)



SRF Type BA (See Note 1)



SRF Type RO (See Note 1)



SRF Type SO

CATALOG CODE	B(IN)±1/16
SRF-06	3/8
SRF-08	1/2
SRF-10	3/4
SRF-14	1
SRF-20	1 1/4
SRF-24	1 1/2
SRF-36	3

NOTES:

1.) For rear brackets, see BRH-XRB.
2.) For pipe clamps, see BRH-SPC.
3.) Sway struts may be installed 180° (end to end) from the configuration on the design drawing.

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING FIXED LENGTH SWAY STRUT			
DRAWING NO. SRF		REV. 1	SHT 1 of 2

1.) All socket welded couplings require a minimum of 1/16" pull back of the extension piece for proper fit-up.

2.) Solid type couplings on struts and end plates on fixed struts shall not exceed 1/16" misalignment from the pipe (barrel) centerline.

3.) The coupling (solid/socket) shall be square relative to the barrel.

4.) For modified struts, barrel size and minimum weld sizes are shown below.

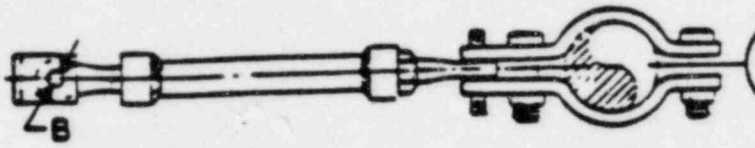
STRUT SIZE	NOMINAL PIPE SIZE FOR BARREL	MINIMUM WELD SIZE*(IN)
06	1" Sch. 40	3/16
08	1 1/4" Sch. 40	3/16
10	1 1/2" Sch. 40	3/16
14	2" Sch. 80	1/4
20	3" Sch. 80	5/16
24	4" Sch. 80	3/8
36	6" Sch. 120	3/8

*Need not be larger than the thickness of the collar.

5.) If spacers are installed, the following notes are applicable:
   (a) Spacers shall be selected to approximately center the eyerod in the bracket/clamp.
   (b) Spacer outside diameter shall not exceed spherical bearing housing outside diameter.
   (c) If the eyerod is installed in a horizontal position and the resulting gap is just enough to install one spacer. The spacer shall be installed on the bottom side.
   (d) Due to configuration of bracket/clamp, the resulting gap may not accomodate a spacer. Omitting of the spacer is permissible.

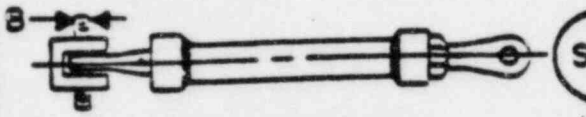
This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING FIXED LENGTH SWAY STRUT			
DRAWING NO. SRF	REV. 1	SHT. 2 of 2	

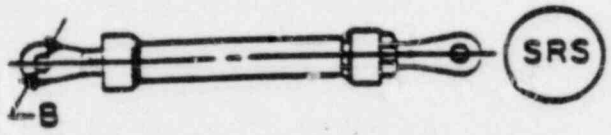


SRS TYPE PC
(SEE NOTES 1&2)

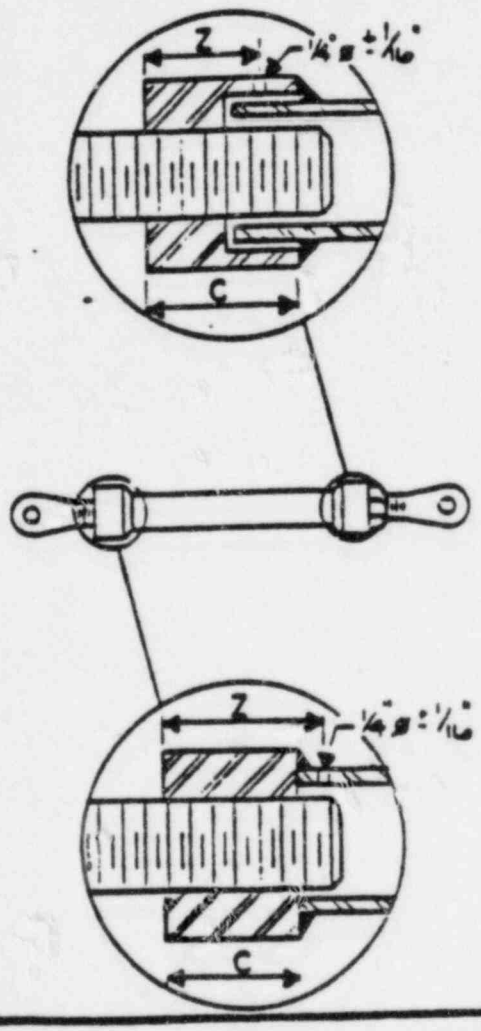
SRS TYPE BA
(SEE NOTE 1)



SRS TYPE RO
(SEE NOTE 1)



SRS TYPE SO



For information see sheet 2 of 2.

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING ADJUSTABLE SWAY STRUT			
DRAWING NO. SRS	REV. 2	SHT. 1 of 2	

SOCKET TYPE COUPLING				SOLID TYPE COUPLING			
CATALOG CODE	B(IN)±1/16	Z(IN)±1/8	C(IN)±1/8	CATALOG CODE	B(IN)±1/16	Z(IN)±1/8	C(IN)±1/8
SRS-06	3/8	1	1 1/4	SRS-06	3/8	1 1/4	13/16
SRS-08	1/2	1 1/4	1 1/2	SRS-08	1/2	1 1/2	1 1/16
SRS-10	3/4	1 1/2	1 3/4	SRS-10	3/4	1 3/4	1 5/16
SRS-14	1	2	2 3/8	SRS-14	1	2 5/16	1 13/16
SRS-20	1 1/4	2 3/4	3 1/4	SRS-20	1 1/4	3 1/8	2 9/16
SRS-24	1 1/2	3 1/4	3 7/8	SRS-24	1 1/2	3 11/16	3 1/16
SRS-36	3	4 3/4	5 1/2	SRS-36	3	5 7/16	4 9/16

NOTES:

1.) For rear brackets, see SRS-ER3
2.) For pipe clamps, see SRS-SPC
3.) Sway struts may be installed 180° (end to end) from the configuration shown on the design drawing.
4.) All socket welded couplings require a minimum of 1/16" pull back of the extension piece for proper fit-up.
5.) Solid type couplings on struts and end plates on fixed struts shall not exceed 1/16" misalignment from the pipe (barrel) centerline.
6.) The coupling (solid/socket) shall be square relative to the barrel.
7.) For modified struts, barrel size and minimum weld size are shown below.

STRUT SIZE	NOMINAL PIPE SIZE FOR BARREL	MINIMUM WELD SIZE*(IN)
06	1" Sch. 40	3/16
08	1¼" Sch. 40	3/16
10	1½" Sch. 40	3/16
14	2" Sch. 80	1/4
20	3" Sch. 80	5/16
24	4" Sch. 80	3/8
36	6" Sch. 120	3/8

*Need not be larger than the thickness of the collar.

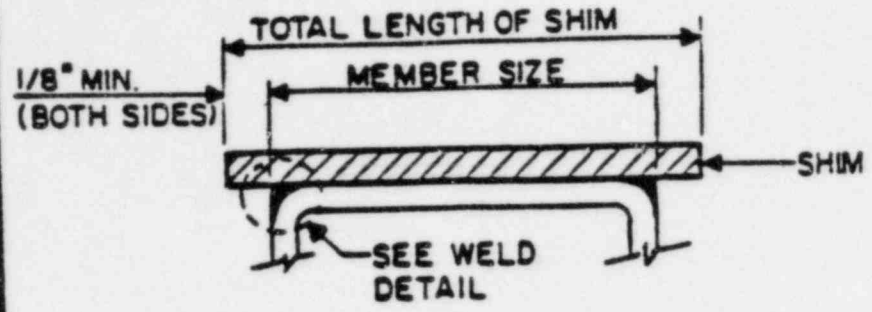
8.) If spacers are installed, the following notes are applicable"
   (a) Spacers shall be selected to approximately center the eyerod in the bracket/clamp.
   (b) Spacer outside diameter shall not exceed spherical bearing housing outside diameter.
   (c) If the eyerod is installed in a horizontal position and the resulting gap to just enough to install one spacer, the spacer shall be installed on the bottom side.
   (d) Due to configuration of bracket/clamp the resulting gap may not accomodate a spacer. Omitting of the spacer is permissible.

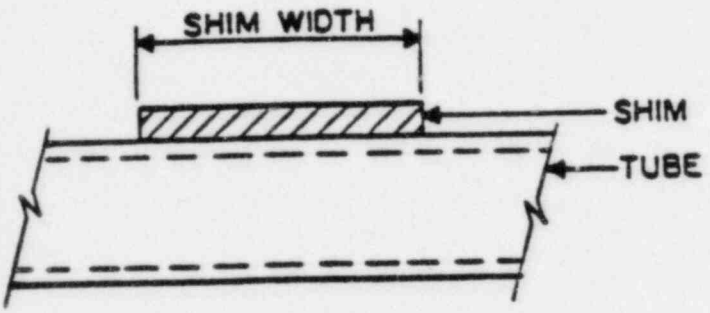
9.) For salvaged socket or solid type coupling, the "C" dimension shall be at least equal to the height of a standard size nut.

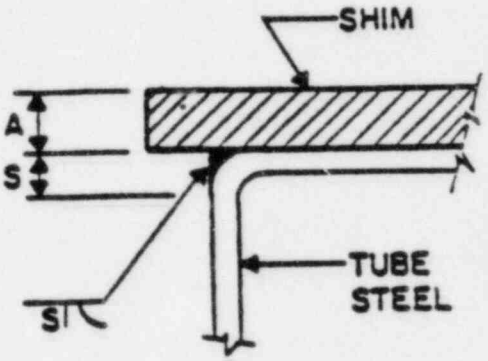
This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING ADJUSTABLE SWAY STRUT			
DRAWING NO. SRS		REV. 2	SHT. 2 of 2

MATERIAL: SA-36; A-36;
SA-515GR55, 60, 65;
A-515GR55, 60, 65;
A-570







WELD DETAIL

SINGLE SHIM ON TUBE STEEL

(TYPE 1)

"A" Shim THK	"S" Weld Size	Min. Weld Length (Note 3)
1/16"	1/16"	1/2"
1/8"	1/8"	1/2"
3/16"	3/16"	1"
¼" to ½" (Inclu.)	3/16"	1½"
½" to 2" (Inclu.)	3/16"	1½"

NOTES:

1) For large bore pipe, the minimum shim width is 2½".

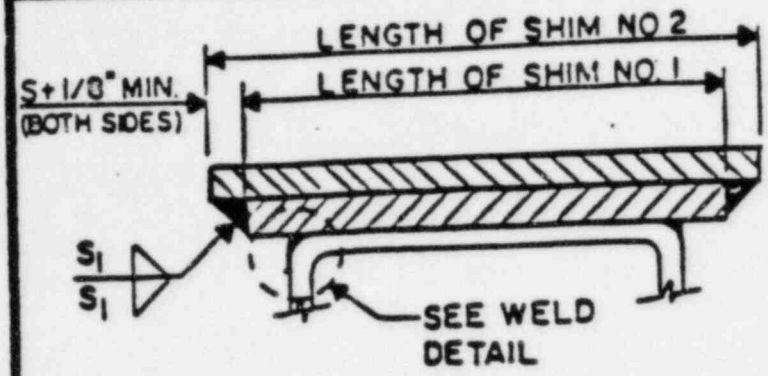
2) For small bore pipe, the shim width shall not be less than ½" unless otherwise noted on drawing.

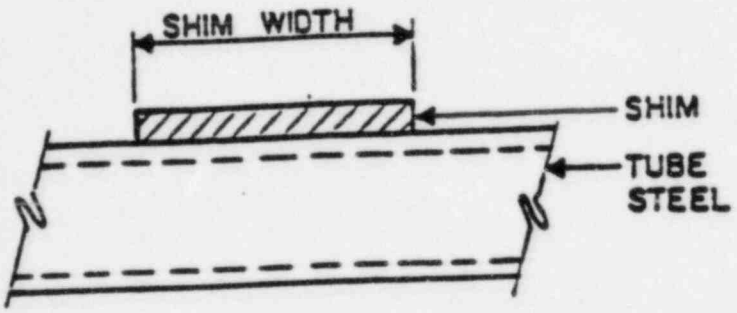
3) For small bore, the weld length is equal to the width of the shim.

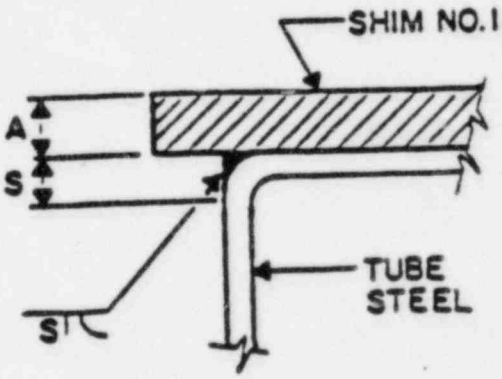
This drawing is for inspection purposes only.

TITLE: Typical Inspection Drawing Shim Details			
DRAWING NO. SHIM		REV. 1	SHT 1 of

MATERIAL: SA-36; A-36;
SA-515GR55, 60, 65;
A-570;
A-515GR55, 60, 65







WELD DETAIL

STACKED SHIMS ON TUBE STEEL
(TYPE 2)

NOTES:

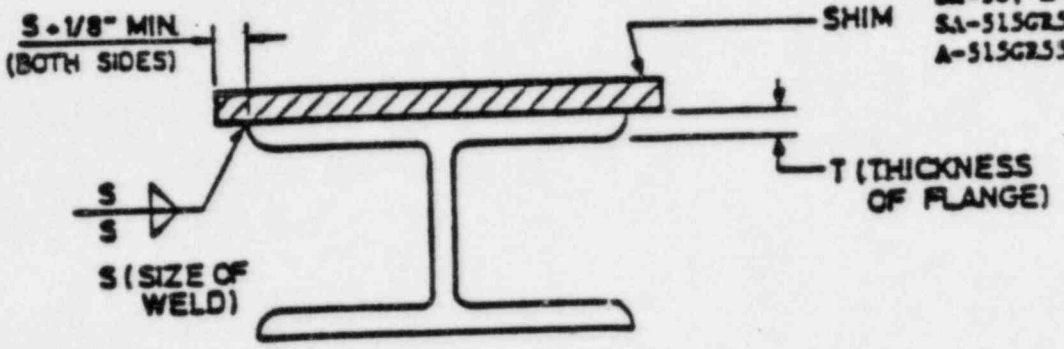
1) For large bore pipe, the minimum shim width is 2½".
2) For small bore pipe, the shim width shall not be less than ½" unless noted otherwise on the drawing.
3) For small bore, the weld length is equal to the width of shim #1.
4) When combining shims, the thicker of the two shims should be attached to the tube steel unless otherwise approved by engineering.
5) Fillet weld size is equal to the thickness of shim #2, but need not exceed 3/16". Length of fillet weld is equal to 5 times the thickness of shim #2, but need not exceed 1 5/8". For small bore, the weld length is equal to the shim width.

"A" Shim #1 THK	"S" Weld Size	Min. Weld Length (Note3)
1/16"	1/16"	½"
1/8"	1/8"	½"
3/16"	3/16"	1"
½" to ½" (Inclu.)	3/16"	1½"
½" to 2" (Inclu.)	3/16"	1½"

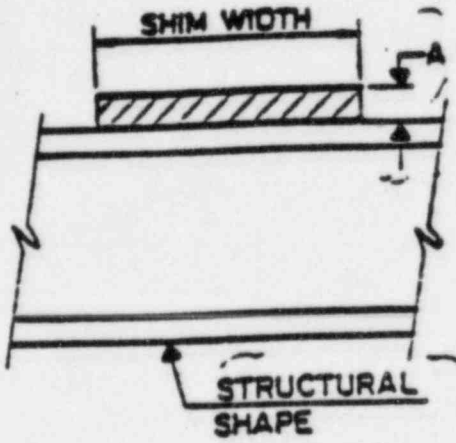
TITLE: Typical Inspection Drawing Shim Details			
DRAWING NO. SHIM		REV. 1	SHT 2 of 3

This drawing is for inspection purposes only.

MATERIAL:
SA-36; A-36; A-570;
SA-515GR55, 60, 65;
A-515GR55, 60, 65



NOTES:
1) IF SHIM OF EQUAL OR GREATER THICKNESS THAN FLANGE (T) THEN: S=T MINUS 1/16".
2) IF SHIM THICKNESS IS LESS THAN FLANGE THICKNESS THEN: S= THICKNESS OF SHIM MINUS 1/16". (EXCEPT FOR 1/8" SHIM, S=1/8" and 1/16" SHIM, S=1/16".



"A" SHIM THK(IN)	MIN. WELD LENGTH(IN)*	MIN. SHIM WIDTH(IN)*
1/16	1/2	1 1/2
1/8	1/2	1 1/2
3/16	1	2
1/4 to 1/2	1 1/4	2 1/4
1/2 to 2	1 1/2	2 1/2

* See Notes 2 and 3.

SHIM ON STRUCTURAL SHAPE OR PLATE (TYPE 3)

NOTES:

1) For large bore, the minimum shim width is 2½".

2) For small bore, the shim width shall not be less than ½" unless otherwise noted on the drawing.

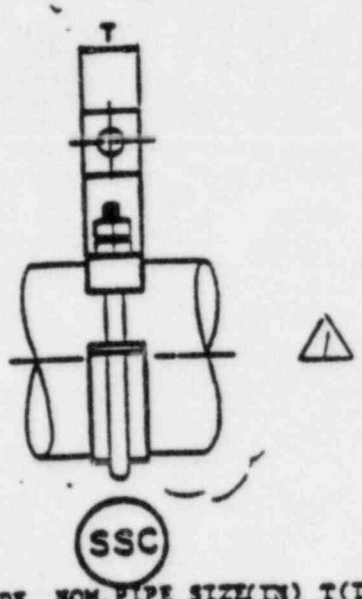
3) For small bore, the weld length is equal to the width of the shim.

TITLE:	Typical Inspection Drawing Shim Details		
DRAWING NO.	SHIM	REV. 1	SHT 3 of 3

This drawing is for inspection purposes only

MATERIAL:

Clamp Body: ASME SA-36
U-Bolt & Pin: ASME SA-193 Grade B7
Nuts: ASME SA-194 Grade 2H
Load Distribution Plate: ASME SA-36



CATALOG CODE	NOM. PIPE SIZE(IN)	T(IN)±1/16	CATALOG CODE	NOM. PIPE SIZE(IN)	T(IN)±1/16
SSC-06-025	2½	1 1/2	SSC-06-100	10	1 1/2
SSC-08-025	2½	1 3/4	SSC-06-100	10	1 3/4
SSC-06-030	3	1 1/2	SSC-10-100	10	2
SSC-08-030	3	1 3/4	SSC-14-100	10	2 1/2
SSC-06-040	4	1 1/2	SSC-20-100	10	3 1/2
SSC-08-040	4	1 3/4	SSC-06-120	10	1 1/2
SSC-10-040	4	2	SSC-08-120	12	1 3/4
SSC-06-050	5	1 1/2	SSC-10-120	12	2
SSC-08-050	5	1 3/4	SSC-14-120	12	2 1/2
SSC-10-050	5	2	SSC-20-120	12	3 1/2
SSC-14-050	5	2 1/2	SSC-24-120	12	4 1/2
SSC-06-060	6	1 1/2	SSC-06-140	14	1 1/2
SSC-08-060	6	1 3/4	SSC-08-140	14	1 3/4
SSC-10-060	6	2	SSC-10-140	14	2
SSC-14-060	6	2 1/2	SSC-14-140	14	2 1/2
SSC-06-080	8	1 1/2	SSC-20-140	14	3 1/2
SSC-08-080	8	1 3/4	SSC-24-140	14	4 1/2
SSC-10-080	8	2	SSC-10-160	16	1 1/2
SSC-14-080	8	2 1/2	SSC-08-160	16	1 3/4
SSC-20-080	8	3 1/2	SSC-10-160	16	2

NOTES:

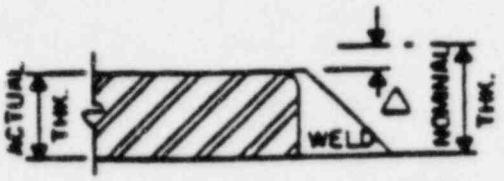
TITLE: TYPICAL INSPECTION DRAWING SUPER STIFF PIPE CLAMP			
DRAWING NO. SSC		REV. 1	SHT 1 of 1

This drawing is for inspection purposes only.

CATALOG CODE	NOM. PIPE SIZE (IN)	T(IN)±1/16
SSC-14-160	16	2 1/2
SSC-20-160	16	3 1/2
SSC-24-160	16	4 1/2
SSC-10-180	18	2
SSC-14-180	18	2 1/2
SSC-20-180	18	3 1/2
SSC-24-180	18	4 1/2
SSC-36-180	18	6
SSC-10-200	20	2
SSC-14-200	20	2 1/2
SSC-20-200	20	3 1/2
SSC-24-200	20	4 1/2
SSC-36-200	20	6
SSC-10-220	22	2
SSC-14-220	22	2 1/2
SSC-20-220	22	3 1/2
SSC-24-220	22	4 1/2
SSC-36-220	22	6
SSC-10-240	24	2
SSC-14-240	24	2 1/2
SSC-20-240	24	3 1/2
SSC-24-240	24	4 1/2
SSC-36-240	24	6
SSC-10-260	26	2
SSC-14-260	26	2 1/2
SSC-20-260	26	3 1/2
SSC-24-260	26	4 1/2
SSC-36-260	26	6
SSC-10-280	28	2
SSC-14-280	28	2 1/2
SSC-20-280	28	3 1/2
SSC-24-280	28	4 1/2
SSC-36-280	28	6
SSC-10-300	30	2
SSC-14-300	30	2 1/2
SSC-20-300	30	3 1/2
SSC-24-300	30	4 1/2
SSC-36-300	30	6
SSC-10-320	32	2
SSC-14-320	32	2 1/2
SSC-20-320	32	3 1/2
SSC-24-320	32	4 1/2
SSC-36-320	32	6
SSC-10-340	34	2
SSC-14-340	34	2 1/2
SSC-20-340	34	3 1/2
SSC-24-340	34	4 1/2
SSC-36-340	34	6
SSC-10-360	36	2
SSC-14-360	36	2 1/2
SSC-20-360	36	3 1/2
SSC-24-360	36	4 1/2
SSC-36-360	36	6

This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING SUPER STIFF PIPE CLAMP		
DRAWING NO. SSC	REV. 1	SHT 2 of 2

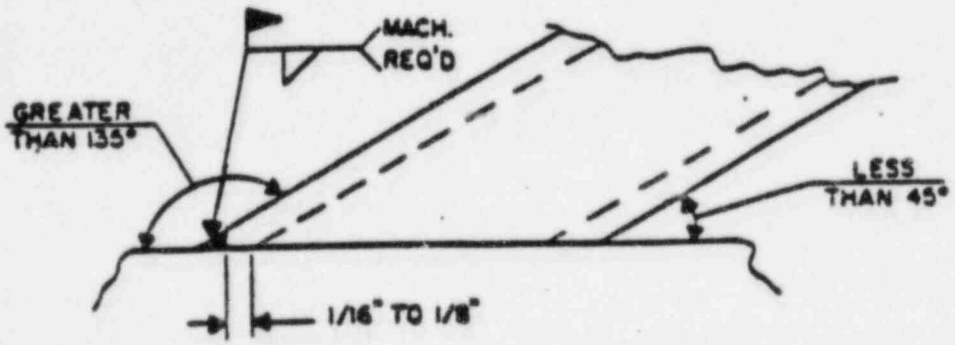


DETAIL 1

Due to manufacturing tolerances, the actual thickness of structural shapes and plates may be less than the nominal thickness. This is acceptable and the weld size need not be any greater than the actual thickness if the difference (Δ) between the actual thickness and the nominal thickness doesn't exceed the following:

Nominal Thickness	Allowable Difference (Δ)
<3/8"	1/32"
≥3/8"	1/16"

The toes of most rolled shapes are rounded. In that case, the edge is built up to ensure full throat of the weld as shown above.

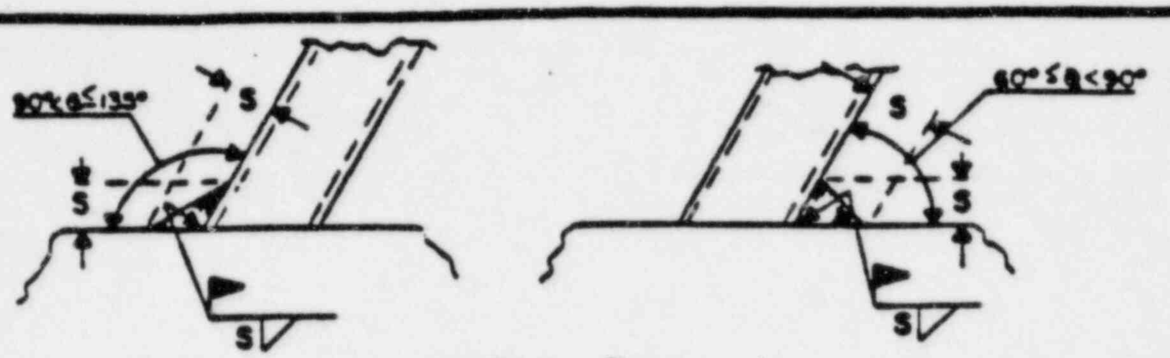


DETAIL 2

For skewed angles where $\alpha \geq 135°$, the inspector need not be concerned about the weld size unless machining is called for, in which case the weld will be a normal fillet weld with size determined by the thickness of the material and the slope. If a weld size is provided on the applicable drawing, the drawing weld size will govern.

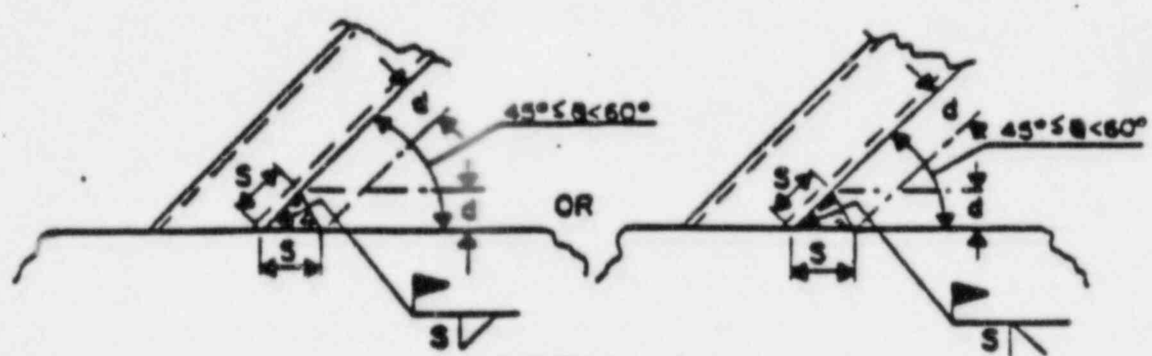
This drawing is for inspection purposes only.

TITLE: Typical Inspection Drawing, Weld Details			
DRAWING NO. WELD		REV. 1	SHT 1 of 3



DETAIL 3

3) THE INSPECTOR SHALL VERIFY THAT THE "S" DIMENSIONS SHOWN IN THE SKETCHES AGREE WITH THE WELD SIZE SHOWN ON THE APPLICABLE DRAWING, AT A MINIMUM.



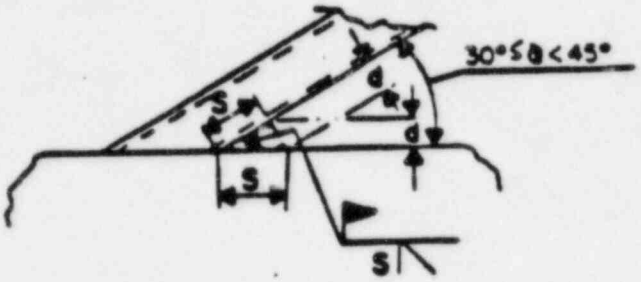
DETAIL 4

4) THIS WELD SHALL BE CONSIDERED AS A GROOVE WELD EVEN IF A FILLET WELD SYMBOL IS USED. THE "S" DIMENSION SHALL BE MEASURED AND SHALL, AT A MINIMUM, MEET THE REQUIREMENTS OF THE TABLE BELOW:

WELD SIZE (S)	3/16	1/4	5/16	3/8	7/16	1/2
[illegible]	.1807	.2163	.2879	.3216	.3758	.4730
[illegible]	.1790	.2130	.2536	.3180	.3710	.4240
57°	.1573	.2096	.2620	.3145	.3668	.4193
[illegible]	.1534	.2047	.2559	.3071	.3583	.4141
[illegible]	.1497	.1996	.2495	.2993	.3492	.3993
[illegible]	.1436	.1915	.2391	.2877	.3351	.3830
[illegible]	.1313	.1837	[illegible]	.2756	.3231	.3716
[illegible]	.1323	.1767	.2204	.2652	.3091	.3535

TITLE: Typical Inspection Drawing Weld Details		
DRAWING NO. WELD	REV. 1	SHT 2 of 3

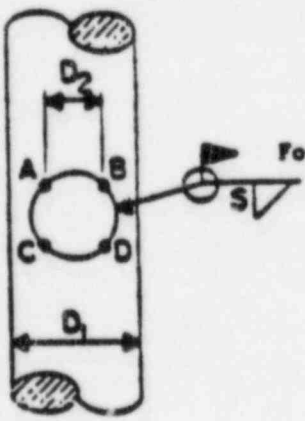
This drawing is for inspection purposes only.



DETAIL 5

The "d" dimension shall be measured and shall, at a minimum, meet the requirements of the table below:

Weld Size	Required "d" Min.
3/8	5/16
7/16	3/8
1/2	3/8
9/16	7/16
5/8	1/2
11/16	9/16
3/4	9/16

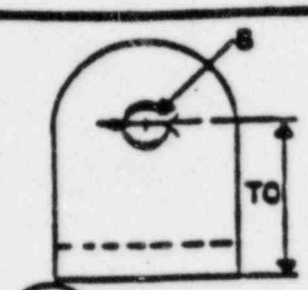


For $D_2/D_1 \geq 2/3$, only the weld between points A-B and C-D needs to measured.

DETAIL 6

This drawing is for inspuction purposes only.

TITLE: Typical Inspection Drawing Weld Details			
DRAWING NO. WELD		REV. 1	SHT 3 of 3



MATERIAL: ASME SA-266 CL.1 or SA 36

SMRB SIZES ¼,½,1,3,10

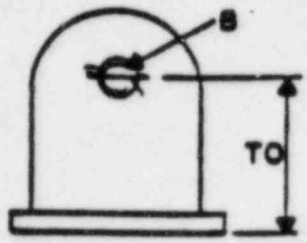
SRRB SIZES 06,08,10,14

XRB SIZES 06,08,10,14

CATALOG CODE	B(IN)±1/16	TO(IN)+5/16, -1/16
SMRB ¼,½	3/8	1½
SRRB 06	3/8	1½
XRB 06	3/8	1½
SMRB 01	1/2	2
SRRB 08	1/2	2
XRB 08	1/2	2
SMRB 03	3/4	2½
SRRB 10	3/4	2½
XRB 10	3/4	2½
SMRB 10	1	3 3/16
SRRB 14	1	3 3/16
XRB 14	1	3 3/16

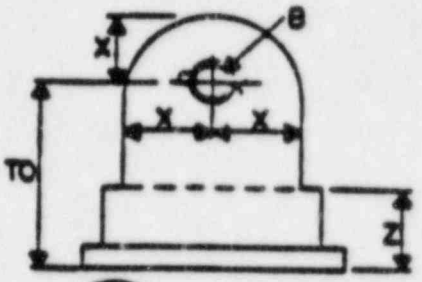
This drawing is for inspection purposes only.

TITLE: TYPICAL INSPECTION DRAWING STRUT/SNUBBER REAR BRACKET		
DRAWING NO. XRB/SRRB/SMRB	REV. 0	SHT 1 of 2



SRRB SIZES 20,24,36

XRB SIZES 20,24,36



SMRB SIZES 35,100

MATERIAL:

ASME SA-266 CL.1
or
SA-36

CATALOG CODE	B(IN) ± 1/16	TO(IN) +5/16, -1/16	X	Z(IN) +1/8, -0
SRRB-20	1 1/4	4	N/A	N/A
XRB-20	1 1/4	4	N/A	N/A
SRRB-24	1 1/2	5 1/4	N/A	N/A
XRB-24	1 1/2	5 1/4	N/A	N/A
SRRB-36	3	8	N/A	N/A
XRB-36	3	8	N/A	N/A
SMRB-35	1 1/2	5 1/2	2 1/16 Min. 2 1/4 Max.	3/4
SMRB-100	2 1/2,3	8	3 1/4 Min. 3 5/16 Max.	2

* See Note 1

NOTES:

1) 2 1/2" pin on shock arrestor end;
3" pin on transition kit end.

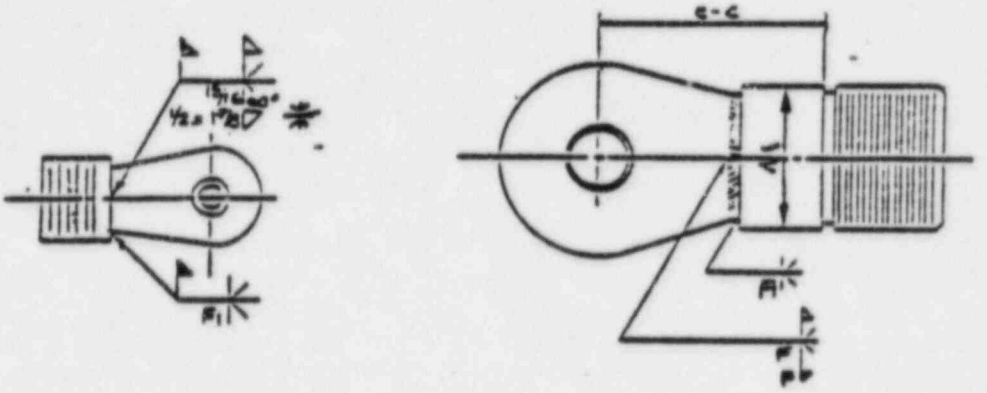
THIS DRAWING IS FOR INSPECTION PURPOSES ONLY.

TITLE: TYPICAL INSPECTION DRAWING STRUT/SNUBBER REAR BRACKET		
DRAWING NO. XRB/SRRB/SMRB	REV. 0	SHT 2 of 2

VERIFICATION PACKAGE NO. _____

Location of Rust
(Stainless Steel Only)

MODIFICATION OF FORWARD BRACKETS

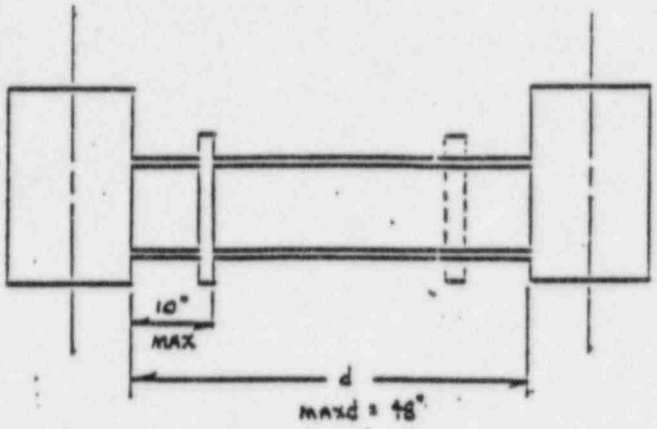


SIZE	C-C	
	MIN	MAX
35	3 1/8	21 13/16
100	5 3/4	29 11/16

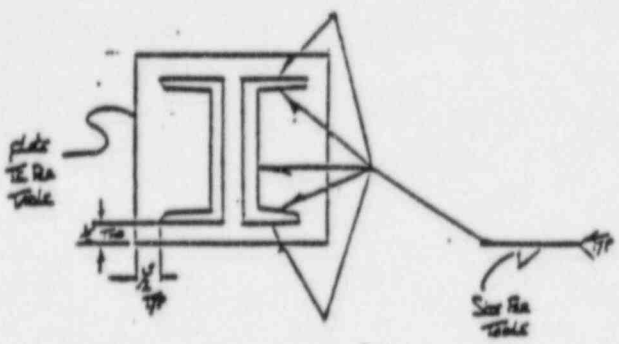
forward bracket

SMFB Sizes	(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

DUAL SPRING CAN ASSEMBLY

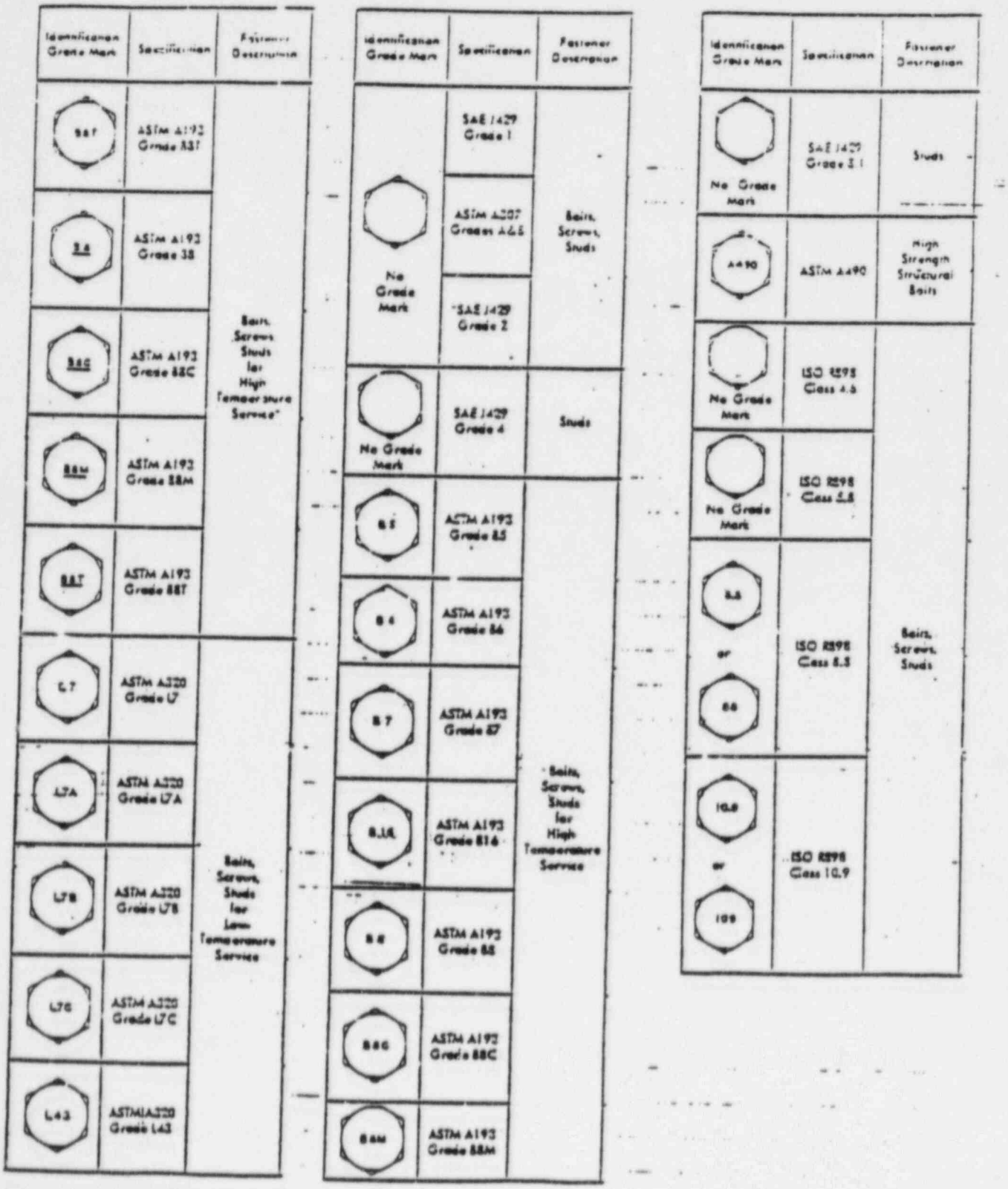


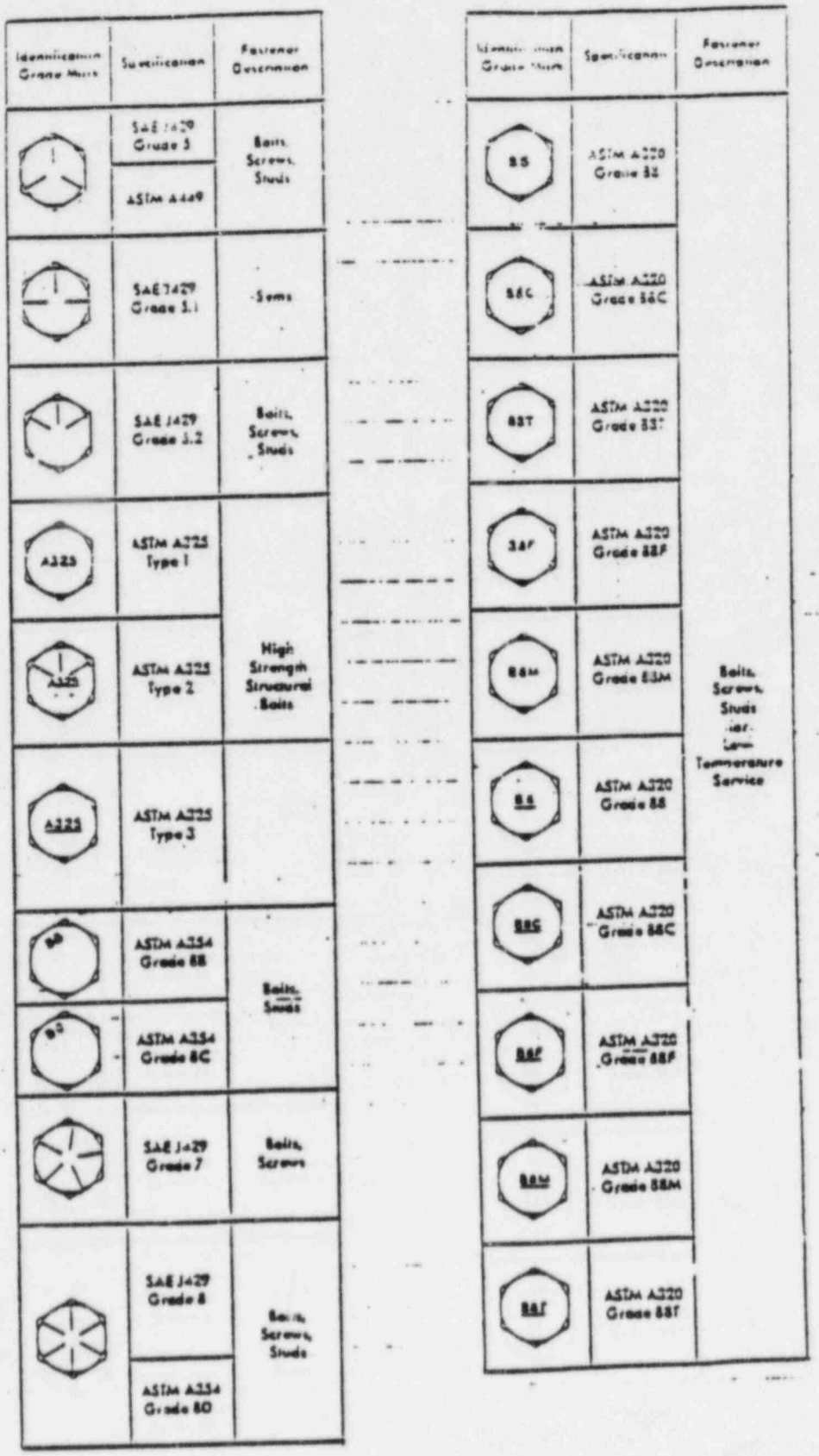
Broken line illustrates the placement of the 2nd connecting plate and assignment of weld numbers when lengthening the assembly.



SPRING SIZE	PLATE tk	WELD SIZE
0 - 8	1/2"	1/8"
9 - 11	1/2"	3/16"
12 - 14	1/2"	3/16"
15 - 17	3/4"	1/4"
18 - 20	3/4"	1/4"
21 - 22	1"	3/8"

STANDARD MARKING/STANDARD BOLTING COMPONENTS

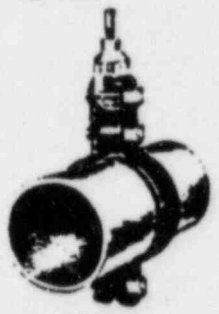


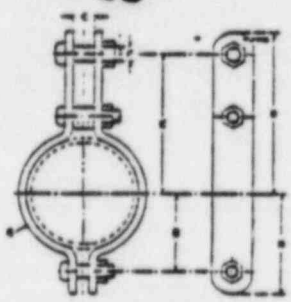

Identification Grade Mark
Specification
Fastener Orientation
SAE J429 Grade 5
ASTM A449
Bolts, Screws, Studs
SAE J429 Grade 5.1
Screws
SAE J429 Grade 5.2
Bolts, Screws, Studs
A325
ASTM A325 Type 1
ASTM A325 Type 2
High Strength Structural Bolts
A325
ASTM A325 Type 3
ASTM A354 Grade BD
ASTM A354 Grade BC
Bolts, Studs
SAE J429 Grade 7
Bolts, Screws
SAE J429 Grade 8
ASTM A354 Grade BD
Bolts, Screws, Studs
BS
ASTM A320 Grade BS
B8C
ASTM A320 Grade B8C
B8T
ASTM A320 Grade B8T
B8F
ASTM A320 Grade B8F
B8M
ASTM A320 Grade B8M
B8
ASTM A320 Grade B8
B8C
ASTM A320 Grade B8C
B8F
ASTM A320 Grade B8F
B8M
ASTM A320 Grade B8M
B8T
ASTM A320 Grade B8T
Bolts, Screws, Studs for Low Temperature Service

ITT GRINNELL COMPONENT STANDARD SUPPORTS

INDEX

double bolt pipe clamp
fig. 295





SIZE RANGE: ¾ through 36 inch.

MATERIAL: Carbon steel.

FINISH: Black or galvanized; furnished black unless otherwise specified.

SERVICE: Recommended for suspension of pipe requiring up to 4 inches of insulation and where flexibility of the clamp is desirable — within the limitation of temperature and loads shown below.

MAXIMUM TEMPERATURE: 750°F.

APPROVALS: Complies with Federal Specification WW-H-171E (Type 3) and Manufacturers Standardization Society SP-69 (Type 3).

INSTALLATION: Attachment to the clamp may be made with a welded eye rod fig. 278, page ph-52, or the weldless eye nut fig. 290, page ph-59.

FEATURES:

- Load bolt and attachment will extend outside of 4 inch thick pipe covering.
- Load ratings meet ANSI code requirements and are substantiated by laboratory test.
- Rounded corners on clamp ends provide greater safety for personnel.

ORDERING: Specify pipe size, figure number, name.

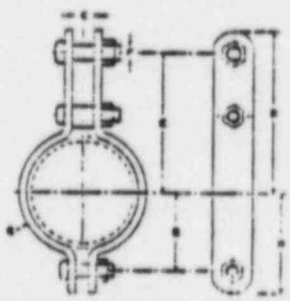
loads • weights • dimensions (inches)

pipe size	max. recom. load, lbs for service temp. 650°F	750°F	wgt (approx) lb per 100	B	C	D	E	F	G	K
¾	950	850	70	1 9/16	⅝	2⅜	2 7/16	½	5/16 x 1	1 ¾
1	950	850	78	1 7/16	⅝	3	2 9/16	⅝	5/16 x 1	1 ½
1¼	950	850	81	1 ¼	⅝	3½	2 11/16	⅝	5/16 x 1	1 11/16
1½	1545	1380	234	1 13/16	1 1/16	4⅜	4⅛	½	⅜ x 1½	2¾
2	1545	1380	258	2 ⅛	1 1/16	5⅜	5⅛	⅝	⅜ x 1½	3 11/16
2½	1545	1380	272	2 5/16	1 1/16	6⅛	5¾	¾	⅜ x 1½	4 5/16
3	1545	1380	304	2¾	1 1/16	6 11/16	5 13/16	⅝	⅜ x 1½	3½
4	2500	2230	566	3¾	1 1/16	7⅝	6½	⅝	5/16 x 2	4½
5	2500	2230	699	3 15/16	1 1/16	8⅛	7	¾	5/16 x 2	5
6	2865	2555	1145	4⅜	1 7/16	9 13/16	8 5/16	⅞	½ x 2½	6⅛
8	2865	2555	1315	5¾	1 7/16	10 13/16	9 5/16	⅞	½ x 2½	7⅝
10	3240	2990	1981	6⅞	1 7/16	12	10 7/16	1	½ x 2½	8½
12	3240	2990	2225	7⅞	1 7/16	13	11 7/16	1	½ x 2½	9½
14	4300	3835	3768	9 1/16	2	14 9/16	12 11/16	1¼	⅝ x 3	10 11/16
16	4300	3835	4137	10 1/16	2	15 9/16	13 11/16	1¼	⅝ x 3	11 11/16
18	4300	3835	4487	11 1/16	2	16 9/16	14 11/16	1¼	⅝ x 3	12 11/16
20	5490	4900	5725	12⅛	2	17½	15⅝	1⅜	⅝ x 3	14
24	4500	4015	6590	14⅛	2	19½	17⅝	1⅜	⅝ x 3	16
28	6000	--	11230	17½	[illegible]	24¼	21¾	1½	⅝ x 4	20
30	7500	--	15000	18½	2½	26¼	23½	1⅝	⅝ x 5	21½
32	8250	--	19330	19⅝	2½	28	25	1½	¾ x 6	22½
34	9900	--	24880	21½	3	31¼	27¾	1⅝	1 x 5	25
36	10500	--	25750	22½	3	32½	28¾	1⅝	1 x 5	26

*Based on the allowable stresses shown in the ANSI Code for Press. Piping.

steel pipe clamps

heavy duty double bolt pipe clamp fig. 295H



SIZE RANGE: 6 through 36 inch.

MATERIAL: Carbon steel.

FINISH: Black.

SERVICE: Recommended for suspension of pipe requiring up to 4 inches of insulation and where flexibility of the clamp is desirable.

MAXIMUM TEMPERATURE: 750°F.

APPROVALS: Complies with Federal Specification WW-H-171E (Type 3) and Manufacturers Standardization Society SP-69 (Type 3).

FEATURES:
- Load bolt and attachment will extend outside of 4 inch thick pipe covering.
- Load ratings meet ANSI code requirements and are substantiated by laboratory test.

ORDERING: Specify pipe size, figure number, name.

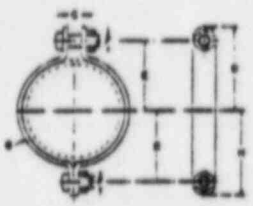
loads • weights • dimensions (inches)

pipe size in.	maximum recommended load, lbs for service temperature* 650°F	750°F	wgt (appr'x) lb per 100	B	C	D	E	F	G	H
6	3500	3125	1200	4¾	1⅝	10 9/16	9 5/16	1	⅝ x 2½	6
8	4800	4285	1850	6	2	11⅝	10⅞	1⅛	⅝ x 2½	7⅛
10	5300	4910	3025	7⅛	2½	13⅛	11⅝	1½	¾ x 3½	9
12	7000	6250	4200	8⅝	2½	14 9/16	12 9/16	1⅝	⅝ x 3½	10⅛
14	9500	8485	6000	9⅝	2½	15½	13½	1½	¾ x 4	11⅝
16	10000	8930	8000	10⅞	3	17⅛	14½	1⅝	⅝ x 4½	13⅛
18	13800	12325	11500	12½	3½	18⅝	16¼	2	1 x 4	14½
20	15300	13665	14000	13½	3½	19⅝	17¼	2	1 x 5	16
24	18300	14555	19000	15½	3½	22 9/16	19 9/16	2	1 x 6	18½
28	18000	---	35400	18½	4	31⅝	27½	2½	1 x 7	23⅛
30	20500	---	40600	19⅝	4¼	32⅝	28¼	2½	1 x 8	24⅛
32	22750	---	55500	21⅜	4½	36	31	2½	1½ x 8	26¾
34	25000	---	60400	23⅛	4½	37½	32½	2½	1½ x 7	28⅛
36	28000	---	67500	24⅝	4½	40½	34¾	2¾	1½ x 8	30½

*Based on the allowable stresses shown in the ANSI Code for Pressure Piping.

steel pipe clamps

medium pipe clamp
fig. 212



SIZE RANGE: ½ through 30 inch.

MATERIAL: Carbon steel.

FINISH: Black or galvanized; furnished black unless otherwise specified.

SERVICE: Recommended for suspension of cold pipe lines or hot lines where little or no insulation is required.

MAXIMUM TEMPERATURE: 750°F.

APPROVALS: Underwriters Laboratories listed and Factory Mutual approved for ¾ through 8 inch pipe. Complies with Federal Specification WW-H-171E (Type 4) and Manufacturers Standardization Society SP-69 (Type 4).

INSTALLATION: Normally used with weldless eye nut fig. 290, page ph-59, or eye rod.

FEATURES:
- Load ratings meet ANSI code requirements and are substantiated by laboratory test.
- Clamps tightly to pipe.
- Wide range of sizes.
- Rounded corners provide greater safety for personnel.

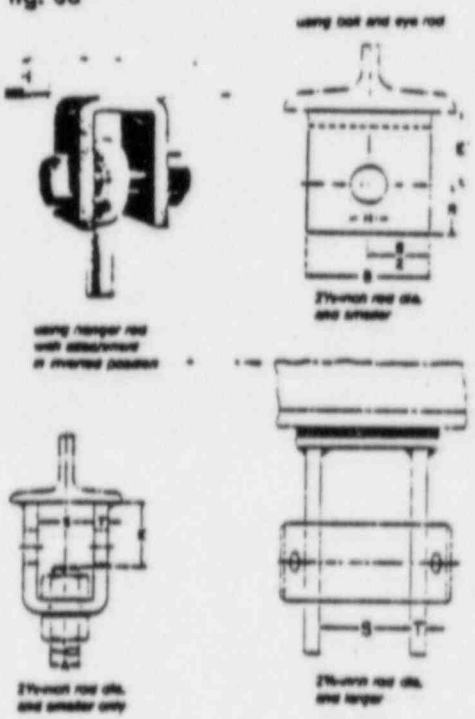
ORDERING: Specify pipe size, figure number, name.

loads • weights • dimensions (inches)

pipe size	max recom load, lbs for service temperatures 650°F	750°F	wgt (approx) lb per 100	B	C	D	E	F	G	H
½	500	445	29	1	7/16	1 17/32	1	5/16	⅛ x 1	1 17/32
¾	500	445	33	1⅛	7/16	1 51/64	1⅛	5/16	⅛ x 1	1 51/64
1	500	445	35	1⅛	7/16	1 59/64	1⅛	5/16	⅛ x 1	1 51/64
1¼	500	445	38	1 7/16	7/16	1 51/64	1 7/16	5/16	⅛ x 1	1 51/64
1½	800	715	43	1 9/16	½	2 9/32	1⅝	5/16	⅛ x 1	2 5/16
2	1040	930	113	2⅛	½	2⅝	2⅛	½	⅛ x 1	2⅝
2½	1040	930	124	2½	⅝	3⅛	2⅝	½	⅛ x 1	3⅛
3	1040	930	139	2 59/64	⅝	3 9/16	2 59/64	½	⅛ x 1	3 7/16
3½	1040	930	153	3⅛	⅝	3 31/32	3⅛	½	⅛ x 1	3⅝
4	1040	930	229	3 7/16	¾	4⅜	3⅝	⅝	⅛ x 1½	4 7/16
5	1040	930	260	4	⅞	4 57/64	4 7/16	⅝	⅛ x 1½	4⅝
6	1515	1440	542	4⅞	⅞	5⅝	5	⅝	⅜ x 1½	5⅝
8	1515	1440	654	6	1	7	6⅛	¾	⅜ x 1½	6⅞
10	2490	2220	1362	7 9/16	1	8 9/16	7 7/16	⅞	½ x 2	8 7/16
12	2490	2220	1518	8⅛	1	9 9/16	8 7/16	⅞	½ x 2	9⅝
14	2490	2220	2050	9	1⅛	10⅝	9⅛	⅞	½ x 2½	10⅝
16	2490	2220	2225	10	1⅛	11⅝	10⅛	⅞	½ x 2½	11⅝
18	3060	2730	3156	11⅛	1⅛	13	11⅝	1	⅝ x 2½	12⅞
20	3060	2730	3581	12½	1⅛	14⅛	12⅝	1⅛	⅝ x 2½	13⅞
24	3060	2730	5312	15	1⅝	16⅞	15⅛	1⅛	⅝ x 3	16⅝
30	3500	3360	11390	18½	2	21¼	19	1¼	¾ x 4	20⅝

•Based on the allowable stresses shown in the ANSI Code for Pressure Piping.

welded beam attachment
fig. 66



MAXIMUM RECOMMENDED LOAD: 71,280 lbs.

MATERIAL: Carbon steel.

SERVICE: Recommended for attachment to bottom of beams, especially where loads are considerable and rod sizes are large.

HOW TO SIZE: Size of attachment is determined by size of rod.

APPROVALS: Complies with Federal Specification WW-H-171E (Type 22) and Manufacturers Standardization Society SP-69 (Type 22).

INSTALLATION: If flexibility at the beam is desired, use with bolt and eye rod fig. 278, page ph-52, or with weldless eye nut fig. 290, page ph-59, and weld as shown to the left. If vertical adjustment is desired, use with threaded rod and nut and weld the attachment in an inverted position to the beam as shown at left.

FEATURES:
- Will accommodate very heavy loads and rod sizes through 3½ inches.
- Can be installed so as to provide for either flexibility or for vertical adjustment.
- Versatility affords economical stocking and erection.
- Beam size need not be considered.

ORDERING: Specify rod size, figure number, name. Specify "with bolt and nut" if required for 1" rod size and smaller.

Specify "with pin and cotter pins" if required for 1¼ inch rod size and larger.

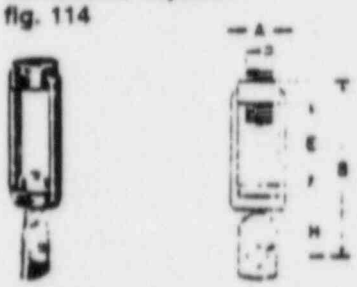
loads • weights • dimensions (inches)

rod size A	beam size	maximum recommended loads, lbs* 650°F	750°F	wgt (approx) lb per 100 without bolt and nut	with bolt and nut	rod take-out E	E'	B	H	R	S	T
⅜	⅛ x 2½	610	510	96	117	1⅞	2	2	11/16	⅜	1½	⅛
½	⅛ x 2½	1130	940	96	131	1⅞	2	2	11/16	⅜	1½	⅛
⅝	⅛ x 2½	1810	1510	96	155	1⅞	2	2	15/16	⅝	1½	⅛
¾	⅜ x 3	2710	2260	192	279	1¾	2	2½	15/16	1⅛	1½	⅛
⅞	1 x 4	3770	3150	253	394	2¾	3	2½	1⅛	1¼	2	⅛
1	1½ x 4½	4940	4150	427	629	2½	3	3	1½	1½	2	⅛
1⅛	1⅝ x 5	6000	5660	809	1022	2⅞	3	4	1½	2	2½	⅛
1¼	1⅝ x 5¾	11630	9700	1560	1902	4	4	5	1½	2½	3	⅛
1⅜	1⅞ x 6⅝	15700	14000	1870	2418	5	5	5	2	2⅝	3⅜	¼
2	2¼ x 6⅝	20700	18460	2290	3055	5¼	5	6	2⅜	3¼	3⅜	¼
2⅛	2½ x 7½	27200	24280	2641	3675	5½	5	6	2⅜	3½	4½	⅜
2½	2⅝ x 7⅝	33500	29680	2669	3965	6¼	6	6	2⅞	3⅝	4½	⅜
2⅝	3 x 7	41580	37068	2875	4075	—	5¾	6	3¼	4	3⅝	⅜
3	2½ x 7	50580	45085	3255	4685	—	6½	7	2⅜	4	2⅜	½
3¼	3½ x 7⅝	60480	53906	4510	6210	—	7	7	3⅜	4½	4½	½
3½	3⅝ x 7⅝	71280	63493	5340	7240	—	7½	8	3⅝	4½	4½	½

* Based on the allowable stresses shown in the ANSI Code for Pressure Piping.

• 1¼" and larger are pins with cotter pins.

turnbuckle adjuster
fig. 114



MAXIMUM RECOMMENDED LOAD: 660 lbs.

MATERIAL: Malleable iron.

FINISH: Black.

INSTALLATION: Normally used with split pipe ring, fig. 108.

APPROVALS: Complies with Federal Specification WW-H-171 E (Type 15) and Manufacturers Standardization Society SP-69 (Type 15).

FEATURES:
- An economical and simple means of obtaining vertical adjustment and flexibility at the pipe connection.
- Permits adjustment after pipe is in place.

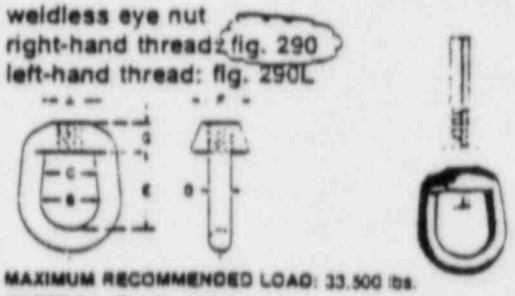
ORDERING: Specify rod tapping size, figure number, name.

loads • weights packaging • dimensions (inches)

rod tapping size, A	pipe size	max recom load, lbs	wgt (app x) lb per 100	no. of pieces per carton	B	E	H
⅜	⅜	230	9	...	2⅛	1½	7/32
½	½ to 2	610	28	50	3 11/16	1⅝	19/32
⅝	2½ to 3½	725	31	50	3 11/16	1 11/16	19/32
¾	4 to 5	710	72	25	4⅛	2 5/16	⅞
¾	6	660	70	25	4 11/16	2 9/16	11/16

• With minimum safety factor of 5 at maximum temperature of 450°F

weldless eye nut
right-hand thread: fig. 290
left-hand thread: fig. 290L



MAXIMUM RECOMMENDED LOAD: 33,500 lbs.

MATERIAL: Forged steel.

SERVICE: For use on high temperature piping installations.

APPROVALS: Complies with Federal Specification WW-H-171E (Type 17) and Manufacturers Standardization Society SP-69 (Type 17).

FEATURES:
- Supports loads equal to the full limitation of the hanger rod.
- Provides flexible connection when used with straight thread rod.

ORDERING: Specify rod size, figure number, name. If other than standard combination of eye nut size and rod tapping size is required, specify eye nut size and special rod tapping size.

loads • weights

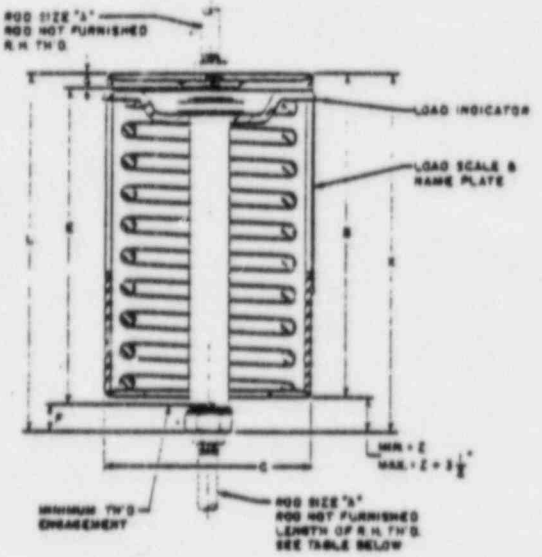
rod size A	max recom loads, lbs 650°F	750°F	wgt (approx) lb per 100
½	610	540	53
⅝	1130	1010	63
¾	1810	1610	62
⅞	2710	2420	60
1	3770	3360	172
1¼	6960	6420	170
1½	8000	7140	384
1¾	11630	10370	345
2	15700	14000	838
2½	20700	18460	1586
3	27200	24250	1536
3½	33500	29880	1488

• Based on the allowable stresses as shown in the ANSI Code for Pressure Piping.

dimensions (inches)

rod size A	B	C	D	E	F	G	size no.
½ ⅝ ¾ ⅞	1⅞	1 9/16	⅞	2	1⅝	11/16	1
1	2	1 11/16	⅝	2⅜	1 9/16	1	2
1¼ 1½	2⅝	1 15/16	1	3⅜	2⅜	1⅛	3
1¾ 2 2½ 3	4	4	1½	6⅝	4	2½	4

fig. B-268: type A



Type A is the basic unit of fig. B-268 ITT Grinnell *Pre-Engineered* spring hanger. It is designed for attachment to its supporting member by screwing a rod into a tapped hole in the top cap of the hanger the full depth of the top cap ("G" dimension). The upper jam nut should then be locked, securing the hanger. Adjustment of the hanger load is accomplished by turning the coupling on the lower hanger rod until the hanger picks up the load and the load indicator points to the desired position.

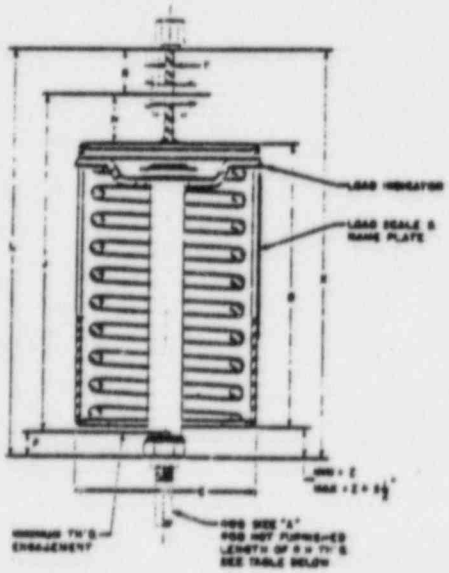
loads • weights • dimensions (inches)

hanger size	rated load, lb	weight (approx) each, lb	rod size A	R.H. thread length	opening length B	opening diam C	rod take-out E	min thd engagement F	thread depth G	shipping length L	loaded length X min	loaded length X max	Z
000	19	5	⅜	5	5¾	4	5 7/16		7/16	8 7/16	6 15/16	9 7/16	1 3/16
00	41	6	⅜	5	7¾	4	6 13/16	19/16	7/16	8 7/16	8 9/16	11 7/16	1 3/16
0	88	7	½	5	6 11/16	4	6 7/16		7/16	7 7/16	7 15/16	10 7/16	¾
1	100	7	½	5	7 9/16	4	6 15/16	15/16	7/16	8 5/16	8 13/16	11 5/16	¾
2	128	8	½	5	8 9/16	4	7 15/16		7/16	9 5/16	9 13/16	12 5/16	1
3	166	12	½	5	7 9/16	5 9/16	6 15/16		7/16	8 5/16	8 13/16	11 5/16	1
4	223	13	½	5	7 9/16	5 9/16	7 15/16	15/16	7/16	9 5/16	9 13/16	12 5/16	1 3/16
5	299	14	½	5	8 9/16	5 9/16	7 15/16		7/16	9 5/16	9 13/16	12 5/16	1 3/16
6	390	23	⅝	5	8 13/16	6¾	7 13/16		⅝	9¾	9⅞	12⅝	⅝
*	532	25	⅝	5	9¾	6¾	8 13/16	15/16	⅝	10¾	10⅞	13⅝	⅝
8	713	28	⅝	5	10⅝	5¾	9 5/16		⅝	10⅞	11⅜	13⅞	⅝
9	950	56	¾	6	10⅞	8¾	9¾		1	11⅜	12⅛	14⅝	¾
10	1238	61	¾	6	12⅛	8¾	11¾	1⅛	1	13⅜	14⅛	16⅝	1½
*11	1615	58	¾	6	9 15/16	8¾	9¾		1	11⅜	12⅛	14⅝	1 1/16
12	2138	51	1	6	10 7/16	8¾	9¾		1	11⅜	12⅛	14⅝	1 1/16
*13	2850	79	1	7	13⅛	8¾	11¾	1⅛	1	13⅜	14⅛	16⅝	1½
*14	3800	83	1⅛	7	13⅛	8¾	11¾		1	13⅜	14⅛	16⅝	⅜
15	5130	97	1¼	7	13⅜	8¾	12 5/16		1⅜	15⅝	16⅛	18⅝	1⅛
16	7125	119	1¼	8	16 7/16	8¾	14 13/16	1 15/16	1⅜	18½	18⅝	21⅛	2 1/16
17	9500	148	1¾	8	18½	8¾	16¾		1⅜	20 7/16	20 9/16	23 1/16	1 15/16
18	12648	300	2	9	18½	12¾	16		2⅛	20 13/16	21 9/16	23 13/16	2 9/16
19	16805	348	2¼	9	20½	12¾	18¾	2 9/16	2⅛	23⅛	23 11/16	26⅜	2 11/16
20	22235	450	2½	10	23⅝	12¾	21¾		2⅛	26 7/16	26 15/16	29 7/16	2 11/16
21	29686	528	2¾	10	26 9/16	12¾	23½		2¾	30	30½	33	3 1/16
22	39591	675	3	11	32⅝	12¾	29¾	3⅛	3	36½	36¾	39½	3¾

*Reflects change in rod size from previously published data.

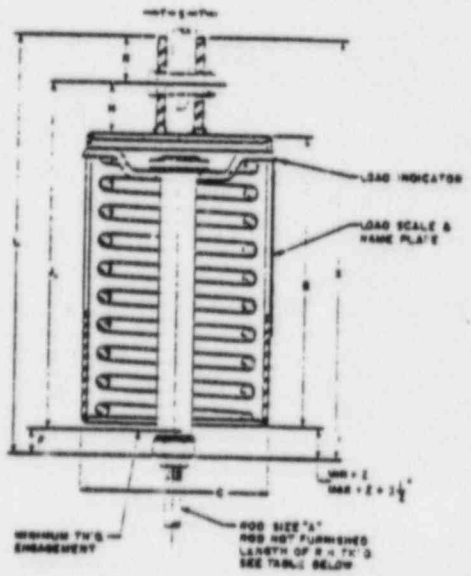
Pre-Engineered spring hangers

fig. B-268: type B



Type B is furnished with a single lug for attachment to the building structure. The lug permits use of a clevis or a pair of angles for attachment where headroom is limited.

fig. B-268: type C



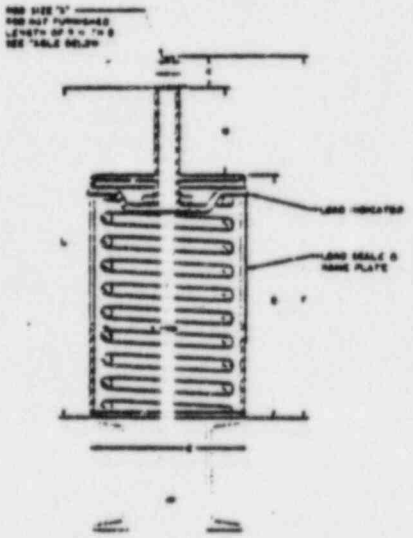
Type C is furnished with two lugs for attachment to the building structure. These two lugs permit the use of an eye rod or a single plate for attachment where headroom is limited.

loads • weights • dimensions (inches)

hanger size	rated load lb	wgt (assembled) each lb	rod dia A	R.H. thd length	lug hole size	casing length B	casing diam C	min thd engagement P	hanger pin H	rod take-out J	shipping length L	R	clevis opening S	thickness T	loaded length X min	loaded length X max	Z
000	19	5	½	5	11/16	5¼	4		1½	7	9 4/16	1¼	⅞	½	9 11/16	12 3/16	1 3/16
00	41	6	½	5	11/16	7¼	4	15/16	1½	8⅝	10 13/16	1¼	⅞	½	11 11/16	13 13/16	1 3/16
0	69	7	½	5	11/16	6 11/16	4		1½	8	10 3/16	1¼	⅞	½	10 11/16	13 3/16	¼
1	100	8	½	5	11/16	7 9/16	4	15/16	1½	8⅝	11 1/16	1¼	⅞	½	11 9/16	14 1/16	¼
2	128	9	½	5	11/16	8 5/16	4		1½	9⅜	12 1/16	1¼	⅞	½	12 5/16	15 1/16	1
3	166	12	½	5	11/16	7 9/16	5 5/16		1½	8⅛	11 1/16	1¼	⅞	½	11 5/16	14 1/16	
4	223	14	½	5	11/16	7 15/16	5 5/16	15/16	1½	8⅝	12 1/16	1¼	⅞	½	12 5/16	15 1/16	1 3/16
5	299	15	½	5	11/16	8⅜	5 5/16		1½	9⅜	12 1/16	1¼	⅞	½	12 5/16	15 1/16	1 3/16
6	399	24	⅝	5	13/16	8 11/16	6⅜		1½	9 13/16	12⅞	1¼	1 1/16	½	12⅝	15 1/16	1 1/16
7	532	27	⅝	5	13/16	9⅜	6⅜	15/16	1½	10 13/16	13⅞	1¼	1 1/16	½	13⅝	16 1/16	1⅛
8	713	29	⅝	5	13/16	10⅛	6⅜		1½	11 1/16	13⅝	1¼	1 1/16	½	14⅛	16⅝	1⅛
9	950	56	¾	6	15/16	10⅝	8⅜		1½	11⅞	14⅜	1½	1½	⅝	14⅞	17⅝	⅛
10	1235	62	¾	6	15/16	12⅛	8⅜	1¼	1½	13⅞	16⅜	1½	1½	⅝	16⅞	19⅜	1⅛
*11	1615	56	¾	6	15/16	9 15/16	8⅜		1½	11⅞	14⅜	1½	1½	⅝	14⅞	17⅜	1 1/16
12	2138	81	1	6	1¼	10 9/16	8⅜		2	12⅜	15⅛	1½	1⅝	½	15⅝	18⅛	1 1/16
*13	2850	79	1	7	1¼	13⅛	8⅜	1½	2	14⅜	17⅛	1½	1⅝	½	17⅝	20⅛	1⅛
*14	3800	84	1¼	7	1½	13½	8⅜		3	15⅜	18⅝	2	2	⅝	19⅛	21⅝	⅛
15	5130	100	1¼	7	1½	13⅜	8⅜		3	16 11/16	20⅛	2	2	⅝	21½	23⅝	1⅛
16	7125	124	1½	8	1¾	16 1/16	8⅜	1 15/16	3	19 3/16	23⅝	2½	2⅜	⅝	24⅛	26⅝	2 1/16
17	9500	154	1¾	8	2	18½	8⅜		3	21½	25 5/16	2½	2⅝	⅝	26 1/16	28 5/16	1 15/16
18	12645	301	2	9	2⅜	18½	12½		4	22⅞	27 11/16	3	2⅞	½	28 3/16	31 11/16	2 1/16
19	16805	348	2¼	9	2⅝	20⅜	12⅝	2 5/16	4½	25	30 5/16	3	3⅛	⅝	31 1/16	34 5/16	2 1/16
20	22325	456	2½	10	2⅞	23⅜	12⅝		4½	28½	34 5/16	4	3⅝	1	35 1/16	38 5/16	2 1/16
21	29688	528	2¾	10	3⅛	26 5/16	12⅝		4½	31½	38½	4	3⅝	1	39	41½	3 1/16
22	39591	684	3	11	3⅜	32⅜	12⅝	3⅛	5	37⅝	45⅝	4	3⅝	1	45⅝	48⅛	3⅛

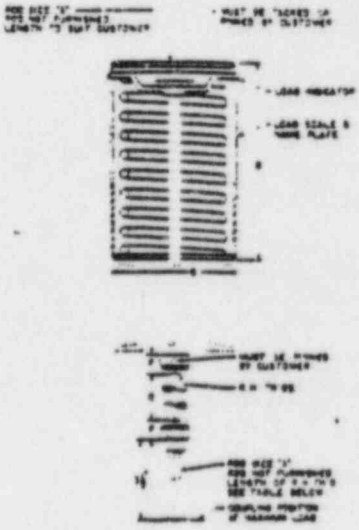
ph-90 *Reflects change in rod size from previously published data.

fig. B-268: type D



Type D permits adjustment of the hanger from the top. This type has a piece of tubing which passes through a hole in the top cap. Type D is especially adapted for use where the hanger is set above the supporting beams and pipe is suspended below.

fig. B-268: type E



Type E is designed to permit adjustment from either above or below the hanger, when it is installed upon the supporting member and pipe is suspended below. A coupling tapped right hand both ends is furnished.

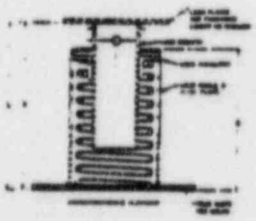
loads • weights • dimensions (inches)

hanger size	rated load lb	wgt (approx) each lb	rod size A	R.H. thd type	casing length B	casing diam C	min thread engagement F	allowance for nuts K	stripping length L	height of spacer M	rod length Y	rod take-out Q
000	19	5	½	5	5⅛	4	13/16	1⅛	8⅜	3⅛	10	6
00	41	6	½	5	7⅛	4	13/16	1⅛	10⅛	3⅛	11⅜	6
0	68	6	½	5	6 11/16	4	15/16	1⅛	9 13/16	3⅛	11 1/16	6
1	100	7	½	5	7 9/16	4		1⅛	10 11/16	3⅛	11 15/16	6
2	128	8	½	5	8 5/16	4		1⅛	11 7/16	3⅛	12 11/16	6
3	166	11	½	5	7 9/16	5 5/16	15/16	1⅛	10 7/16	3⅛	11 11/16	6
4	223	12	½	5	7 15/16	5 5/16		1⅛	11 1/16	3⅛	12 5/16	6
5	299	14	½	5	8⅝	5 5/16		1⅛	11⅜	3⅛	13	6
6	399	22	⅝	5	8 13/16	6⅝	1 1/16	1⅛	11 11/16	3	13 5/16	6
7	532	25	⅝	5	9⅜	6⅝		1⅛	12⅜	3	14⅛	6
8	713	28	⅝	5	10⅛	6⅝		1⅛	13⅛	3	14⅞	6
9	950	51	¾	6	10⅞	8⅝	1 1/4	1⅜	13⅝	3	15⅝	6
10	1235	58	¾	6	12⅛	8⅝		1⅜	15⅛	3	16⅝	6
*11	1615	51	¾	6	9 15/16	8⅝		1⅜	12 15/16	3	14 11/16	6
12	2138	56	1	6	10 9/16	8⅝	1 5/16	2⅛	13 9/16	3	15 13/16	6
*13	2850	73	1	7	13½	8⅝		2⅛	16⅛	3	18⅝	6
*14	3800	77	1⅛	7	13¼	8⅝		3	16⅛	3	19½	6
15	5130	88	1⅛	7	13¾	8⅝	1 15/16	3	16⅝	3	19⅝	6
16	7125	107	1½	8	16 1/16	8⅝		3½	19 1/16	3	22 9/16	6
17	9500	133	1½	8	18⅛	8⅝		4	21⅛	3	25⅛	6
18	12545	262	2	9	18⅛	12¾	2 9/16	4 9/16	21⅛	3	25 1/16	6
19	16805	300	2¼	9	20¾	12¾		5	23¾	3	28⅜	6
20	22325	370	2½	10	23⅛	12¾		5 9/16	26⅜	3	32 1/16	6
21	29688	455	2¾	10	26 5/16	12¾	3¼	6⅛	29 5/16	3	35 9/16	7
22	39581	505	3	11	32¾	12¾		6⅝	35⅜	3	42	7

*Reflects change in rod size from previously published data.

Pre-Engineered spring hangers

fig. B-268: type F



* Hanger take-out or installed height: With pipe movement up, cold to hot, installed height should be between minimum and maximum "X" dimension.

With pipe movement down, cold to hot, installed height should be "X" dimension (between minimum and maximum) plus the amount of vertical movement.

Type F is for use under a base elbow or piping that must be supported directly from the floor. It is recommended that in all cases where more than ¼ inch of horizontal translation occurs of loads resting on the flat load flange or other flat surface junction between the type F spring hanger and the load a double roller design pipe roll should be used. Pipe rolls, as illustrated above, will be furnished on request. For dimension of the pipe roll, refer to fig. 273, page ph- 71. Base type variable springs will be furnished with an extended load column on special order.

roll size, in.	roll mat'l	max load, lb	P, in.	R, in.	S, in.
2- 3½	C. I.	780	1¾	4½	4½
4- 6	C. I.	1900	2⅛	5⅞	5½
8-10	C. I.	4200	2¾	8¼	6¾
8-10	Steel	14000	2¾	8¼	6¾
12-14	C. I.	6150	3½	10¾	6¾
12-14	Steel	26000	3½	10¾	6¾
16-20	C. I.	9960	3¾	12	6¾
16-20	Steel	34000	3¾	12	6¾
24	C. I.	12200	4	13¼	7
24	Steel	60000	4	13¼	10
30	C. I.	15000	4½	16½	8¼
30	Steel	60000	5	16½	10
36	C. I.	24000	4 15/16	19	13
36	Steel	80000	5	19	12

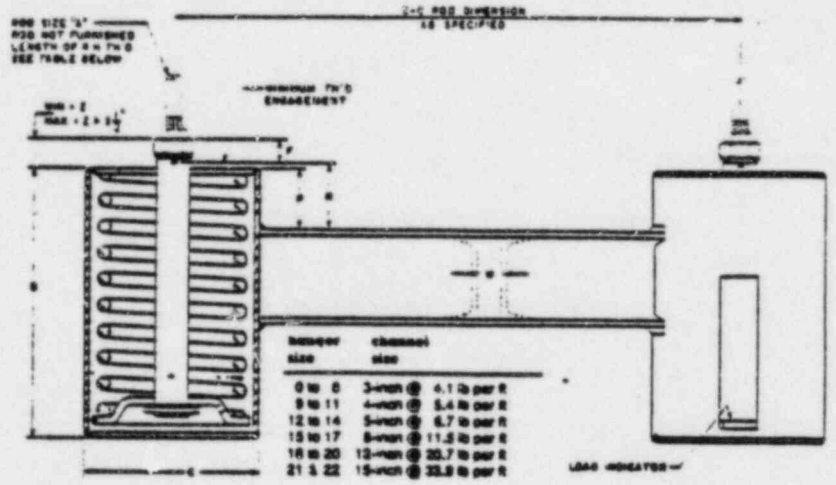
Adjustment to the required load rating is made by inserting a bar into holes provided in the load column* and turning the column. The two-inch increment between minimum and maximum "X" dimensions is the amount of field adjustment available and is in excess of the amount required for load adjustment. When possible, we recommend the use of the mean "X" dimension thus providing field adjustment of plus or minus one inch.

* Sizes 15 and larger are furnished with a hexagon nut and teflon-filled coated collar arrangement at the top of the load column to facilitate adjustment with a wrench.

loads • weights • dimensions (inches)

hanger size	rated load lb	wgt (approx) each lb	B	casing diam C	bottom flange square	bottom flange bolt circle min	bottom flange bolt circle max	bottom flange bolts	thickness bottom flange	shipping length L	lengths X min	lengths X max	load col. diam	load flange diam*	thickness of load flange*
000	19	11	8 11/16	4	7½	7	8¾	⅝	¼	7 9/16	7 9/16	9 9/16	1.900	3⅞	3/16
00	41	12	7 7/16	4	7½	7	8¾	⅝	¼	8 15/16	8 15/16	10 15/16	1.900	3⅞	3/16
0	69	13	6 11/16	4	7½	7	8¾	⅝	¼	8 3/16	8 3/16	10 3/16	1.900		3/16
1	100	13	7 9/16	4	7½	7	8¾	⅝	¼	9 1/16	9 1/16	11 1/16	1.900	3⅞	3/16
2	128	14	8 3/16	4	7½	7	8¾	⅝	¼	9 13/16	9 13/16	11 13/16	1.900		3/16
3	168	21	7¾	5 9/16	7½	7¾	8¾	⅝	¼	8 15/16	8 15/16	10 15/16	2.875		3/16
4	223	23	8	5 9/16	7½	7¾	8¾	⅝	¼	9 9/16	9 9/16	11 9/16	2.875	5¾	3/16
5	299	24	8 11/16	5 9/16	7½	7¾	8¾	⅝	¼	10⅛	10⅛	12⅛	2.875		3/16
6	399	37	8¾	6⅝	9	8	10½	⅝	⅜	10 7/16	10 7/16	12 7/16	3.50		½
7	532	43	9¾	6⅝	9	8	10½	⅝	⅜	11 7/16	11 7/16	13 7/16	3.50	6¾	½
8	713	44	10 9/16	6⅝	9	8	10½	⅝	⅜	11½	11½	13½	3.50		½
9	950	81	10⅞	8⅝	13¼	10 9/16	16½	⅝	½	12 7/16	12 7/16	14 7/16	4.50		½
10	1235	88	12⅛	8⅝	13¼	10 9/16	16½	⅝	½	13 11/16	13 11/16	15 11/16	4.50	8¾	½
11	1615	90	9 15/16	8⅝	13¼	10 9/16	16½	⅝	½	11½	11½	13½	4.50		½
12	2138	85	10 9/16	8⅝	13¼	10 9/16	16½	⅝	½	12⅛	12⅛	14⅛	4.50		½
13	2850	105	13⅛	8⅝	13¼	10 9/16	16½	⅝	½	14 11/16	14 11/16	16 11/16	4.50	8¾	½
14	3800	109	12⅛	8⅝	13¼	10 9/16	16½	⅝	½	14 13/16	14 13/16	16 13/16	4.50		½
15	5130	116	13½	8⅝	13¼	10 9/16	16½	⅝	½	15 1/16	15 1/16	17 1/16	4.50		½
16	7125	136	15 13/16	8⅝	13¼	10 9/16	16½	⅝	½	17¾	17¾	19¾	4.50	8¾	½
17	9500	159	17½	8⅝	13¼	10 9/16	16½	⅝	½	19 7/16	19 7/16	21 7/16	4.50		½
18	12646	313	17½	12¾	17¼	15¾	22	⅝	¾	19 1/16	19 1/16	21 1/16	5.563	12½	½
19	16805	350	19¾	12¾	17¼	15¾	22	⅝	¾	21 5/16	21 5/16	23 5/16	5.563	12½	½
20	22325	441	23	12¾	17¼	15¾	22	⅝	¾	24 9/16	24 9/16	26 9/16	5.563	12½	½
21	29688	466	25 11/16	12¾	17¼	15¾	22	⅝	¾	27 9/16	27 9/16	29 9/16	5.563	12½	½
22	39591	624	31¾	12¾	17¼	15¾	22	⅝	¾	33¾	33¾	35¾	5.563	12½	½

fig. B-268: type G



Type G is a complete trapeze assembly. The hanger consists of two standard spring units plus a pair of back-to-back channels welded at each end to the hanger casing.

The "P" dimension can be varied with the customer's instructions.

In sizing a Type G hanger, it must be remembered that each standard spring unit carries one-half of the total pipe load. Therefore, in using the hanger selection chart, use one-half of the total pipe load as the rod load.

When the pipe line is designed so as not to be centered on the channel, one spring of the trapeze will carry a heavier load, the other a lighter load. Care should be taken in calculating the load of each hanger and in choosing the proper sized spring in such cases. The center-to-center rod dimension must be specified when ordering.

loads • weights • dimensions (inches)

hanger size	rated load lb	weight (approx) each, lb	rod size A	R.H. thread length S	casing length B	casing diameter C	min thread engagement P	rod take-out N	space between channels W	P	Z
000	38	24	½	5	5⅝	4	15/16	1⅜	⅝	1½	13/16
00	82	26	½	5	7⅜	4		1⅜	⅝	1½	1 3/16
0	138	28	½	5	8 11/16	4	15/16	1 15/16	⅝	1½	⅜
1	200	29	½	5	7 9/16	4		1 15/16	⅝	1½	⅜
2	256	30	½	5	8 9/16	4		1 9/16	⅝	1½	1
3	332	37	½	5	7 9/16	5 9/16	15/16	2 1/16	⅝	2	1
4	448	38	½	5	7 15/16	5 9/16		2 7/16	⅝	2	1⅜
5	598	39	½	5	8⅜	5 9/16		1⅜	⅝	2	1 7/16
6	798	57	⅝	5	8 13/16	6⅝	15/16	1⅝	1	2	9/16
7	1064	63	⅝	5	9⅜	6⅝		1 11/16	1	2	⅝
8	1426	67	⅝	5	10⅛	6⅝		1 11/16	1	2	⅝
9	1900	123	¾	6	10⅞	8⅝	1⅛	2 1/8	1⅛	3	¾
10	2470	137	¾	6	12⅛	8⅝		3 1/16	1⅛	3	1 1/2
*11	3200	125	¾	6	9 15/16	6⅝		3 7/16	1⅛	3	1 7/16
12	4278	137	1	6	10 9/16	6⅝	1⅛	3 13/16	1½	4	1 1/16
*13	5700	175	1	7	13⅛	8⅝		3¼	1½	4	½
*14	7600	183	1¼	7	13¼	8⅝		3⅛	1½	4	⅜
15	10280	224	1⅛	7	13¾	8⅝	1 15/16	3 15/16	2⅛	4	1 7/8
16	14250	270	1½	8	16 1/16	8⅝		4⅛	2⅛	4	2 1/16
17	19000	326	1¾	8	16⅛	8⅝		4	2⅛	4	1 15/16
18	25290	630	2	9	18⅛	12¾	2 9/16	4	2⅜	4	2 9/16
19	33810	723	2¼	9	20⅛	12¾		4 1/16	2⅜	4	2 11/16
20	44650	933	2½	10	22⅛	12¾		4 1/16	2⅜	4	2 11/16
21	58378	1137	2¾	10	26 9/16	12¾	3⅛	4 9/16	3⅛	4	3 1/16
22	79162	1436	3	11	32⅛	12¾		4⅝	3⅛	4	3⅛

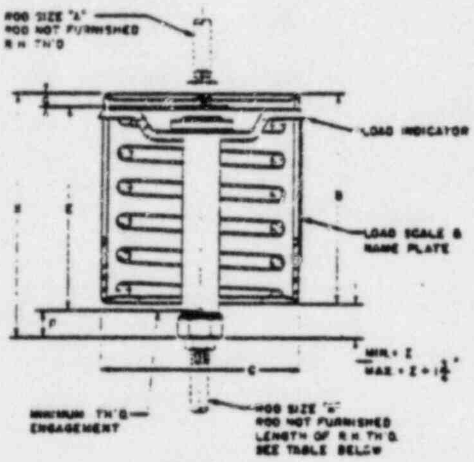
* Weight based on 24 inch center-to-center dimension. *Reflects change in rod size from previously published data.

ph-93

Attachment 6.26
QI-029
Rev. 3

Pre-Engineered spring hangers

short spring: fig. 82



TYPE A

The ITT Grinnell Pre-Engineered Short Spring Hanger, fig. 82, embodies all of the fig. B-268 features, and is designed to the same exacting specifications. This hanger is particularly applicable for use in confined areas where thermal movement of the piping is relatively small.

The minimum and maximum loads for the individual sizes of the fig. 82 are exactly the same as those for the fig. B-268.

This hanger is offered in the seven basic types as shown for the fig. B-268.

The load table and instructions for sizing this hanger may be found on page ph-88.

weights • dimensions (inches)

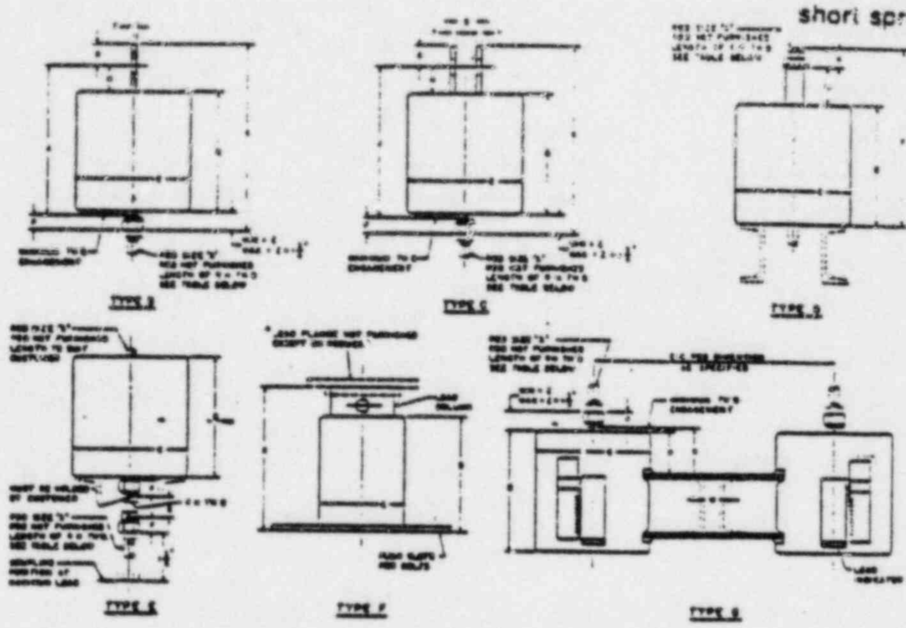
hanger size	rod size A	R.H. thd lgth	casing diam C	min thread engagement F	Z	casing length B type A, B, C, D, E, G	casing length B type F	rod take-out type A E	rod take-out type B, C J	rod take-out type E O	rod take-out type G K	thd depth type A G	types B, C lug hole size	types B, C height of pin H	types B, C R	types B, C clearance opening S	types B, C thickness T	type D rod length Y	type D dimension for nuts X	type D height of spacer W
0	[illegible]	3	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	[illegible]	3	4		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	3	4		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	2	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	3	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	3	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	3	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	4	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
*11	[illegible]	4	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	1	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	1	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
*13	1	4	[illegible]		1	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	1	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
*14	[illegible]	4	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	1	[illegible]	3	2	2	[illegible]	[illegible]	3	[illegible]
15	[illegible]	5	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	6	[illegible]	[illegible]	[illegible]	3	2	2	[illegible]	[illegible]	3	[illegible]
16	[illegible]	5	[illegible]		2	[illegible]	[illegible]	[illegible]	[illegible]	6	[illegible]	[illegible]	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	6	[illegible]		2	[illegible]	[illegible]	[illegible]	15	6	[illegible]	[illegible]	2	3	[illegible]	[illegible]	[illegible]	[illegible]	4	[illegible]
18	2	7	[illegible]	[illegible]	[illegible]	13	[illegible]	[illegible]	[illegible]	6	[illegible]	[illegible]	[illegible]	4	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	[illegible]	7	[illegible]		[illegible]	14	[illegible]	[illegible]	[illegible]	6	1	[illegible]	[illegible]	[illegible]	3	[illegible]	[illegible]	[illegible]	5	[illegible]
20	[illegible]	8	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	4	[illegible]	1	[illegible]	[illegible]	[illegible]
21	[illegible]	9	[illegible]	[illegible]	[illegible]	17	[illegible]	[illegible]	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	4	[illegible]	1	25	[illegible]	[illegible]
22	3	10	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7	[illegible]	3	[illegible]	5	4	[illegible]	1	[illegible]	[illegible]	[illegible]

*Reflects change in rod size from previously published data.

table continued

spring

short spring: fig. 82



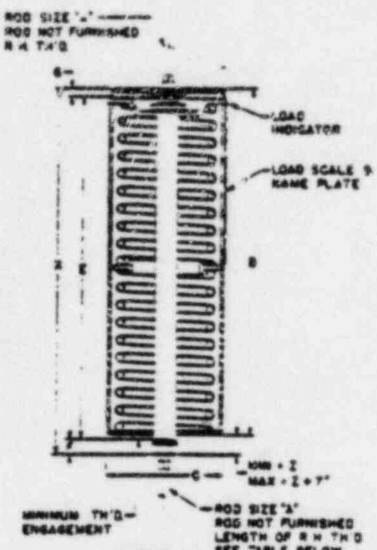
* Hanger take-out (type F only): Pipe movement up, cold to hot, installed height equals "X" dimension. Pipe movement down, cold to hot, installed height should be "X" dimension plus amount of vertical travel.
• Weight based on 24 inch center-to-center dimension.

hanger size	type F: bottom flange square	type F: bottom flange bolt circle min	type F: bottom flange bolt circle max	type F: bottom flange bolts	type F: steel bottom flange	type F: load col diam	type F: load flange diam Dc	type F: diam. of load flanges	type G: space between channels (note ?)	P	installed length X: type A min	type A max	types B, C min	types B, C max	types F* min	types F* max	weight (approx) lb. each: types A, B & C	types D, E	type F	type G•
0	7[illegible]	7	8[illegible]	[illegible]	[illegible]	1.900		[illegible]	[illegible]	1	5[illegible]	6[illegible]	8[illegible]	9[illegible]	8[illegible]	8[illegible]	5	4	10	25
1	7[illegible]	7	8[illegible]	[illegible]	[illegible]	1.900	3[illegible]	[illegible]	[illegible]	1	5[illegible]	6[illegible]	8[illegible]	9[illegible]	8[illegible]	8[illegible]	6	5	10	25
2	7[illegible]	7	8[illegible]	[illegible]	[illegible]	1.900		[illegible]	[illegible]	1	6[illegible]	7[illegible]	9[illegible]	10[illegible]	6[illegible]	7[illegible]	7	6	11	27
3	7[illegible]	7[illegible]	8[illegible]	[illegible]	[illegible]	2.875		[illegible]	[illegible]	1	5[illegible]	6[illegible]	8[illegible]	9[illegible]	6[illegible]	7	9	8	17	29
4	7[illegible]	7[illegible]	9[illegible]	[illegible]	[illegible]	2.875	5[illegible]	[illegible]	[illegible]	1	6[illegible]	7[illegible]	9[illegible]	10[illegible]	6[illegible]	7[illegible]	10	9	18	31
5	7[illegible]	7[illegible]	8[illegible]	[illegible]	[illegible]	2.875		[illegible]	[illegible]	1	6[illegible]	8[illegible]	9[illegible]	10[illegible]	7[illegible]	7[illegible]	11	10	19	32
6	9	8	10[illegible]	[illegible]	[illegible]	3.50		[illegible]	1	2	6[illegible]	8[illegible]	9[illegible]	10[illegible]	7[illegible]	8	17	16	30	45
7	9	8	10[illegible]	[illegible]	[illegible]	3.50	6[illegible]	[illegible]	1	2	7[illegible]	9	10[illegible]	11[illegible]	8[illegible]	9[illegible]	20	19	22	51
8	9	8	10[illegible]	[illegible]	[illegible]	3.50		[illegible]	1	2	7[illegible]	9	10[illegible]	11[illegible]	5[illegible]	5[illegible]	21	20	23	43
9	13[illegible]	10[illegible]	16[illegible]	[illegible]	½	4.50		½	1½	2	9[illegible]	10[illegible]	11[illegible]	13[illegible]	9[illegible]	10[illegible]	46	42	58	105
10	13[illegible]	10[illegible]	16[illegible]	[illegible]	½	4.50	8[illegible]	½	1½	2	9[illegible]	11[illegible]	12[illegible]	13[illegible]	9[illegible]	10[illegible]	52	48	74	117
11	13[illegible]	10[illegible]	16[illegible]	[illegible]	½	4.50		½	1½	2	5[illegible]	9[illegible]	11[illegible]	12[illegible]	6[illegible]	9[illegible]	45	41	56	101
12	13[illegible]	10[illegible]	16½	[illegible]	½	4.50		½	1½	1½	9[illegible]	9[illegible]	11[illegible]	13[illegible]	9[illegible]	9[illegible]	48	43	58	112
13	13[illegible]	10[illegible]	16½	[illegible]	½	4.50	8[illegible]	½	1½	3	9[illegible]	11[illegible]	13[illegible]	14[illegible]	10[illegible]	11[illegible]	58	53	71	134
14	13[illegible]	10[illegible]	16½	[illegible]	½	4.50		½	1½	3	9[illegible]	11[illegible]	14[illegible]	16[illegible]	10[illegible]	11[illegible]	62	55	61	139
15	13[illegible]	10[illegible]	16½	[illegible]	½	4.50		½	2[illegible]	1	11[illegible]	12[illegible]	16[illegible]	17[illegible]	10[illegible]	11[illegible]	74	65	86	172
16	13[illegible]	10[illegible]	16½	[illegible]	½	4.50	8[illegible]	½	2[illegible]	2	12[illegible]	14[illegible]	18[illegible]	19[illegible]	11[illegible]	12[illegible]	86	77	96	202
17	13[illegible]	10[illegible]	16½	[illegible]	½	4.50		½	2[illegible]	2	14[illegible]	15[illegible]	19[illegible]	20[illegible]	13[illegible]	14[illegible]	106	91	112	238
18	17[illegible]	15[illegible]	22	[illegible]	[illegible]	5.563		½	2[illegible]	½	15[illegible]	17	22[illegible]	23[illegible]	13[illegible]	14[illegible]	229	196	240	488
19	17[illegible]	15[illegible]	22	[illegible]	[illegible]	5.563	12[illegible]	½	2[illegible]	1	16[illegible]	18[illegible]	24[illegible]	25[illegible]	14[illegible]	15[illegible]	256	216	245	539
20	17[illegible]	15[illegible]	22	[illegible]	[illegible]	5.563		½	2[illegible]	[illegible]	19[illegible]	20[illegible]	27[illegible]	28[illegible]	16[illegible]	17[illegible]	320	272	314	569
21	17[illegible]	15[illegible]	22	[illegible]	[illegible]	5.563	12[illegible]	½	3[illegible]	1	20	21[illegible]	28[illegible]	29[illegible]	18	19	371	309	318	827
22	17[illegible]	15[illegible]	22	[illegible]	[illegible]	5.563		½	3[illegible]	3	24[illegible]	25[illegible]	33[illegible]	34[illegible]	22[illegible]	23[illegible]	460	401	413	1008

Pre-Engineered spring hangers

double spring: fig. 98

pipe hangers and supports



TYPE A

The ITT Grinnell Pre-Engineered Double Spring Hanger, fig. 98, embodies all of the fig. B-268 features, and is designed to the same exacting specifications. Each basic unit consists of two springs arranged in series within a single casing. A centering guide is provided to assure the permanent alignment of the spring assembly.

This hanger is offered in the seven basic types as shown for the fig. B-268.

The load table and instructions for sizing this hanger may be found on page ph- 88.

weights • dimensions (inches)

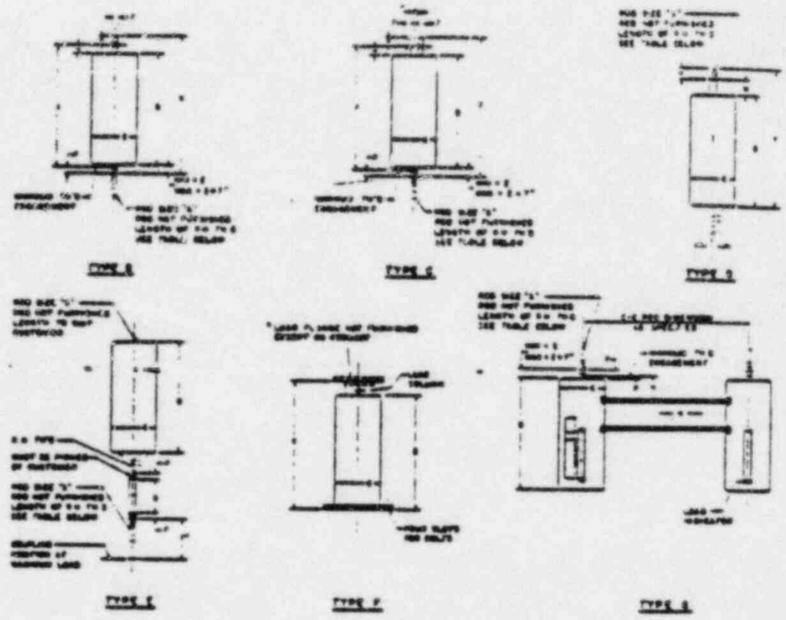
hanger size	A	R.H. thd lgth	C	F	Z	casing length B, in. types A, B, C, D, E, G	F	rod take-out types A: E	B, C: J	E: O	G: H	thread depth type A: G	types B, C	H	R	S	T	type D: Y	K	M
0	1/2	9	4		15/16	12¾	12 11/16	12 3/16	14 1/16	9	1½	7/16	11/16	1½	1¼	⅝	¼	19¾	1¼	5½
1	1/2	9	4	15/16	15/16	14¾	14 7/16	13 15/16	15 13/16	9	1½	7/16	11/16	1½	1¼	⅝	¼	21¼	1¼	5½
2	1/2	9	4		11/16	15⅞	15 15/16	15 3/16	17 5/16	9	1½	7/16	11/16	1½	1¼	⅝	¼	22¾	1¼	5½
3	1/2	9	5 9/16		13/16	14	14 1/16	13 7/16	15 9/16	9	1½	7/16	11/16	1½	1¼	⅝	¼	20¾	1¼	5½
4	1/2	9	5 9/16	15/16	1 5/16	15¾	15 5/16	15 3/16	16 13/16	9	2⅛	7/16	11/16	1½	1¼	⅝	¼	22	1¼	5½
5	1/2	9	5 9/16		11/16	16¾	16 11/16	15 15/16	18 1/16	9	1¼	7/16	11/16	1½	1¼	⅝	¼	23½	1¼	5½
6	5/8	9	6⅝		13/16	16 11/16	16 13/16	15 15/16	18 9/16	9	1½	⅝	13/16	1½	1¼	1 1/16	¼	23 11/16	1½	5½
7	5/8	9	6⅝	15/16	1⅛	18¾	18¾	18 3/16	20 5/16	9	2 3/16	⅝	13/16	1½	1¼	1 1/16	¼	25¾	1½	5½
8	5/8	9	6⅝		11/16	19 9/16	19 11/16	13 11/16	20 11/16	9	1¼	⅝	13/16	1½	1¼	1 1/16	¼	28 9/16	1½	5½
9	3/4	9	6⅝		15/16	20 9/16	20 3/16	19½	21¼	9	2 11/16	1	15/16	1½	1¼	1¼	¼	27 7/16	1¾	5½
10	3/4	9	8⅝	1¼	1	22¾	22½	21¾	23⅞	9	2¾	1	15/16	1½	1¼	1¼	¼	29⅝	1¾	5½
*11	3/4	10	8⅝		⅝	18½	18¼	16⅝	19⅝	12	2¾	1	15/16	1½	1¼	1¼	¼	25½	1¾	5½
12	1	10	8⅝		⅜	19½	19½	17⅞	20 13/16	12	3¼	1	1¼	2	1½	1¼	½	27⅞	2¼	5½
*13	1	10	8⅝	1¼	⅜	24¾	24¾	22⅞	26¾	12	3½	1	1¼	2	1½	1¾	½	32¾	2½	5½
*14	1¼	10	8⅝		½	24⅞	24⅞	23¼	27¼	12	3¾	1	1½	3	2	2	¾	33¾	3	5½
15	1¼	10	8⅝		2½	25¾	25	24 7/16	28¾	7	4 3/16	1¾	1½	3	2	2	¾	33¾	3	5½
16	1½	11	8⅝	1 13/16	2	29⅞	29¾	28 9/16	32 13/16	7	4 1/16	1¾	1¾	3	2½	2⅜	¾	38⅞	3½	5½
17	1¾	12	8⅝		2⅛	34	33¾	32 11/16	37 5/16	7	4 3/16	1¾	2	3	2½	2⅜	¾	43½	4	5½
18	2	12	12¾		2 11/16	33¾	32½	31¼	37⅞	7	4¾	2¼	2¾	4	3	2⅞	¾	43 9/16	4 9/16	5½
19	2¼	13	12¾	2 5/16	2 9/16	37¾	37	35½	42⅞	7	4	2¼	2¾	4½	3	3⅛	¾	48⅝	5	5½
20	2½	14	12¾		2 11/16	44¼	43½	42⅞	48¾	7	4⅛	2½	2⅞	4½	4	3⅜	1	55 3/16	5 9/16	5½
21	2¾	14	12¾	3⅛	2 11/16	48⅞	48¼	45 7/16	52 11/16	7	3 9/16	2¾	3¼	4½	4	3⅜	1	60¾	6¼	5½
22	3	15	12¾		3½	61	60¾	58¼	66¼	7	4¾	3	3¾	5	4	3⅞	1	73¾	6¾	5½

table continued

*Reflects change in rod size from previously published data.

spring

double spring: fig. 98

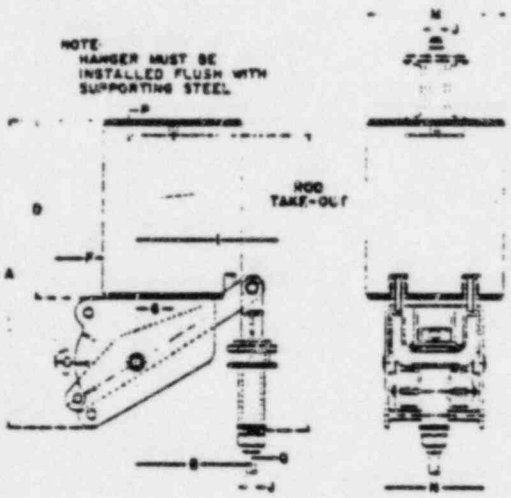


• Hanger take-out (type F only): Pipe movement up, cold to hot, installed height equals "X" dimension. Pipe movement down, cold to hot, installed height should be "X" dimension plus amount of vertical travel.
• Weight based on 24 inch center-to-center dimension.

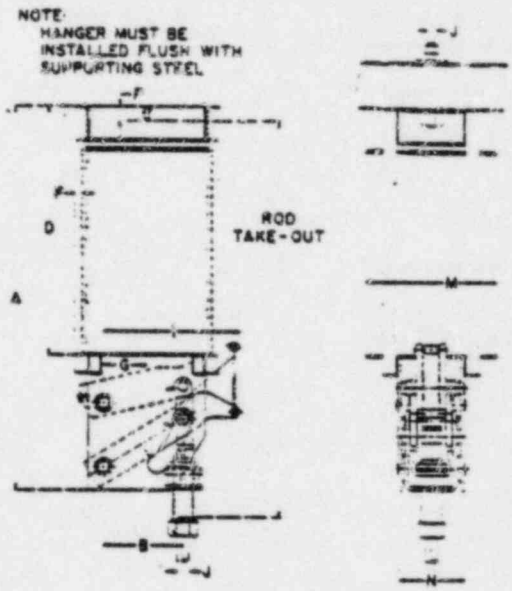
hanger size	type F: bottom load flange square	type F: bottom flange bolt circle min	type F: bolt circle max	type F: bolt holes	type F: max bolt	type F: load col. diam	type F: load flange diam Do	type F: thickness of load flange	type G	P	installed length X: type A min	type A max	types B, C min	types B, C max	type F min	type F max	weight (approx) lb each: types A, B, C	types D, E	type F	type G*
0	7 [illegible]	7	6 [illegible]	[illegible]	[illegible]	1.900	3 [illegible]	[illegible]/16	[illegible]	1 [illegible]	14 [illegible]/16	19 [illegible]/16	17 [illegible]/16	22 [illegible]/16	14 [illegible]	16 [illegible]	11	11	19	35
1	7 [illegible]	7	6 [illegible]	[illegible]	[illegible]	1.900		[illegible]/16	[illegible]	1 [illegible]	16 [illegible]/16	21 [illegible]/16	19 [illegible]/16	24 [illegible]/16	15 [illegible]/16	17 [illegible]/16	13	13	20	39
2	7 [illegible]	7	6 [illegible]	[illegible]	[illegible]	1.900		[illegible]/16	[illegible]	1 [illegible]	17 [illegible]/16	22 [illegible]/16	20 [illegible]/16	25 [illegible]/16	17 [illegible]/16	19 [illegible]/16	15	15	22	43
3	7 [illegible]	7 [illegible]	8 [illegible]	[illegible]	[illegible]	2.875	5 [illegible]	[illegible]/16	[illegible]	2	15 [illegible]/16	20 [illegible]/16	18 [illegible]/16	23 [illegible]/16	15 [illegible]	17 [illegible]	20	19	33	51
4	7 [illegible]	7 [illegible]	8 [illegible]	[illegible]	[illegible]	2.875		[illegible]/16	[illegible]	2	17 [illegible]/16	22 [illegible]/16	20 [illegible]/16	25 [illegible]/16	16 [illegible]	18 [illegible]	23	22	37	57
5	7 [illegible]	7 [illegible]	8 [illegible]	[illegible]	[illegible]	2.875		[illegible]/16	[illegible]	2	18 [illegible]/16	23 [illegible]/16	21 [illegible]/16	26 [illegible]/16	18 [illegible]	20 [illegible]	25	24	39	61
6	9	8	10 [illegible]	[illegible]	[illegible]	3.50	5 [illegible]	[illegible]	1	2	18 [illegible]	23 [illegible]	21 [illegible]	26 [illegible]	18 [illegible]	20 [illegible]	38	37	59	97
7	9	8	10 [illegible]	[illegible]	[illegible]	3.50		[illegible]	1	2	20 [illegible]	25 [illegible]	23 [illegible]	28 [illegible]	20 [illegible]/16	22 [illegible]/16	46	45	49	103
8	9	8	10 [illegible]	[illegible]	[illegible]	3.50		[illegible]	1	2	21 [illegible]	26 [illegible]	24	29	21 [illegible]	23 [illegible]	58	49	72	127
9	13 [illegible]	10 [illegible]/16	16 [illegible]	[illegible]	[illegible]	4.50	8 [illegible]	[illegible]	1 [illegible]	3	22 [illegible]	27 [illegible]	24 [illegible]	29 [illegible]	21 [illegible]	23 [illegible]	67	64	126	187
10	13 [illegible]	10 [illegible]/16	16 [illegible]	[illegible]	[illegible]	4.50		[illegible]	1 [illegible]	3	24 [illegible]	29 [illegible]	27 [illegible]	32 [illegible]	24 [illegible]/16	26 [illegible]/16	104	98	140	221
11	13 [illegible]	10 [illegible]/16	16 [illegible]	[illegible]	[illegible]	4.50		[illegible]	1 [illegible]	3	20 [illegible]	25 [illegible]	22 [illegible]	27 [illegible]	19 [illegible]/16	21 [illegible]/16	98	95	124	189
12	13 [illegible]	10 [illegible]/16	16 [illegible]	[illegible]	[illegible]	4.50	8 [illegible]	[illegible]	1 [illegible]	4	21 [illegible]	26 [illegible]	24 [illegible]	29 [illegible]	21 [illegible]/16	23 [illegible]/16	98	94	134	213
13	13 [illegible]	10 [illegible]/16	16 [illegible]	[illegible]	[illegible]	4.50		[illegible]	1 [illegible]	4	26 [illegible]	31 [illegible]	29 [illegible]	34 [illegible]	26 [illegible]/16	28 [illegible]/16	134	129	171	255
14	13 [illegible]	10 [illegible]/16	16 [illegible]	[illegible]	[illegible]	4.50		[illegible]	1 [illegible]	4	28 [illegible]	31 [illegible]	31 [illegible]	36 [illegible]	26 [illegible]/16	28 [illegible]/16	143	137	178	303
15	13 [illegible]	10 [illegible]/16	16 [illegible]	[illegible]	[illegible]	4.50	8 [illegible]	[illegible]	2 [illegible]	4	28 [illegible]	33 [illegible]	33 [illegible]	38 [illegible]	26 [illegible]/16	28 [illegible]/16	158	149	187	342
16	13 [illegible]	10 [illegible]/16	16 [illegible]	[illegible]	[illegible]	4.50		[illegible]	2 [illegible]	4	32 [illegible]	37 [illegible]	38 [illegible]	43 [illegible]	31 [illegible]/16	33 [illegible]/16	204	188	227	434
17	13 [illegible]	10 [illegible]/16	16 [illegible]	[illegible]	[illegible]	4.50		[illegible]	2 [illegible]	4	37 [illegible]	42 [illegible]	42 [illegible]	47 [illegible]	35 [illegible]/16	37 [illegible]/16	259	233	273	544
18	17 [illegible]	15 [illegible]	22	[illegible]	[illegible]	5.563	12 [illegible]	[illegible]	2 [illegible]	4	36 [illegible]/16	41 [illegible]/16	43 [illegible]/16	48 [illegible]/16	34 [illegible]/16	36 [illegible]/16	462	447	520	996
19	17 [illegible]	15 [illegible]	22	[illegible]	[illegible]	5.563	12 [illegible]	[illegible]	2 [illegible]	4	41 [illegible]/16	46 [illegible]/16	48 [illegible]/16	53 [illegible]/16	38 [illegible]/16	40 [illegible]/16	570	516	594	1171
20	17 [illegible]	15 [illegible]	22	[illegible]	[illegible]	5.563	12 [illegible]	[illegible]	2 [illegible]	4	47 [illegible]/16	52 [illegible]/16	56 [illegible]/16	61 [illegible]/16	45 [illegible]/16	47 [illegible]/16	772	693	777	1573
21	17 [illegible]	15 [illegible]	22	[illegible]	[illegible]	5.563	12 [illegible]	[illegible]	3 [illegible]	4	52 [illegible]/16	57 [illegible]/16	61 [illegible]/16	66 [illegible]/16	48 [illegible]	51 [illegible]	910	815	842	1905
22	17 [illegible]	15 [illegible]	22	[illegible]	[illegible]	5.563	12 [illegible]	[illegible]	3 [illegible]	4	65 [illegible]	70 [illegible]	74 [illegible]	79 [illegible]	62	64	1210	1110	1154	2508

constant supports

fig. 80-V type A
model R



sizes 10-63



sizes 64-83

Type A of the Figure 80-V Vertical Design model R Constant Support Hanger is designed for attachment to its supporting member by screwing a rod into a tapped hole in the top cap of hanger a distance equal to the "P" dimension plus ⅜ of an inch. Sight holes are provided near the top of the casing to allow visible inspection for correct thread engagement of upper hanger rod.

NOTES: See load travel tables on pages ph-108-111 for "B" dimension.

For weights see page ph-126.

dimensions (inches)

hanger size	A	D	F	G	I	diam M	N	P	Q	total travel	footprint	J-rod: min thread length	J-rod: min rod diam	J-rod: max rod diam
1-9	available in Fig. 81-H only													
10-18	16 7/16	8⅝	2	1½	•	8⅝	6¼	⅞	3½	3½ or less 4 or more	16 15/16 19¼	1¾ – TT	½	⅝
19-34	28¼	16	2½	2⅝	•	12¾	8⅝	1⅛	4	5 or less 5½ or more	27 9/16 30 7/16	2⅜ – TT	½	1¼
35-49	31 9/16	18¼	4⅜	3⅜	•	14	9 9/16	1½	5½	6 or less 6½ or more	32⅜ 37	3¼ – TT	½	1⅜
50-63	46⅝	28½	8 9/16	5⅞	•	18	11⅛	2	8½	11 or less 11½ or more	46½ 51⅜	4¼ – TT	⅝	2¼
64-74	67½	44⅛	1 3/16	7½	25⅜	22 3/16	11	2½	–	10½ or less 11 or more	77⅜ 77⅞	5¾ – TT	1	2¾
75-83	69½	46⅛	1½	7½	25⅜	27 3/16	11	3	–	10½ or less 11 or more	78 3/16 78 5/16	5¾ – TT	1½	3 1/16•
84-110	see page ph-119													

• Rod take-out = (factor minus $\left(\frac{\text{total travel}}{2}\right)$

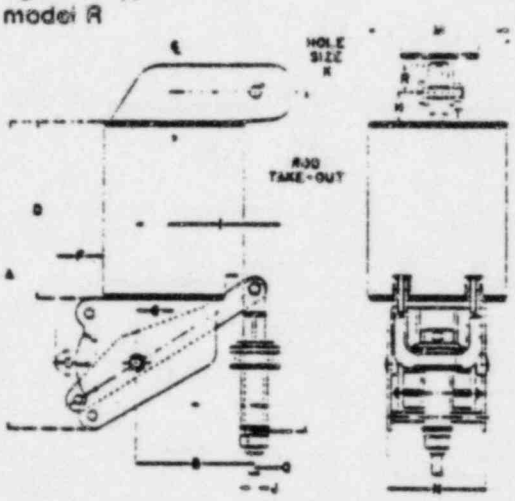
• "T" dimension for sizes 10 through 53 equals "B" plus "Q"

J-rod selection chart

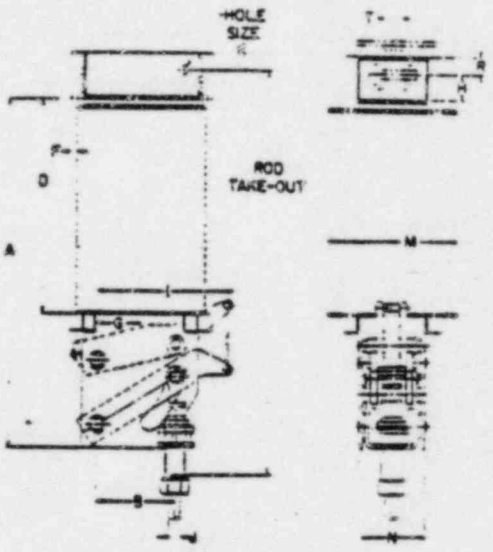
load lb	0 800	801 1500	1501 2540	2541 4000	4001 6100	6101 9400	9401 13400	13401 18300	18301 24700	24701 31000	31001 39000	39001 48000	48001 58000
rod diam	½	⅝	¾	1	1¼	1½	1¾	2	2¼	2½	2¾	3	3 1/16•

• 3 1/16 inch is furnished with 8 UN series threads.

fig. 80-V type B
model R



Sizes 10-63



Sizes 64-83

Type B is furnished with a single lug for attachment to the building structure. The lug permits use of a Figure 66 welded beam attachment, a Figure 299 clevis or a pair of angles for attachment where headroom is limited.

NOTES: See load travel tables on pages pn-108-111 for "S" dimensions.

For weights see page pn-126.

dimensions (inches)

hanger sizes	A	D	F	G	H	I	diam M	N	O	R	T	total travel	hex bore	J-rod min thread length	J-rod min rod diam	J-rod max rod diam
1-6	available on fig. 81-H only															
10-18	19 9/16	8 3/4	2	1 1/2	1 1/2	●	8 1/2	6 3/4	3 1/2	1 1/2	1/2	3 1/2 or less 4 or more	12 9/16 21 1/4	1 3/4 - 7T	1/2	1 1/4
19-34	28 1/4	16	2 1/2	2 1/4	2	●	12 3/4	8 1/4	4	1 1/2	1/2	5 or less 5 1/2 or more	31 1/16 33 9/16	2 1/2 - 7T	1/2	1 1/2
35-40	31 9/16	18 1/4	4 1/4	3 3/4	3	●	14	9 9/16	5 1/2	1 1/2 K-hole and smaller 1 1/2 1 3/4 K-hole and larger 2	1/2	6 or less 6 1/2 or more	36 1/8 41 1/2	3 1/4 - 7T	1/2	1 3/4
50-63	46 1/8	28 1/4	8 1/16	5 1/4	4	●	18	11 1/4	6 1/2	1 9/16 K-hole, 1 1/2 1 3/4 thru 1 7/8 K-hole 2 2 1/2 K-hole and larger 3	1	11 or less 11 1/2 or more	52 1/2 57 1/8	4 1/2 - 7T	1/4	2 1/4
64-74	60 1/2	37 1/4	10 1/16	7 1/2	4 1/2	25 1/4	22 1/16	11	—	3	2	10 1/2 or less 11 or more	77 1/2 77 1/4	5 1/4 - 7T	1 1/2	2 1/4
75-83	61 1/4	38	11 1/2	7 1/2	3 3/4	25 1/4	27 1/16	11	—	3 1/4	2 1/2	10 1/2 or less 11 or more	77 1/16 78 1/4	5 1/4 - 7T	1 1/2	2 1/4
84-110	see page pn-119															

• Rod take-out = (factor minus $\left(\frac{\text{total travel}}{2}\right)$

• "T" dimension for sizes 10 through 63 equals "S" plus "O"

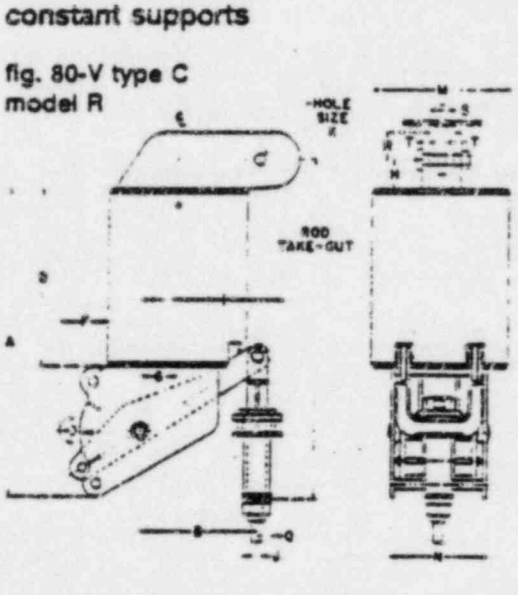
J-rod — K-hole selection chart

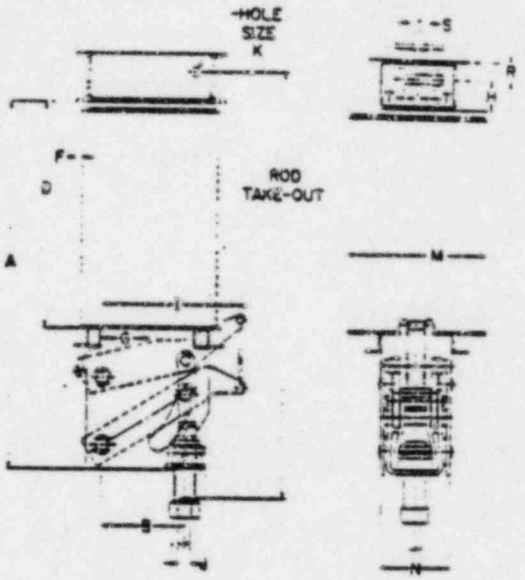
load lb	0 - 900	901 - 1500	1501 - 2540	2541 - 4000	4001 - 6100	6101 - 9400	9401 - 13400	13401 - 18300	18301 - 24700	24701 - 31000	31001 - 39000	39001 - 48000	48001 - 58000
J-rod size	1/2	5/8	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4•
K-hole size	1 1/16	1 5/16	1 5/16	1 5/8	1 7/8	1 7/8	2	2 1/4	2 1/4	2 5/8	3 1/4	3 1/4	3 1/4

• 3 1/4 inch is furnished with 8 UN series threads.

constant supports

fig. 80-V type C
model R





Type C is furnished with a pair of lugs for attachment to the building structure. These lugs permit the use of an eye rod or a single plate for attachment where headroom is limited.

Sizes 64-83

NOTES: See load travel tables on pages ph-108-111 for "B" dimension.

For weights see page ph-126.

dimensions (inches)

hanger sizes	A	D	F	G	H	I	diam M	N	Q	R	T	total travel	take-out	J-rod: min thread length	J-rod: min rod diam	J-rod: max rod diam
1-9	available on fig. 81-H only															
10-18	18 7/16	6 5/8	2	1 1/2	1 1/2	*	8 5/8	6 5/8	3 1/2	1 1/2 *	3/4	3 1/2 or less 4 or more	19 9/16 21 1/16	1 1/4 + TT	1/2	3/4
19-34	28 5/8	10	2 1/2	2 1/2	2	*	12 3/4	8 5/8	4	1 1/2	3/4	5 or less 5 1/2 or more	31 11/16 33 3/16	2 1/2 + TT	1/2	1 1/4
35-49	31 9/16	16 1/4	4 1/4	3 1/4	3	*	14	9 11/16	5 1/2	1 1/4 K-hole and smaller, 1 1/2 1 1/2 K-hole and larger, 2	1	6 or less 6 1/2 or more	36 1/2 41 1/16	3 1/4 + TT	1/2	1 1/4
50-63	46 1/4	23 1/8	6 1/16	5 1/2	4	*	18	11 1/4	6 1/2	1 9/16 K-hole, 1 1/2 1 1/2 thru 1 1/4 K-hole, 2 1 1/2 K-hole and larger, 3	1	11 or less 11 1/2 or more	52 1/2 57 1/4	4 1/4 + TT	1	2 1/2
64-74	60	38 1/4	1 11/16	7 1/16	5	2 5/8	22 9/16	11	—	3	1 1/2	10 1/2 or less 11 or more	77 1/16 77 3/4	5 1/4 + TT	1 1/2	2 1/2
75-83	60 1/2	37 1/4	1 1/2	7 1/2	4 1/4	2 5/8	27 11/16	11	—	3 1/4	1	10 1/2 or less 11 or more	77 15/16 78 11/16	5 1/4 + TT	1 1/2	3 1/4 *
84-110	see page ph-119															

* Rod take-out = (factor minus $\left(\frac{\text{total travel}}{2}\right)$

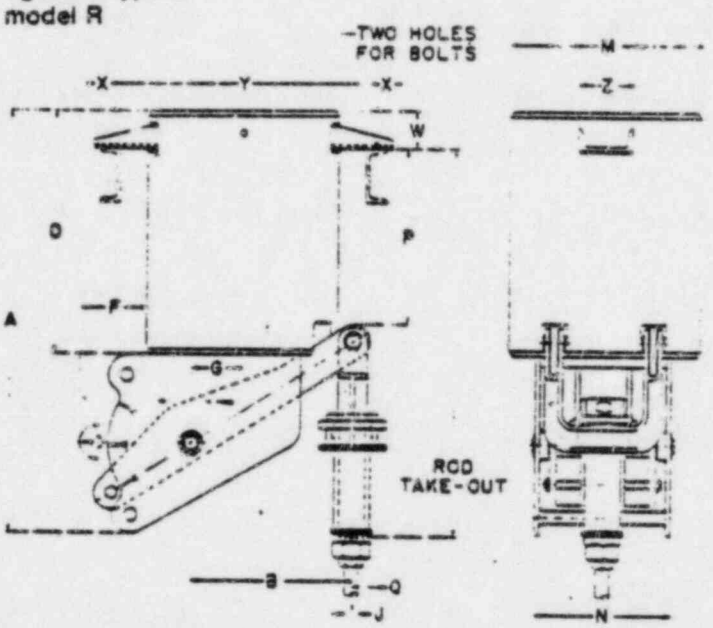
* "T" dimension for sizes 10 through 63 equals "B" plus "Q".

J-rod — K-hole selection chart

load lb	0 - 800	801 - 1500	1501 - 2540	2541 - 4000	4001 - 6100	6101 - 9400	9401 - 13400	13401 - 18300	18301 - 24700	24701 - 31000	31001 - 39000	39001 - 48000	48001 - 58000
J-rod size	1/2	5/8	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4 *
K-hole size	1 1/16	1 5/16	1 9/16	1 3/4	1 1/2	1 3/4	2	2 1/4	2 1/4	2 1/2	2 3/4	3 1/4	3 1/4
B	1/2	1 1/16	1 1/4	1 1/4	2	2 1/4	2 1/4	2 1/4	3 1/4	3 1/4	3 1/4	3 1/4	4 1/4

* 3 1/4 inch is furnished with 8 UN series threads.

fig. 80-V type D
model R



Type D rests on top of structural steel while most of the constant support itself hangs between or below the supporting beams. The depth of the beam is limited by the "P" dimension. Dimension "P" can be varied on special order, however, "P" dimension shown is maximum for the hanger.

NOTES: See load travel tables on pages ph-108-111 for "B" dimension.

For weights see page ph-128.

dimensions (inches)

hanger size	A	O	F	G	diam M	N	Q	P	W	X	Y	Z	bracket hole diam	total travel	toleration	J-rod: min thread length	J-rod: min rod diam	J-rod: max rod diam
1-9	available on fig. 81-H only																	
10-18	16 7/16	8 1/8	2	1 1/2	6 1/8	6 1/4	3 1/2	4 15/16	2 1/8	1 1/2	10 3/8	3	3/4	3 1/2 or less 4 or more	15 1/2 17 5/16	1 1/4 - 7T	1/2	3/4
19-34	26 1/4	16	2 1/2	2 1/2	12 1/8	5 1/4	4	12 1/2	2 1/4	1 1/2	14 1/2	3	1	5 or less 5 1/2 or more	26 11/16 28 13/16	2 1/4 - 7T	1/2	1 1/4
35-49	31 9/16	18 1/4	4 1/4	3 1/4	14	8 1/16	5 1/2	13 1/2	2 1/4	2	16 1/4	4	1 1/4	6 or less 6 1/2 or more	31 1/4 35 3/4	3 1/4 - 7T	1/2	1 3/4
50-83	46 3/4	28 1/2	6 9/16	5 1/2	18	11 1/4	8 1/2	24 1/2	2 1/2	3	21	6	1 1/4	11 or less 11 1/2 or more	45 7/16 50 3/4	4 1/4 - 7T	1/2	2 1/2
84-83	available on fig 81-H only																	
84-110	not available																	

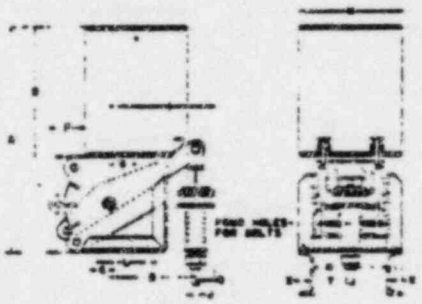
* Rod take-out = (factor minus $\left(\frac{\text{total travel}}{2}\right)$

J-rod selection chart

load lb	0 - 500	501 - 1500	1501 - 2540	2541 - 4000	4001 - 6100	6101 - 9400	9401 - 13400	13401 - 18300	18301 - 24700
rod diam	1/2	5/8	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/2

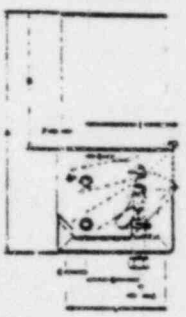
constant supports

fig. 80-V type E
model R



Sizes 10-63

Sizes 64-74



Sizes 75-83

Type E rests on the top flange of structural steel and the constant support is entirely above the supporting beams.

If rod take-out does not exceed the depth of the supporting steel and the rod coupling is required to extend below the steel, specify the depth of the supporting steel. Increase rod take-out by depth of the steel.

NOTES: See load travel tables on pages ph-108-111 for "B" dimension.

For weights see page ph-126.

dimensions (inches)

hanger sizes	A	C	D	F	G	I	L	slots M	N	Q	X	Y	angle size	bracket hole diam	total travel	factory	J-rod: min thread length	J-rod: min rod diam	J-rod: max rod diam
1-9	available in fig 81-H only																		
10-18	16 7/16	1 1/2	8 3/8	2	1 1/2	•	4 5/16	9 3/4	8 1/4	3 1/2	3/4	8 7/16	1 1/2 x 1 1/2 x 1/4	3/4	3 1/2 or less 4 or more	1 7/16 3 1/4 •	1 3/4 + TT	1/2	3/4
19-34	28 1/4	1 15/16	16	2 1/2	2 1/2	•	6 11/16	12 3/4	8 3/4	4	1/2	10 5/16	1 1/2 x 1 1/2 x 1/4	3/4	5 or less 5 1/2 or more	2 3/16 4 3/16	2 1/2 + TT	1/2	1 1/2
36-49	31 1/16	1 3/4	18 1/4	4 1/4	3 1/4	•	8 1/16	14	9 13/16	5 1/2	1 5/16	12 3/4	2 x 2 x 1/4	7/8	6 or less 6 1/2 or more	2 1/2 7 1/2	3 1/4 + TT	1/2	1 1/4
50-63	46 3/4	3 1/4	28 1/4	8 1/16	5 1/2	•	12 13/16	18	11 1/4	6 1/2	1 5/16	14 11/16	3 x 3 x 1/4	1 1/4	11 or less 11 1/2 or more	1 3/4 7	4 1/4 + TT	1/2	2 1/2
64-74	62	1/4	35 3/4	1/4	7 1/2	25 3/4	15 3/4	22 1/16	11	...	1 5/16	14 13/16	3 1/2 x 3 1/2 x 1/2	1 1/4	10 1/2 or less 11 or more	9 1/4 9 1/2	5 3/4 + TT	1 1/2	2 1/4
75-83	62 1/2	5 1/4	35 3/4	1 1/2	7 1/2	25 1/2	25 1/4	27 1/16	11	...	1 3/4	15 1/2	4 x 4 x 1/4	1 1/4	10 1/2 or less 11 or more	8 3/4 8 1/2	5 3/4 + TT	1 1/2	3 1/4 •
84-110	not available																		

• Rod take-out = (factor) minus $\left(\frac{\text{total travel}}{2}\right)$

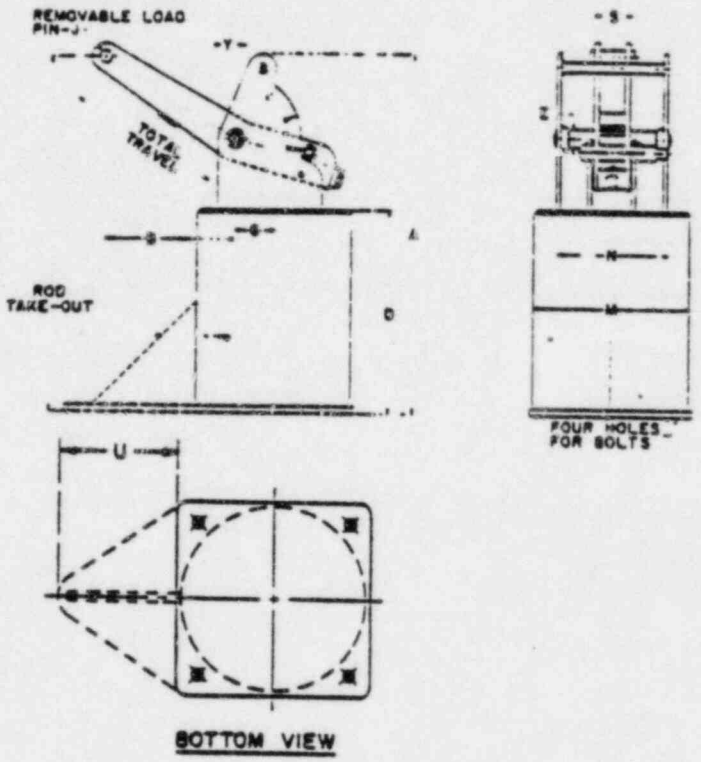
• "T" dimension for sizes 10 through 63 equals "B" plus "C".

J-rod selection chart

load lb	0 800	801 1500	1501 2540	2541 4000	4001 6100	6101 9400	9401 13400	13401 18300	18301 24700	24701 31000	31001 39000	39001 48000	48001 58000
rod diam	1/2	5/8	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4 •

• 3 1/4 inch is furnished with 8 UN series threads.

fig. 80-V type F model R



hanger sizes	total travel in.	U in.
1-3 to 18	5 thru 8	5
19 to 34	7 thru 10	7½
35 to 49	6½ thru 9 9½ thru 14	7 11½
50 to 63	7 thru 10 10½ thru 16	8½ 14

Type F is for support of piping or equipment from below. It has a base flange for fastening to the floor or to beams. The load arm is furnished with a removable load pin. The intermediate strut which runs from the load arm to the piping is not furnished and must be ordered separately, designed to the specific requirement.

NOTES: See load travel tables on pages ph-108-111 for "S" dimension.

For weights see page ph-126.

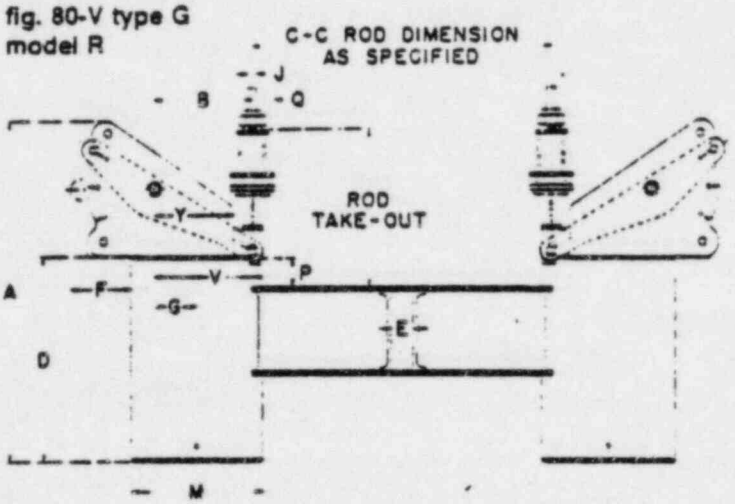
dimensions (inches)

hanger sizes	A	D	G	M	N	S	Y	Z	bottom flange square	flange bolt circle	flange hole diam	flange thickness	flange factors	total travel	J-diam
1-9	not available														
10-18	18¾	3¾	11½	9⅛	5½	1	1	27/32	9	10	7/16	⅛	12⅛	5½ or less 6 or more	⅜ ½
19-34	25⅜	14 11/16	2⅛	12⅜	8⅜	1 9/16	1	1¼	13	15	⅝	⅜	20⅛	4 or less 4½ or more	1⅛ ⅞
35-49	32⅜	18½	3 11/16	14	9 15/16	2¼	1½	1⅝	14½	17	⅞	½	25½	7 or less 7½ or more	1½ 1⅛
50-63	46¾	28⅜	5⅛	18	11⅛	2¼	1⅝	2	18½	21	1⅛	⅝	38½	8 or less 8½ or more	2 1½
64-110	not available														

* Rod take-out = (factor plus $\left(\frac{\text{total travel}}{2}\right)$

constant supports

fig. 80-V type G model R



NOTES: See load travel tables on pages ph-108-111 for "B" dimension.

For weights see page ph-126.

Type G is a complete trapeze assembly. The hanger consists of two vertical type constant support units plus a pair of channels, back-to-back, welded at each end to the hanger casing.

In sizing a Type G hanger, it must be remembered that each standard spring unit carries one-half of the total pipe load. Furthermore, the weight of the hanger itself must be considered as part of the overall load. Therefore, using one-half the total pipe load, select the required hanger size from the Load-Travel table and add one-half the weight of the size hanger selected to one-half the total pipe load. If the load now exceeds the maximum load at the required total travel for the hanger size selected, it is necessary to go to the next larger hanger. If the pipe line is designed so as not to be centered on the channel, one spring of the trapeze will carry a heavier load than the other and care must be taken in sizing the individual hanger units. The center-to-center rod dimension must be specified when ordering. The minimum C-C dimension can be determined as follows:

B plus Q greater than Y: O.D. of pipe covering plus 2Q.

B plus Q less than Y: O.D. of pipe covering plus 2 (Y minus B).

NOTE: If U-bolt is used to fasten pipe to channels, C-C of U-bolt tangents plus one washer plate width cannot be greater than C-C of the hanger rods minus 2 (V minus B).

dimensions (inches)

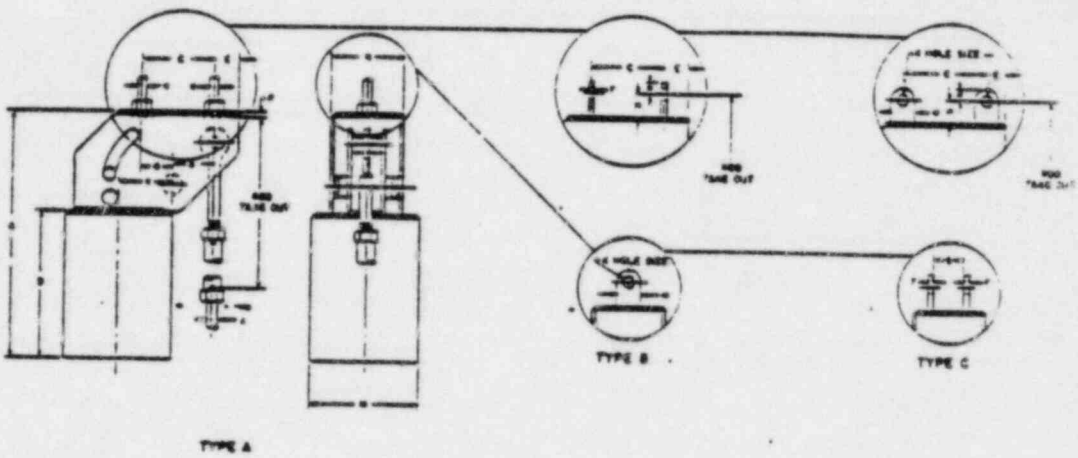
hanger size	A	D	E	F	G	diam M	N	P	Q	V	Y	channel size	total travel	* toe-tare	J-rod: min thread length	J-rod: min rod diam	J-rod: max rod diam
1-9	not available																
10-18	16 7/16	9 1/8	1	2	1 1/2	6 1/8	See Type A	2 5/16	3 1/2	5 13/16	3 5/16	4 @ 5.4 lb/ft	3 1/2 or less 4 or more	11 11/16 14	1 1/4 - 7T	1/2	3/4
19-34	28 1/4	16	1 1/4	2 1/4	2 1/4	12 1/4		3 5/16	4	9	6 1/4	6 @ 10.5 lb/ft	5 or less 5 1/2 or more	15 7/16 18 1/4	2 1/4 - 7T	1	1 1/4
35-49	31 5/16	18 1/4	1 1/2	4 1/4	3 1/4	14		3 7/16	5 1/2	10 1/4	8	10 @ 15.3 lb/ft	6 or less 6 1/2 or more	19 1/4 23 1/2	3 1/4 - 7T	1/2	1 1/4
50-63	46 1/4	28 1/4	2 1/4	6 1/16	5 1/8	18		4	6 1/2	14 1/4	10 5/16	12 @ 20.7 lb/ft	11 or less 11 1/2 or more	24 1/4 30	4 1/4 - 7T	1/4	2 1/4
64-110	not available																

* Rod take-out = (factor minus $\left(\frac{\text{total travel}}{2}\right)$

J-rod selection chart

load lb per spring	0 - 800	801 - 1500	1501 - 2540	2540 - 4000	4001 - 6100	6101 - 9400	9401 - 13400	13401 - 18300	18301 - 24700
rod diam	1/2	3/4	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4

**fig. 80-V types A, B and C
model R, sizes 84 to 110**



Types A, B and C sizes 84 to 110, for large loads and long travels, provide for basically the same methods of upper attachment as sizes 10 to 83 shown on pages ph-112-114.

NOTES: See load travel tables on pages ph-108-111 for "B" dimension.

For weights see page ph-126.

dimensions (inches)

hanger size	total travel	A	C types A & B	C type C	D	E types A & B	E type C	G types A & B	G type C	H	M	N	P	X	factory type A	factory types B & C	J-rod min thd length	J-rod rod diam min	J-rod rod diam max
84-94	9½ or less	75¾	16	15	49¾	4	4½	1½	1	6	24	10½	3	12	45¾	54¾	10	2	3¾ •
	10 or more														55½	64½	13		
96-110	14 or less	100	24	23	64	4	4½	7½	7	6	24	11½	3½	13½	58½	68	12	2½	3¾ •
	14½ or more														65¾	74⅞	15		

• Rod take-out = (factor) minus (.75 × total travel)

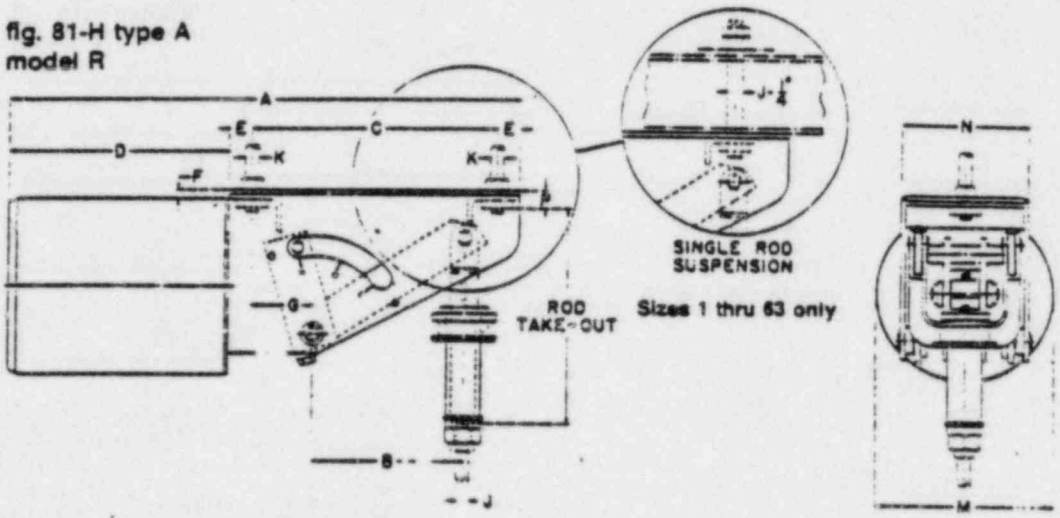
J-Rod — K-Rod — K-Hole Selection Chart

load (lb)	14378 18300	18301 24700	24701 31300	31301 39300	39001 48700	44001 58000	58001 69000	69001 87500
J & K-Rods	2	2½	2½	2¾	3	3½ •	3½ •	3¾ •
K-Hole	2¾	2¾	2⅞	3⅛	3⅜	3⅜	3⅞	4⅛
R	3	3	4	4	4	4½	4½	4½
S	2⅞	3⅛	3⅜	3⅜	3⅞	4⅛	4⅜	4⅜
T (Type B)	¾	¾	1	1	1	1	1½	1¾
T (Type C)	¾	¾	1	1	1	1	1⅛	1⅛
W	8	8	8	8	8	9	9	9

• 3½ and larger are furnished with 8 UN series threads.

constant supports

fig. 81-H type A model R



Type A of the Figure 81-H Horizontal Design model R Constant Support Hanger is designed for attaching to its supporting member by screwing two rods into tapped holes in the top of the hanger frame a distance equal to the "P" dimension plus ⅜ of an inch. Sizes 1 to 9 are furnished with swivel eye and turnbuckle instead of yoke and coupling.

NOTES: Also available for single rod suspension as indicated above. When ordering specify "for single rod suspension."

See load travel tables on pages ph-108-111 for "B" dimension.

For weights see page ph-126.

dimensions (inches)

hanger sizes	total travel	A	C	D	E	P	G	M	N	P	fac-tors	J-rod: min thread length	J-rod: min rod diam	J-rod: max rod diam
1-8	4 or less 4½ or more	13 15/16 17 5/16	8 10	5 5/16	1	⅞	2	6⅛	4⅛	13/16	12¾ 15 5/16	1⅛ – TT	½	½
10-18	3½ or less 4 to 5 5½ or more	18 7/16 18 7/16 21 7/16	8 8 11	8 7/16	1	½	2 9/16	6 9/16	6⅛	11/16	10⅝ 13⅛ 13⅝	1⅜ + TT	½	⅝
19-34	5 or less 5½ or more	26 13/16 31 1/16	10 14⅛	14 7/16	1⅛	⅝	3⅛	12 7/16	5⅜	1⅛	16⅜ 18½	2⅜ – TT	½	1⅛
35-49	6 or less 6½ or more	31 9/16 39 9/16	11 19	17 7/16	1⅜	11/16	4⅜	13⅜	9 15/16	1⅜	19 1/16 23 11/16	3⅛ – TT	½	1⅜
50-63	8 or less 8½ to 11 11½ or more	45 5/16 53 5/16 53 5/16	16 24 24	28 5/16	1 11/16	15/16	7 1/16	17 11/16	11½	1⅝	24 15/16 24 15/16 30½	4⅛ – TT	⅝	2½
64-74	10½ or less 11 or more	57½ 63	15¾ 21½	35¾	3	3⅛	5⅛	22 3/16	11	3 7/16	34 7/16 34 9/16	5¾ – TT	1⅛	2⅜
75-83	10½ or less 11 or more	57½ 63	15¼ 20¾	35¾	3⅛	3⅜	5	27 3/16	11	4⅛	36½ 35⅜	5¾ – TT	1½	3 1/16*
84-110	see page ph-125													

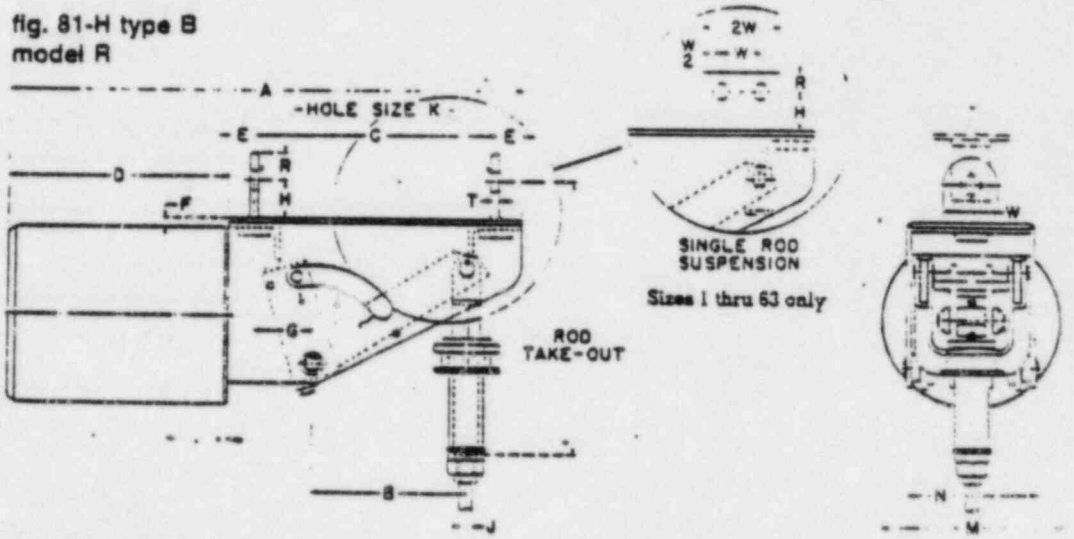
* Rod take-out = (factor) minus $\left(\frac{\text{total travel}}{2}\right)$

J-rod — K-rod selection chart

load lb	0 800	801 1500	1501 2540	2541 4000	4001 6100	6101 9400	9401 13400	13401 18300	18301 24700	24701 31000	31001 39000	39001 48000	48001 58000
rod diam	½	⅝	¾	1	1¼	1½	1¾	2	2¼	2½	2¾	3	3 1/16*

* 3 1/16 inch is furnished with 8 UN series threads.

fig. 81-H type B model R



Type B is furnished with two lugs — one at each end of the hanger frame. These lugs permit use of Figure 66 welded beam attachments, clevises or angle clips for attachment where headroom is limited. Sizes 1 to 9 are furnished with swivel eye and turnbuckle instead of yoke and coupling.

NOTES: Also available for single rod suspension as indicated above. When ordering specify "for single rod suspension."

See load travel tables on pages ph-108-111 for "B" dimension.

For weights see page ph-126.

dimensions (inches)

hanger sizes	load travel	A	C	D	E	F	G	H	M	N	loc-tors	J-rod: min thread length	J-rod: min rod diam	J-rod: max rod diam
1-9	4 or less 4½ or more	13 5/16 17 5/16	5½ 9½	5 5/16	1¼	⅞	1¾	1½	6⅛	4⅛	14⅝ 17⅞	1¾ - TT	½	½
10-18	3½ or less 4 to 5 5½ or more	18 7/16 18 7/16 21 7/16	7½ 7½ 10½	8 7/16	1½	½	2 9/16	1½	8 9/16	6¼	13 7/16 15 7/16 15 7/16	1¾ - TT	½	¾
19-34	5 or less 5½ or more	26 5/16 31 7/16	9⅜ 13⅞	14 7/16	1⅞	⅝	3¾	2	12 7/16	8¾	19½ 21⅝	2⅜ - TT	½	1¼
35-49	6 or less 6½ or more	31 5/16 39 5/16	10½ 18½	17 7/16	2	11/16	4½	3	13⅜	9 5/16	23 7/16 28 7/16	3½ - TT	½	1¾
50-63	8 or less 8½ to 11 11½ or more	45 5/16 53 5/16 53 5/16	13¾ 21⅜ 21¾	28 5/16	3	15/16	6⅝	4	17 11/16	11¼	30 11/16 30 11/16 36	4¼ - TT	¾	2½
64-74	10½ or less 11 or more	57½ 63	15⅛ 20¾	35¾	3½	3½	5	4½	22 1/16	11	42⅞ 42½	5¾ - TT	1	2¾
75-83	10½ or less 11 or more	57½ 63	14⅜ 20⅛	35¾	3½	3⅜	4⅜	5	27 1/16	11	45⅜ 45⅞	5¾ - TT	1½	3½ ▲
84-110	see page ph-125													

J-rod — K-hole selection chart

load lb	0 800	801 1500	1501 2540	2541 4000	4001 6100	6101 9400	9401 13400	13401 18300	18301 24700	24701 31000	31001 39000	39001 48000	48001 58000
J-rod	½	⅝	¾	1	1⅛	1½	1⅝	2	2½	2½	2⅝	3	3½ •
K-hole size	11/16	13/16	15/16	1⅛	1⅜	1¾	2	2⅛	2⅜	2⅝	3⅛	3⅜	3⅝
R	1⅛	1⅛	1⅛	1½	2	2½	2½	3	3	4	4	4	4½
T	½ A	½ A	⅝	⅞	⅝	⅝	¾	¾	¾	1	1	1	1
W	2½	2½	2½	3	4	5	5	6	6	8	8	8	9

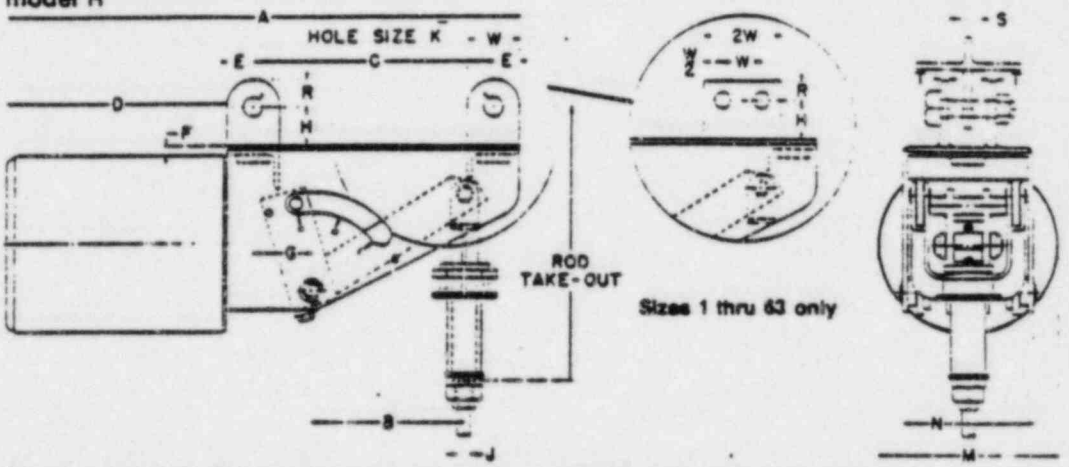
* Rod take-out = (factor) minus $\left(\frac{\text{total travel}}{2}\right)$

▲ ⅛ inch for single rod suspension.

• 3½ inch is furnished with 8 UN series threads.

constant supports

fig. 81-H type C
model R



Type C is furnished with two pairs of lugs, one pair of lugs at each end of the hanger frame. These lugs permit the use of two eye rods or two single plates for attachment where headroom is limited. Sizes 1 to 9 are furnished with swivel eye and turnbuckle instead of yoke and coupling.

NOTES: Also available for single rod suspension as indicated above. When ordering specify "for single rod suspension."

See load travel tables on pages ph-108-111 for "B" dimension.

For weights see page ph-126.

dimensions (inches)

hanger sizes	total travel	A	C	D	E	F	G	H	M	N	box-to-box	J-rod: min thread length	J-rod: min rod diam	J-rod: max rod diam
1-9	4 or less 4½ or more	13 1/16 17 1/16	5½ 9½	5 5/16	1¼	⅝	1⅜	1½	6⅛	4⅛	14⅝ 17 5/16	1⅛ – T**	½	½
10-18	3½ or less 4 to 5 5½ or more	18 7/16 18 7/16 21 7/16	7½ 7½ 10½	8 7/16	1¼	½	2 9/16	1½	8 9/16	6⅛	13 7/16 15 7/16 15 7/16	1⅛ – TT	½	⅝
19-34	5 or less 5½ or more	28 1/16 31 1/16	8½ 12½	14 7/16	2	⅝	3⅛	2	12 7/16	8⅛	19½ 21⅝	2⅛ – TT	½	1⅛
35-49	6 or less 6½ or more	31 1/16 39 1/16	9½ 17½	17 7/16	2½	1 1/16	4	3	13⅛	9 9/16	23 7/16 28 1/16	3⅛ – TT	½	1⅜
50-63	8 or less 8½ to 11 11½ or more	45 9/16 53 9/16 53 9/16	13⅜ 21⅜ 21⅜	26 9/16	3	1 9/16	6⅜	4	17 11/16	11⅛	30 11/16 30 11/16 36	4⅛ – TT	⅝	2⅛
64-74	10½ or less 11 or more	57½ 63	13⅜ 19¼	35⅜	4	3⅛	4⅛	4½	22 3/16	11	42⅜ 42½	5⅛ – TT	1¼	2⅜
75-83	10½ or less 11 or more	57½ 63	12⅜ 18⅛	35⅜	4½	3⅜	3⅜	5	27 3/16	11	45⅜ 45⅝	5⅜ – TT	1½	3 1/16
84-11C	see page ph-125													

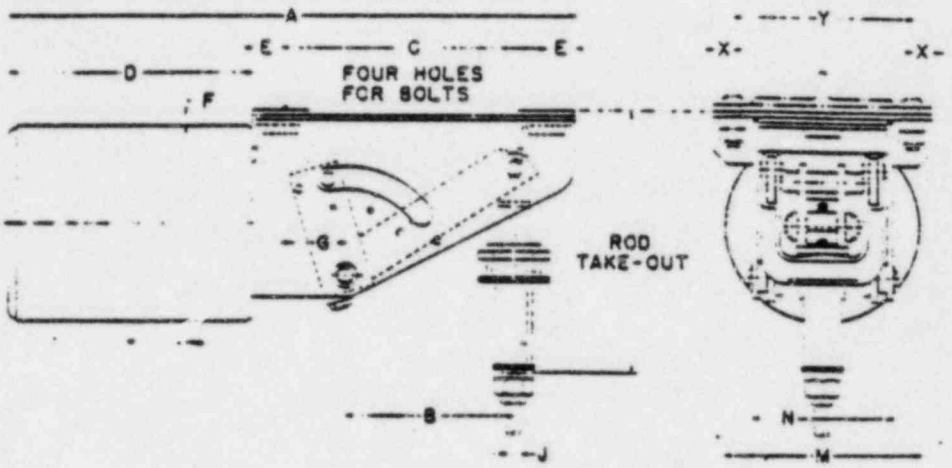
J-rod — K-hole selection chart

load lb	0 800	801 1500	1501 2540	2541 4000	4001 6100	6101 9400	9401 13400	13401 18300	18301 24700	24701 31000	31001 39000	39001 48000	48001 55000
J-rod	½	⅝	⅝	1	1⅛	1½	1⅝	2	2⅛	2½	2⅝	3	3⅛ ▲
K-hole size	11/16	13/16	15/16	1⅛	1½	1⅝	2	2⅛	2⅝	2⅞	3⅛	3⅜	3⅝
R	1⅛	1⅛	1⅛	1½	2	2½	2½	3	3	4	4	4	4½
S	⅞	1 1/16	1½	1⅝	2	2⅜	2⅝	2½	3½	3⅜	3⅝	3½	4½
T	½ ▲	½ ▲	⅝	½	⅝	⅝	⅝	¾	⅝	1	1	1	1
W	2½	2½	2½	3	4	5	5	6	6	8	8	8	9

* Rod take-out = (factor) minus $\left(\frac{\text{total travel}}{2}\right)$

▲ ¼ inch for single rod suspension. ** 3⅛ inch is furnished with 8 UN series threads.

fig. 81-H type D model R



Type D may be bolted directly under steel. Sizes 1 to 9 are furnished with swivel eye and turnbuckle instead of yoke and coupling.

NOTES: See load travel tables on pages ph-108-111 for "B" dimension.

For weights see page ph-126.

dimensions (inches)

hanger sizes	total travel	A	C	D	E	F	G	M	N	X	Y	angle size	bracket hole diameter	bolt	J-rod: short thread length	J-rod: short rod diam	J-rod: max rod diam
1-9	4 or less 4½ or more	13 9/16 17 9/16	6 10	5 5/16	1	⅞	2	6⅛	4½	¾	5⅜	2x2x⅜	9/16	13⅛ 15 5/16	1⅛ - 7T	½	½
10-18	3½ or less 4 to 5 5½ or more	18 7/16 19 7/16 21 7/16	8 8 11	8 7/16	1	½	2 13/16	8 9/16	6¾	⅞	8	2x2x¼	⅝	11 13/16 14 1/16 14 1/16	1⅛ - 7T	½	⅝
19-34	5 or less 5½ or more	28 13/16 31 1/16	9½ 13½	14 7/16	1½	⅝	3⅛	12 7/16	8¾	1½	10⅝	2x3x¼	⅝	17⅝ 19½	2⅛ - 7T	½	1⅛
35-48	6 or less 6½ or more	31 9/16 28 9/16	10½ 18½	17 7/16	2	1 1/16	4½	13⅜	9 5/16	1⅝	12⅝	3x4x¼	⅞	23 13/16 29 1/16	3⅛ - 7T	½	1⅜
50-63	8 or less 8½ to 11 11½ or more	46 5/16 53 5/16 53 5/16	15⅜ 23⅜ 23⅜	28 1/16	2	1 9/16	7⅜	17 11/16	11⅝	1⅝	14⅝	4x4x⅜	1⅛	27 1/16 27 1/16 32½	4⅛ - 7T	⅞	2⅛
64-74	10½ or less 11 or more	57 1/16 63	15⅝ 21⅛	38⅛	3	3⅛	5⅛	22 5/16	11	2	15	4x6x½	1⅛	38⅛ 28½	5⅛ - 7T	1⅛	2⅜
75-83	10½ or less 11 or more	57 1/16 63	14⅜ 20⅛	38⅛	4	3⅛	4⅜	27 5/16	11	2	15	4x6x½	1⅛	41½ 41⅛	5⅛ - 7T	1½	3⅛*
84-110	not available																

* Rod take-out = (factor) minus $\left(\frac{\text{total travel}}{2}\right)$

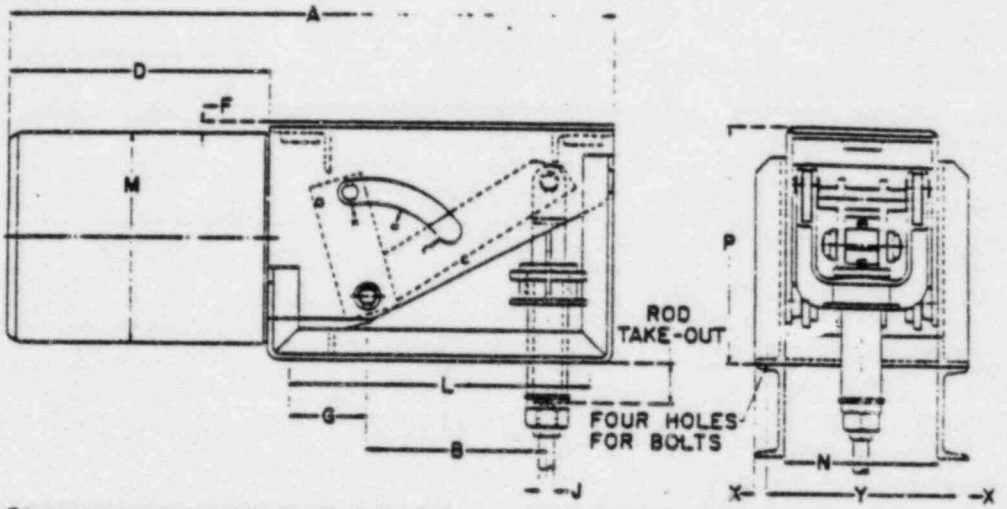
J-rod selection chart

load lb	0 800	801 1500	1501 2540	2541 4000	4001 6100	6101 9400	9401 13400	13401 18300	18301 24700	24701 31000	31001 39000	39001 48000	48001 58000
rod diam	½	⅝	¾	1	1¼	1½	1¾	2	2¼	2½	2¾	3	3⅛*

* 3⅛ inch is furnished with 8 UN series threads.

constant supports

fig. 81-H type E
model R



Type E incorporates two brackets as part of its frame, permitting the bolting of the constant support to the top of structural steel. Sizes 1 to 9 are furnished with swivel eye and turnbuckle instead of yoke and coupling.

If rod take-out does not exceed the depth of the supporting steel and the rod coupling is required to extend below the steel, specify the depth of the supporting steel. Increase rod take-out by the depth of the steel.

NOTES: See load travel tables on pages ph-108-111 for "S" dimension.

For weights see page ph-126.

dimensions (inches)

hanger size	total travel	A	D	F	G	L	M	N	P	X	Y	angle iron	bracket hole diameter	foot bore	J-rod: min thread length	J-rod: min rod diam	J-rod: max rod diam
1-6	4 or less 4½ or more	13 9/16 17 9/16	5 5/16	10/16	2	6 10	6⅝	4½	5 7/16	½	8 9/16	1½x1½x⅛	9/16	5⅛ 7 11/16	1½ + TT	½	⅝
10-18	3½ or less 4 to 8 8½ or more	18 7/16 18 7/16 21 7/16	8 7/16	9/16	2 9/16	7⅞ 7⅞ 10½	6 9/16	8⅝	9⅝	½	8 7/16	1½x1½x⅛	13/16	1⅜ 4 1/16 4 1/16	1⅜ + TT	½	⅝
19-34	8 or less 8½ or more	28 9/16 31 9/16	14 7/16	11/16	3⅛	10 14½	12 7/16	8⅝	14½	½	10 9/16	1½x1½x⅛	⅝	3⅜ 5½	2¾ + TT	½	1⅛
35-49	8 or less 8½ or more	31 9/16 38 9/16	17 7/16	⅝	5 7/16	11⅝ 19⅝	13⅜	9 5/16	15½	13/16	12⅜	2 x 2 x ¼	⅝	4½ 9½	3½ + TT	½	1⅛
50-63	8 or less 8½ to 11 11½ or more	46 9/16 53 9/16 53 9/16	26 9/16	1	7⅝	15⅝ 23⅝ 23⅝	17 11/16	11⅛	19⅝	1 9/16	14 11/16	3 x3 x ¼	1⅛	6⅝ 6⅝ 12	4½ + TT	⅝	2½
64-74	10½ or less 11 or more	57½ 63	35⅝	3 1/16	6⅝	17½ 23	22 5/16	11	25⅝	1 13/16	14 15/16	3½x3½x¼	1⅛	11⅛ 11⅛	5⅛ + TT	1⅛	2⅜
75-83	10½ or less 11 or more	57½ 63	35⅝	3 11/16	5⅛	17½ 23	2 7/16	11	31⅞	1 9/16	14 15/16	2½x3½x¼	1⅛	9 9½	5⅛ + TT	1½	3 1/16
84-110	see page ph-125																

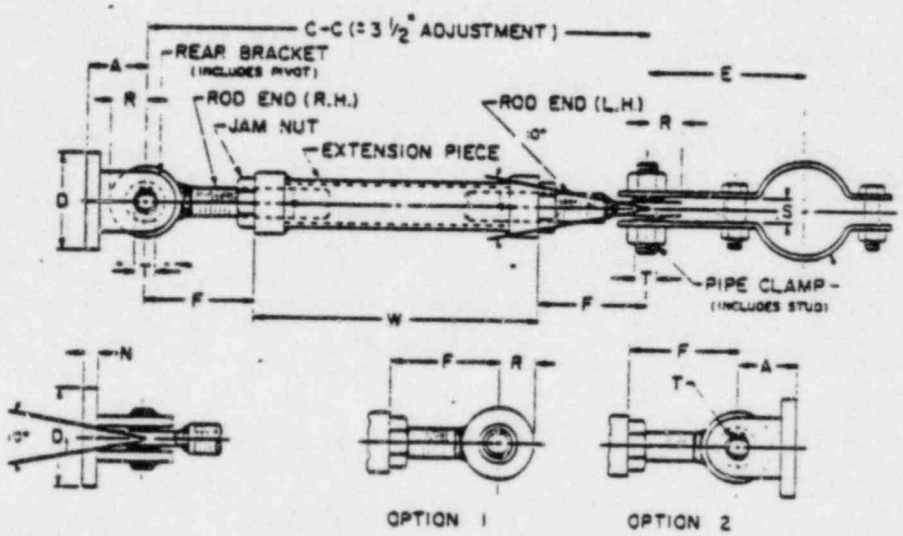
* Rod take-out = (factor) minus $\left(\frac{\text{total travel}}{2}\right)$

J-rod selection chart

load lb	0 800	801 1500	1501 2540	2541 4000	4001 6100	6101 9400	9401 13400	13401 18300	18301 24700	24701 31000	31001 39000	39001 46000	46001 58000
rod diam	½	⅝	¾	1	1⅛	1½	⅝	2	2⅜	2½	2¾	3	3 1/16*

* 3 1/16 inch is furnished with 8 UN series threads.

sway strut assembly:
fig. 211



load (lbs) • dimensions (inches)

Size	Load •	Rod End	Std. Pipe		A	C—C Max.	C—C Min.	W Max.	W Min.	F	D	D1	N	R	S	T
A	550	¾	1	Sch 80	1	60	16¾	52½	9¼	3¾	2⅜	1½	⅛	⅝	⅝	.374
B	1500	1	1½	Sch 40	2⅛	108	19½	98¼	9¾	4⅞	5	3¾	½	1⅜	1⅜	.372 .749
C	4500	1	2	Sch 40	2⅛	120	19½	110½	9¾	4⅞	5	3¾	½	1⅜	1⅜	.747 .749 .747
1	8000	1¼	2	Sch 160	2½	120	21⅛	109¾	11	5⅛	4½	3	¾	1½	1⅜	.999
2	11630	1½	2½	Sch 160	2½	120	21⅞	109⅛	11	5 7/16	4½	3	¾	1½	1⅜	.997 .999
3	15700	1¾	2½	Sch 160	3⅛	120	24	107	11	6⅛	5¾	3 9/16	1	2	1 11/16	.997 1.249 1.247
4	20700	2	3	Sch 160	3⅛	120	25½	106¼	12¾	6⅞	5¾	3 9/16	1	2	1 11/16	1.249 1.247
5	27200	2½	3	Sch 160	4	120	28⅛	104½	12¾	7¾	6⅞	4½	1¼	2½	2	1.499
6	33500	2½	4	Sch 160	5	120	30	102½	12¾	8¾	7⅞	5¾	1¾	3	2¾	1.497 1.749 1.747
7	58734	3	4	Sch 160	5¾	120	34¾	100	14¾	10	9⅛	6½	2	3½	2¾	1.999 1.997
8	110000	4	6	Sch 80	7¼	84	42½	58½	17	12⅜	14	8¾	2¼	4¾	3½	2.499
			6	Sch 160	7⅛	120	84	94½	58½							2.497

• Loads must not be applied outside a 10° included angle cone of action to the pipe clamp axis without special authorization

HILTI LENGTH DESIGNATIONS

Stamp On Anchor	Length of Anchor* (Inches)
A	1 1/2
B	2
C	2 1/2
D	3
E	3 1/2
F	4
G	4 1/2
H	5
I	5 1/2
J	6
K	6 1/2
L	7
M	7 1/2
N	8
O	8 1/2
P	9
Q	9 1/2
R	10
S	11
T	12
U	13
V	14
W	15
X	16
Y	17
Z	18

*To be used for checking embedment length only

STANDARD HILTI DATA

Bolt Diameter	Minimum Embedment KWIK (before torque)	Length of Threads
1/4	1 1/8	3/4
3/8	1 5/8	varies
1/2	2 1/4	1 1/4
5/8	2 3/4	1 1/2
3/4	3 1/4	1 1/2
1	4 1/2	2 1/4
1 1/4	5 1/2	3 1/4