ARKANSAS POWER & LIGHT COMPANY
POST OFFICE BOX 551 LITTLE ROCK, ARKANSAS 72203 (501) 371-4000

August 1, 1979

2-089-3

Mr. K. V. Seyfrit, Director
Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76011

Subject: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
IE Bulletin 79-14
(File: 2-1510)

Gentlemen:

In response to I & E Bulletin 79-14, we are submitting the following information which is a follow-up to our July 19, 1979 letter and telephone conference call with your Mr. Roger Woodruff and Mr. Glen Madsen on 7/27/79.

As committed to in the 7/27/79 telecon, we are submitting our justification documentation to illustrate that the field control and verification measures which have been exercised on ANO-2 during the construction and startup phases provide assurance that the as-built configurations of all safety-related piping have valid and up to date seismic analyses which assure that all safety systems will perform their desired safety function. The pipe support and restraint review logs provide the basic documentation and control to assure that the as-built configuration of the piping is properly analyzed and documented. Typical sheets for ASME Section III and ANSI B31.1 are provided as Attachment A. These sheets illustrate the results of the field engineering walkdown and as-built verification along with the home office or stress engineer walkdown and seismic analysis verification. These walkdowns were performed at different times by different groups of people thus providing assurance that the as-built configuration of the piping systems were properly documented and evaluated after installation. The bulk of the stress walkdowns were performed between 9/1/77 and 7/7/78.

To assure that these walkdowns were performed with a consistent set of criteria, specifications were issued to cover the installation, inspection and documentation of pipe supports, hangers and restraints for ASME Section III and ANSI B31.1 piping systems. Specification M-2504 and M-2505 for ASME Section III and ANSI B31.1 piping are provided as Attachments B and C, respectively, to illustrate the criteria which was utilized for the walkdowns. These specifications are controlled documents which were issued and controlled by the architect engineer home office staff.

Add- L. Engle
R. LaGrange
S. Hosford

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The results of the walkdowns were documented and controlled under the constructors quality assurance program. This included the utilization of a Field Change Request (FCR), Field Change Notice (FCN), and Non-Conformance Report (NCR) to assure that all deviations from original design were documented, tracked, evaluated and closed-out, thus keeping the seismic analysis valid and up to date. The FCR, FCN, and NCR are the formal communication links between the constructor and the architect engineer, which in the case for ANO-2 was Bechtel Corporation, for processing discrepancies. Project procedures at the architect engineer's home office assured that the actual seismic analysis was updated when necessary.

Based on the above information and the enclosed attachments, we feel that we have verified that the seismic analysis applies to the actual configuration of the safety-related piping systems in ANO-2 throughout the construction and startup phases. This verification process is being and will continue to be utilized in the future. Therefore, we request your concurrence that no inspection or additional verification be performed on ANO-2.

As committed to in the 7/27/79 telecon with Mr. Glen Madsen and Mr. Roger Woodruff, we are submitting the above information in lieu of the specific information requested in the 30 day response to the bulletin.

Very truly yours,

David C. Trimble

David C. Trimble
Manager, Licensing

DCT/MOW/vb

Attachment

cc: Mr. Victor Stello, Jr., Director
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Mr. Norman C. Moseley, Director
Division of Reactor Operations Inspection
Nuclear Regulatory Commission
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Mr. W. D. Johnson
U. S. Nuclear Regulatory Commission
P. O. Box 2090
Russellville, Arkansas 72801

ARKANSAS POWER & LIGHT COMPANY
ARKANSAS NUCLEAR ONE
UNIT 2

INSTALLATION REVIEW

PIPE SUPPORTS RESTRAINTS

(1) GIANT NO	(2) SUPPORT OR RESTRAINT MARK NO	REV	(3) INSTALLED	(4) SPPT OR RESTR TYPE	(5) INSTALLED CORRECT	(6) APPROVAL INITIAL STATE
			✓			
			✓			
		F	✓			
			✓			
			✓			
			✓			
		OF1	✓			
			✓			
			✓			
			✓			
		OF1				
		OF2	✓			
		OF2	✓			
		OF2	✓			
		OF2	✓			
			✓	A		

(7) MODIFY INSTALLATION

(8) INSTALLATION IS SATISFACTORY PER FINAL SKETCH

(9) INSTALLATION COMPLETE

(10) STRESS GROUP APPROVAL INITIAL & DATE

SAN FRANCISCO POWER DIVISION

PIPE SUPPORT RESTRAINT
INSTALLATION REVIEW

SYSTEM

BY DATE

Attachment A
A-1

POOR ORIGINAL

FOR INFORMATION ONLY

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ARKANSAS POWER & LIGHT COMPANY
ARKANSAS NUCLEAR ONE
UNIT 2

INSTALLATION REVIEW

PIPE SUPPORTS RESTRAINTS > AND OVER

(1) IDENT NO	(2) SUPPORT OR RESTRAINT MARK NO	REV	(3) INSTALLED	(4) SPPT OR RESTR TYPE	(5) INSTALLED CORRECT	(6) QC APPROVAL INITIAL & DATE

(7) CORRECTIVE ACTION BY FIELD

(7a) MODIFY INSTALLATION	(7b) INSTALLATION IS VALID (EXPLAIN BELOW)	(7c) NCR NO	(7d) APPROVAL INITIAL & DATE

609 220

POOR ORIGINAL

FOR
[redacted]
ONLY

LEGEND OF COMPLETIONS

SAN FRANCISCO POWER DIVISION

PIPE SUPPORT RESTRAINT
INSTALLATION REVIEW

SYSTEM

P 1265 1 75 EV3

ARKANSAS POWER & LIGHT COMPANY
ARKANSAS NUCLEAR ONE
UNIT 2

DESIGN AND INSTALLATION REVIEW

2" AND UNDER PIPE SUPPORTS - RESTRAINTS

IDENTIFICATION				DESIGN REVIEW				INSTALLATION REVIEW								
ISOMETRIC NUMBER	N E V	LINE IDENT. NO.	LINE DESCRIPTION	DESIGN SPEM												
				✓												
								OK								
				✓				OK								

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SAN FRANCISCO POWER DIVISION

PIPE SUPPORT - RESTRAINT
DESIGN AND INSTALLATION REVIEW

SYSTEM

SPEM - SMALL PIPE ENGINEERING MANUAL

ARKANSAS POWER & LIGHT COMPANY
ARKANSAS NUCLEAR ONE
UNIT 2

DESIGN AND INSTALLATION REVIEW

AND UNDER FIRE SUPPORTS - RESTRAINTS

IDENTIFICATION				DESIGN REVIEW																					
ISOMETRIC NUMBER	REV	LINE IDENTNO	LINE DESCRIPTION	DESIGN SPEM	COMP	PIPE GRADE	SIZE	THERMAL DESIGN	LINE																

POOR ORIGINAL

Attachment B

TECHNICAL SPECIFICATION

FOR

ASME SECTION III

INSTALLATION, INSPECTION, AND DOCUMENTATION

OF

PIPE SUPPORTS, HANGERS, AND RESTRAINTS

FOR THE

ARKANSAS POWER & LIGHT COMPANY

ARKANSAS NUCLEAR ONE – UNIT 2

Bechtel Power Corporation

San Francisco, California

FOR INFORMATION ONLY

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No.	DATE	REVISIONS	BY	CH'K	APPR
5	2/21/78	Rev. para. 2.5,5.4,6.2,6.3.Deleted para 5.3,App.C	TWKH		
4	9/30/77	Revised para 4.5.2,4.14,5.2,5.3,6.2,Added APP. F	TWKH		
3	6/21/76	Added [Q] ...lgmation. Rev. Para. 5.3, 6.3(a)	TWKH		
2	4/14/76	Rev. Para. 4.1 & 6.1	TWKH		
1		Issued for Construction	TWKH		

ORIGIN

ARKANSAS POWER & LIGHT CO.
ARKANSAS NUCLEAR ONE – UNIT TWO

JOB No. 6600-2

M-2504 REV. 4

SHEET OF

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TECHNICAL SPECIFICATION

FOR

ASME SECTION III

INSTALLATION, INSPECTION, AND DOCUMENTATION

OF

PIPE SUPPORTS, HANGERS, AND RESTRAINTS

FOR THE

ARKANSAS POWER & LIGHT COMPANY

ARKANSAS NUCLEAR ONE - UNIT 2

Bechtel Power Corporation

San Francisco, California

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TECHNICAL SPECIFICATION

FOR

ASME SECTION III

INSTALLATION, INSPECTION, AND DOCUMENTATION

OF

PIPE SUPPORTS, HANGERS, AND RESTRAINTS

ARKANSAS NUCLEAR ONE - UNIT 2

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APPENDICES

A Adjustment Methods for Piping Systems

B Large Pipe Support Installation Review, Form P-129S3

C (Deleted)

D Figure 1 Typical Dynamometer Installation at a Rigid Pipe Support, Form P-128S3

Figure 2 Adjustment Sequence for Pipe Supports, Form P-128S3

Figure 3 Torque Chart, Form P-114S3

E Small Pipe Support Installation Review, Form P-119S3

F Welding Procedures

ATTACHMENTS

1 Specification 6600-M-2084, Piping Materials and Standard Details

2 Specification 6600-M-2103A, Field Fabrication and Installation of Piping for Nuclear Service

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3 Specification 6600-M-2103B, Field Fabrication and Installation of Non-Nuclear Piping and Instrumentation in a Nuclear Power Plant

4 Pipe Support Design Drawings

5 Isometric Drawings

6 Specification 6600-M-2119, Technical Specifications for Design and Documentation of Pipe Supports, Hangers, and Restraints for Pipe 2-1/2 Inches and Larger for a Nuclear Power Plant

7 Specification 6600-M-2118, Technical Specifications for Fabrication and Installation of Pipe Supports, Hangers, and Restraints for Pipe 2 Inches and Smaller

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TECHNICAL SPECIFICATION

FOR

ASME SECTION III

INSTALLATION, INSPECTION, AND DOCUMENTATION

OF

PIPE SUPPORTS, HANGERS, AND RESTRAINTS

ARKANSAS NUCLEAR ONE - UNIT 2

1. SCOPE

This specification describes the procedures for the field installation, adjustment, inspection, and documentation of supports, hangers, and restraints for all ASME Section III Classes 1, 2, and 3 process piping.

2. CODES AND STANDARDS

2.1 Materials, fabrication, installation, and examination of pipe supports for nuclear piping shall be in accordance with the ASME Boiler and Pressure Vessel Code, Section III, Nuclear Power Plant Components, 1971 issue, summer 1972 addenda.

2.2 Field installation, adjustment, inspection, and documentation of supports, hangers, and restraints for ANSI B31.1 process piping shall be performed in accordance with Specification 6600-M-2505.

2.3 The pipe support design drawings will indicate whether the supports are for nuclear Class 1, 2, or 3 piping.

2.4 The designation of the applicable Code is indicated by the pipe support mark number as defined for the applicable line in Specification 6600-M-2083.

2.5 In the event of any conflict between the requirements of this Technical Specification and the Codes referenced in Paragraphs 2.1 and 2.2, the Project Field Engineer shall submit the matter to the Project Engineer for resolution. Adoption of any Code case interpretations and special rulings, or subsequent issues of Codes, shall be subject to the approval of the Project Engineer.

3. REFERENCE DOCUMENTS

Applicable portions of the documents listed in the Table of Contents of this specification are incorporated in this specification by reference.

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4. INSTALLATION

4.1 Compliance with Design Drawings

To the greatest extent possible, pipe supports shall be installed in strict compliance with the pipe support design drawings. It is recognized, however, that although the pipe support design drawings reflect the best information available at the time of their preparation, in some circumstances minor variations in local conditions may necessitate a modification in the location of a pipe support, or in its overall dimensions. Under such circumstances, and within the limitations prescribed in Paragraphs 4.2 and 4.3, the Field Mechanical Engineer may sanction the modification of pipe supports without filing a Field Change Request (FCR) or Field Change Notice (FCN). All modifications shall be documented in accordance with the requirements of Paragraph 6. Changes, other than the above, shall be submitted to Project Engineering for approval in accordance with the Field Inspection Manual (FIM). Field Change Notice (FCN) shall not be used for changes to ASME III Class I piping hangers.

4.2 Acceptable Deviations - Horizontal Piping

4.2.1 Horizontal Deviations of Piping Support Assembly

The horizontal location of a pipe support may deviate from its design location by an amount no greater than two (2) pipe diameters for pipes up through 12-inches diameter, and no greater than 2 feet for pipes 14-inches diameter and over. This deviation is permitted only in a direction parallel to the pipe centerline. If the pipe support design drawing indicates that the support is to be installed with a stated amount of offset, the same amount of offset shall be incorporated at the modified location.

4.2.2 Vertical Deviations of Structural Attachments for Rigid Pipe Supports

Modification of the vertical elevation at which a rigid pipe support assembly is attached to the supporting structure is permitted provided that:

a. The pipe centerline elevation is maintained at its design location

b. The overall length of the hanger assembly, i.e., the distance measured vertically from the pipe centerline to the point of its attachment to the supporting structure, is not reduced by an amount greater than 20 percent of the corresponding dimension shown on the pipe support design drawing. If it is necessary to reduce the overall length of the hanger assembly by more than 20 percent, a check shall be made to ensure that the angle through which the hanger rod will swing as the pipe expands from its cold position to its hot position will not exceed four (4) degrees. If the hanger rod swing angle will exceed

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two (2) degrees, the hanger shall be offset by two-thirds (2/3) of the calculated horizontal expansion. Project Engineering should be contacted for proper direction and magnitude of cold to hot movement.

4.2.3 Vertical Deviations of Structural Attachments for Variable and Constant Supports

Modification of the vertical elevation at which a variable or constant support assembly is attached to the supporting structure is permitted within the limitations prescribed for rigid supports in Paragraph 4.2.2, and provided also that the load setting of the spring is maintained.

4.3 Acceptable Deviations - Vertical Piping

4.3.1 Horizontal Deviations of Pipe Attachment

No deviation in the horizontal direction is permitted for supports attached to vertical piping.

4.3.2 Vertical Deviations of Pipe Attachment

The vertical location of a support, at the point of its attachment to the pipe, may deviate from its design location by an amount not exceeding the following:

For Variable or Constant Supports:

a. 20 percent of the length of the vertical pipe run.

For Rigid Supports:

a. Two (2) pipe diameters for pipes up through 12-inches diameter; or,

b. Two (2) feet for pipes 14-inches diameter and over.

4.3.3 Horizontal Deviations of Structural Attachments - Rigid, Variable, or Spring Supports

If it is necessary to modify the horizontal location of the pipe support structural attachment, a check shall be made to ensure that the modified hanger rod angle will not exceed one degree, and that the total hanger rod angle will not exceed two degrees when the pipe moves from the cold to the hot position. Project Engineering should be contacted for the proper direction and magnitude of the cold to hot pipe movement.

4.4 Acceptable Deviations of Piping Restraints Such As Shock Suppressors and Rigid Struts

4.4.1 Location Deviation of Piping Restraint Assemblies

The location of a pipe restraint assembly may deviate from its design location by an amount no greater than one (1) pipe diameter for pipes up through 12-inches diameter, and no greater

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than one (1) foot for pipes 14-inches diameter and over. This deviation is permitted only in a direction parallel to the pipe centerline.

4.4.2 Structural Attachment Deviation

The orientation of the axis of a restraint may deviate from its design orientation by an amount no greater than ±5°. This deviation is permitted only in a direction perpendicular to the plane of the pipe centerline with the restraint axis.

4.4.3 Axial Deviation

The pin-to-pin dimension for a restraint may deviate from its design dimension by no more than ±10 percent. For suppressors, this deviation is permitted provided that the cold setting is per Paragraph 4.14.f.

4.4.4 If the pipe restraint design drawing indicates that the restraint is to be installed with a stated amount of offset, the same amount of offset shall be incorporated at the modified installation.

4.5 Welding

4.5.1 Integral Attachments

Attachments which are to be welded to pressure boundary components shall fall under the jurisdiction of the component and be welded in accordance with the applicable component specification.

4.5.2 Other Welds

Welding of hangers and hanger attachments not covered by 4.5.1 shall be performed by welders and welding operators qualified in accordance with ASME Section IX, using welding procedures listed in Appendix F.

4.6 Variable Spring Support Installation Procedure

4.6.1 Steam or Gas Filled Piping

4.6.1.1 Before Hydrotesting

a. Ensure that all travel stops are securely installed.

b. Adjust variable or constant supports to their approximate cold load settings.

4.6.1.2 After Hydrotesting

a. Ensure that piping system has been drained, and that insulation has been installed.

b. If used, remove and store all temporary supports, to be reinstalled prior to future hydrotesting.

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c. Remove all travel stops, and securely attach these stops to the outside of or immediately adjacent to the spring supports for re-installation prior to future hydrotesting. (NOTE: Do not attach in any manner which obscures the spring load scales from view.)

d. Check variable or constant support cold load settings, and adjust as necessary. After such adjustment, ensure that the cold-to-hot movements of the piping, as indicated on the pipe support design drawings, are within the remaining travel ranges of the load scales of the springs. If the indicated range of travel is no longer available, refer to the Project Design Engineer for guidance.

4.6.2 Water Filled Piping

4.6.2.1 After System is Filled with Water

a. Adjust variable or constant supports to their approximate cold load settings.

b. Do not remove travel stops if piping is to be drained following hydrotest.

c. After hydrotest, and after piping system is filled with water prior to any startup, preoperational testing, or other mode of operation during which the service temperature will exceed 120F, remove all travel stops and attach them to the outside of or immediately adjacent to the spring supports for future use.

d. Check variable or constant support cold load settings as described in Paragraph 4.6.1.2.d.

e. Before normal system service, remove all remaining travel stops.

4.6.2.2 Before Piping System is Drained

At all times prior to draining the system, reinstall travel stops on the first three variable spring supports off rotating equipment.

4.7 Constant Spring Support Installation Procedure

In general, constant spring supports shall be installed following the procedures described for variable spring supports in Paragraph 4.6. Travel stop removal and load adjustments are to be carried out in strict compliance with the instructions for these operations furnished by the manufacturer. Particular care shall be taken to avoid the use of unnecessary force during the removal of travel stops.

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4.8 Rigid Hanger Adjustment Procedures

The following procedure is applicable only to piping systems 2-1/2" in diameter and over.

(NOTE: Where a piping system is supported by a combination of spring supports and rigid hangers, these procedures shall be conducted simultaneously with the installation and adjustment of the spring supports.)

Two procedures for the adjustment of rigid hangers are described below. These are: (1) dynamometer method; and, (2) torque wrench method. The dynamometer method is intended for use with piping systems whose function may be subject to severe dynamic loadings, e.g., main steam turbine trip. Piping systems in this category are listed in Appendix A of this specification, and the dynamometer method of rigid hanger adjustment is mandatory for these systems. In no case shall the dynamometer method be used for 2 inch and smaller diameter pipe hanger adjustments. The torque wrench method is acceptable for the adjustment of rigid hangers on piping systems defined in Appendix A, although the dynamometer method is recommended on other large diameter systems, at the discretion of the project field engineer.

4.8.1 Dynamometer Method

Appendix D, Figures 1 and 2 illustrate the method and typical sequence. While the precise sequence to be followed must be determined on a case-by-case basis, that determination should be based on the principles incorporated in the description which follows.

a. Procure three 20-kip* dynamometers with chains and come-alongs.

b. Verify that all rigid supports are carrying a load.

c. Verify that the piping system is fully insulated, and is at ambient temperature. Water systems must be filled with water.

d. Verify that all spring supports are at their cold load settings, with travel stops removed.

e. Install dynamometers at each of the first three consecutive rigid hangers, counting from one system terminal, e.g., #1, #2, and #3, Figure 2.

f. By means of the come-alongs, adjust tension on the dynamometers until each is just carrying the cold load as indicated on the corresponding pipe support drawing.

g. Dynamometer readings should be within ±5 percent of the design cold loads. If any dynamometer reading is outside this range, adjust the tension of adjacent hangers (or dynamometers) so as to bring the divergent dynamometer reading within ±5 percent of the design cold load.

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h. With all dynamometers in place, adjust the nearest adjacent spring supports to their design cold load settings as stated on the pipe support design drawings.

i. Recheck dynamometer load readings, and readjust to ±5 percent of the design cold load settings if necessary.

j. Tighten rigid pipe hanger nearest to the terminal from which the procedure was started, e.g., #1 on Figure 2, until rigid hanger just begins to carry the dynamometer load. Then completely unload and remove this dynamometer and install it at the fourth rigid hanger location, e.g., #4 on Figure 2.

k. Adjust tension on dynamometer at fourth rigid hanger until it is just carrying the load previously being carried by that hanger.

l. Repeat Step (i) for the second and third dynamometers.

m. Repeat Steps (j) through (l), and continue sequentially until all spring and rigid hangers have been adjusted. When the last three rigid hangers on the system have been adjusted and tightened in this manner, all three dynamometers may now be removed in turn. With branched systems, complete the adjustment of hangers one branch at a time, removing all three dynamometers on the branch before proceeding systematically along the header to the next branch in sequence.

*This capacity will be sufficient for most applications. Larger loads must be handled on a case-by-case basis.

4.8.2 Torque Wrench Method

Refer to Appendix D, Figure 3 which gives torque wrench settings versus load carried for a range of hanger rod sizes from 1/2-inch through 2-inch diameter. Its use is self-explanatory. The sequence to be followed is the same as that described for the dynamometer method in Paragraph 4.8.1.

Before adjusting rigid hangers by this method, ensure that all threaded parts are well lubricated, and that burrs and scale under the bearing surfaces of adjusting nuts have been removed.

4.9 Locking Devices

In order to prevent hanger assemblies from loosening during operation, all threaded connections should be secured by one of the following methods:

a. Jam nut with a hex nut

b. Two jam nuts (not in a tension member)

c. Pin or cotter

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d. Tack weld or stake per dwg. 6600-M-2810.

e. C-clip.

4.10 Spring Scale Visibility

All springs shall be installed so that the load scales will be clearly visible.

4.11 Support Assemblies of Greater Strength Than Required

Pipe support or restraint assemblies are acceptable if components having greater strength are substituted in place of those indicated on the support detail. The greater strength should be understood to mean as follows:

a. Larger structural beam (i.e. larger moment of inertia)

b. Thicker plates

c. Heavier hanger rods or hanger rod components

d. Larger or additional anchor bolts

e. Larger or longer welds.

4.12 Clearance Between Plates at Walls

The clearance between the concrete walls and the structural attachment plates should not exceed 1/16 inch over a maximum of 20 percent of the bearing area. If the gap exceeds 1/16 inch or if the clearance exists over more than 20 percent of the bearing area, grouting is required in order to ensure proper bearing.

4.13 Concrete Expansion Bolts

a. Concrete expansion bolts may be used only where specifically indicated on the appropriate pipe support detail.

b. Where allowed, expansion bolts shall be installed in strict accordance with the applicable project specifications and the expansion bolt manufacturer's guidelines.

c. All expansion bolts shall be visually inspected for correct installation and true alignment.

d. Expansion bolt installations shall be tested and repaired, and the results shall be documented in accordance with the applicable project specifications.

4.14 Shock Suppressors

a. The acceptable suppressor installation deviation from the design location shall be as specified per Paragraph 4.4.

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b. The cold settings of the suppressor may deviate from the design setting by an amount no greater than ±1/2 inch. This deviation is permitted only if at least 1 inch of travel remains between the modified cold and hot settings and the nearest adjacent ends of travel.

c. Shock suppressors are precision mechanical devices and consequently must receive careful treatment during and after installation.

d. After installation, the suppressor assembly shall be protected from physical damage due to normal construction activities by providing wooden or heavy cloth protective covers.

e. Under no circumstances shall the suppressor assembly provide hold down for scaffolding, hoists, or any other equipment.

5. INSPECTION

5.1 Initial Installation

Upon completion of installation and prior to hydrotest, and with piping at ambient temperature, the Mechanical Field Engineer shall inspect all supports on each piping system for completeness and correctness of the installation, excellence of workmanship, and the adequacy of the installation to perform its function during hydrotest, startup, and hot functional testing. To achieve this, the Mechanical Field Engineer shall look for deficiencies in installation including, but not necessarily limited to, the following:

a. Noncompliance with pipe support design drawings

b. Insufficient clearances for cold-to-hot expansion at guides, stops, and failure restraints

c. Insufficient travel availability on spring supports

d. Offset of hangers inadequate, or in wrong direction

e. Incomplete welding of attachments

f. Insufficient thread engagement of threaded parts

g. Travel stops on spring supports not removed, except on drained water lines.

h. Temporary supports and tack welding not removed following hydrotest

i. Spring canisters dented or otherwise damaged

j. Lock nuts missing, or other means for preventing loosening of threaded parts not provided

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k. Local interferences that could impair support function

l. Suppressor cold settings incorrect

m. Oil leaking from hydraulic suppressors

n. The overall configuration of the piping system should be inspected to assure proper slope, and to assure that no excessive sag exists.

o. A check should be made to assure sufficient clearance exists between pipe and adjacent structures to accommodate anticipated thermal expansion.

5.2 During Startup and Hot Functional Testing

The performance of all pipe supports and hangers shall be observed where accessible by the Startup Field Engineer during the startup and hot functional testing of all piping systems. He shall take such corrective action as may be necessary to prevent impairment of the piping system or its supports in a timely manner. Particular attention shall be given to the following:

a. Spring supports not moving within their prescribed travel range

b. Binding, jamming, or galling of springs within their containers

c. Interference at guides, stops, and restraints before maximum expansion has taken place

d. Excessive gaps at failure restraints when piping is at full temperature

e. Excessive swing of hanger rods

f. Sliding supports not moving freely.

5.3 (Deleted)

5.4 Project Stress Engineer

After the Mechanical Field Engineer has completed his inspection and acceptance of the installed piping and support system, the Project Stress Engineer shall inspect the installation to ensure that all supports are performing their intended engineering function. Deficiencies noted during this inspection shall be brought to the attention of the Mechanical Field Engineer for correction. Following correction of deficiencies, the installation shall be reinspected by the Project Stress Engineer for final acceptance.

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5.5 Inspection Documentation

The results of all inspections made in accordance with this section shall be recorded by means of the documentation requirements described in Section 6.

6. DOCUMENTATION

6.1 Pipe Support Design Drawings

The detailed design of all pipe supports covered by this specification is depicted on the pipe support design drawings prepared by Project Engineering, San Francisco. Field revisions to the pipe support design drawings are permitted as provided in Paragraphs 4.2 and 4.3 or by specific correspondence from the Project Engineer. These revisions shall be approved by the Mechanical Field Engineer and shall be recorded on "as-built" pipe support design drawings. Changes, other than the above, shall be submitted to SFHO Engineering for approval in accordance with the Field Inspection Manual (FIM). Field Change Notice (FCN) shall not be used for changes to ASME III Class I piping hangers.

In course of the installation inspections required by Section 5, the pipe support design drawings shall be further revised to record "as-built" conditions, showing final spring hanger load settings and similar pertinent design data.

The "as-built" pipe support design drawings shall be transmitted to Project Engineering, San Francisco, for review, final approval, and incorporation in the permanent project records. If the "as-built" design is found to be unacceptable, Project Engineering, San Francisco, shall make appropriate revisions to the design, and reissue the pipe support design drawings to the Field for further action. All necessary rework shall be subject to the inspections and approvals described in Section 5.

6.2 Pipe Support Installation Review for Piping 2-1/2 Inches in Diameter and Over, Form P-129S3

Appendix B, Form P-129S3 is used to record all inspections and approvals as specified herein and to record all deficiencies noted and actions taken in the field. Its use is further described below.

a. Appendix B, Form P-129S3 is initiated by Project Engineering, San Francisco, by filling out Columns 1, 2, and 4. A separate form is used for each piping system. The forms are then transmitted to the field.

b. Upon receipt of Form P-129S3, the responsible Field Engineer completes Column 3. Upon completion of the support installations and the required inspections, and after all remedial action has been carried out satisfactorily, the Field Mechanical Engineer signifies

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his approval by initialing and dating Column 5 and 6. He then passes the form on to the SFHO Stress Engineer.

c. (Deleted)

d. In the course of his inspection the Stress Engineer enters a description of any noted deficiencies in Column 7, and returns the form to the Field Mechanical Engineer for corrective action. Upon satisfactory resolution of any noted deficiencies, the Stress Engineer signifies his final approval by dating Column 9. Form P-129 is then transmitted to Project Engineering, San Francisco, for retention in the permanent project records.

e. Legend for filling out Form P-129S3

Column 1 - Identification number of isometric marked-up sketch showing locations of supports and restraints

Column 2 - Identification and revision number of the current support restraint sketch to be reviewed

Column 3 - Check ( ) if support/restraint assembly is installed

Column 4 - SS - spring support
PS - rigid support
CS - constant support
RR - rigid restraint
MR - mechanical restraint
A - anchor

Column 5 - Field engineering will check installation against SFHO approved final support/restraint sketch. If no discrepancies exist, field engineer will initial and date this column.

Column 6 - Field Engineer will initial and date this column at the same time he signs Column 5.

Column 7 - Identification of discrepancies and remarks recorded by field quality control and SFHO stress engineers. Field engineering will insure these items are corrected.

Column 7A - Installation requires modifications or rework as noted.

Column 7B - Installation deviates from final support/restraint sketch as noted. Field to take corrective action, if specified. Reinspection by Stress Engineer is not

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required. If installation is acceptable as is, so state.

Column 7C - Check ( ) if the acceptable support/restraint deviations as noted in column 7B are significant and require an "as-built" sketch.

Column 8 - Check ( ) by:

(a) Stress engineering after column 7A is completed and corrected
(b) Field engineering after column 7B is completed (with initials and date)
(c) Field engineering after Column 7C is completed (with initials and date).

Column 9 - (a) If no installation deviations requiring modifications or rework exist, SFHO stress engineering will initial and date this column.

(b) If corrective action is specified in Column 7B, Stress Engineering will initial and date this column after Field Engineering has initialed and dated Column 8, signifying completion of the specified action.

6.3 Pipe Support Installation Review for Piping 2 Inches in Diameter and Under, Form P-119S3

Appendix E, Form P-119S3, is used to record all inspections and approvals as specified herein, and to record all deficiencies noted and actions taken in the field. Its use is further described below.

a. Project Engineering, San Francisco, will define scope of review effort and assemble review packages consisting of the appropriate review data sheets and fill out Columns 1 through 5, Appendix E, Form P-119S3.

b. Upon completion of the support installations and the required inspections, and after all remedial action has been carried out satisfactorily, the Field Mechanical Engineer signifies his approval by initialing and dating Column 11, 13, 14, 15, 16, 17 & 18. He then passes the form on to the SFHO Stress Engineer.

c. (Deleted)

d. The Stress Engineer enters the description of any noted deficiencies on the small piping isometric and returns the form with the isometric to the Field Engineer for corrective action. Upon satisfactory resolution of any noted deficiencies, the Stress Engineer will fill out

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Columns 6 through 13, and 19, and signifies his final approval by dating Column 20. Form P-119 is then transmitted to Project Engineering, San Francisco, for retention in the permanent project records.

e. Legend for Filling Out Form P-119S3

Columns 1 through 4 — Line identification number and description.

Column 5 — Design is per Small Pipe Engineering Manual.

Column 6 — Design is by computer analysis.

Column 7 — Gravity span between supports is appropriate.

Column 8 — Seismic span between restraints is appropriate.

Column 9 — Piping flexibility between first restraint and moving terminal points is sufficient.

Column 10 — Remainder of pipe is sufficient for thermal flexibility.

Column 11 — Structural attachment is adequate and conforms with Small Pipe Engineering Manual.

Column 12 — Thermal flexibility in as-built configuration is sufficient.

Column 13 — Welds are sufficient and conform with Small Pipe Engineering Manual.

Column 14 — Field Engineer's signature and date of acceptance of installation.

Column 15 — Total number of supports/restraints required per isometric drawing.

Column 16 — Total number of supports/restraints actually installed.

Column 17 — Total number of incomplete installations (deficiencies) per isometric.

Column 18 — Field Engineer will initial and date this column when he signs Column 14.

Column 19 — Remarks, notes, discrepancies, etc.

Column 20 — Piping Stress Analysis Group Engineer's signature and date of acceptance of design and installation.

Note: A check mark ( ) in a column indicates item is approved.

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APPENDIX A

ADJUSTMENT METHODS FOR PIPING SYSTEMS

I. Rigid hangers in the following listed systems shall be adjusted using a dynamometer in accordance with Section 4.8.1.

Main Steam, Feedwater, Steam dump to condenser.

II. Rigid hangers in the following listed systems shall be adjusted using a dynamometer as outlined, or by using a torque wrench in accordance with Section 4.8.2.

All Seismic Category I Systems 2-1/2" in diameter and over not listed above.

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APPENDICES B, D, AND E

To be complete this specification must have the following three appendices (consisting of four sheets) which may be obtained from the Document Control Center.

Appendix B	Large Pipe Support Installation Review, Form P-129S3
Appendix D	
Figure 1	Typical Dynamometer Installation At a Rigid Pipe Support, Form P-128S3
Figure 2	Adjustment Sequence for Pipe Supports, Form P-128S3
Figure 3	Torque Chart, Form P-114S3
Appendix E	Small Pipe Suppor- Installation Review, Form P-119S3

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INSTALLATION REVIEW

PIPE SUPPORTS & RESTRAINTS - 2½" AND OVER

(1) IDENT NO.	(2) SUPPORT OR RESTRAINT MARK NO.	(2) REV	(3) INSTALLED	(4) SPT OR RESTR TYPE	(5) INSTALLED CORRECT	(6) QC APPROVAL INITIAL & DATE	(7) CORRECTIVE ACTION BY FIELD (7A) MODIFY INSTALLATION	(7B) INSTALLATION DEVIATES FROM FINAL SKETCH	(7C) AS BLT DWG REQ'D	(8) COMPLETE	(9) STRESS GROUP APPROVAL INITIAL & DATE

LEGEND OF COMMON DEFICIENCIES

a) Cold setting not per hanger sketch
b) Remove travel stops
c) Provide full thread engagements
d) Face or burn thread, or use double nuts at clamps, lugs and u-bolts
e) Welding of structural attachment not per hanger sketch
f) Welding of pipe attachment not per hanger sketch
g) Structural attachment not per hanger sketch
h) Spring/hydraulic restraint type, size and mark no. not per sketch
k) Off set of structural attachment not per hanger sketch
l) Insufficient clearance for thermal expansion near support/restraint
j) Number or size of concrete anchor bolts not per sketch
k) Concrete anchor bolts installed incorrectly or excessive clearance between plate and wall

SAN FRANCISCO POWER DIVISION

SYSTEM

BY | DATE

PIPE SUPPORT/RESTRAINT INSTALLATION REVIEW

JOB NO	DRAWING NO	REV

P1295 1.75 EVS

POOR ORIGINAL

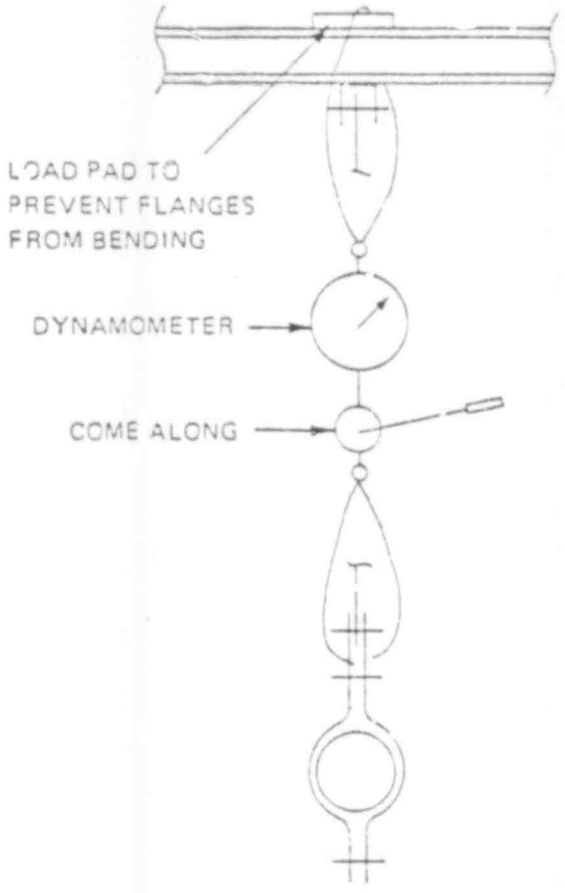


FIG. 1 TYPICAL DYNAMOMETER INSTALLATION
AT A RIGID PIPE SUPPORT

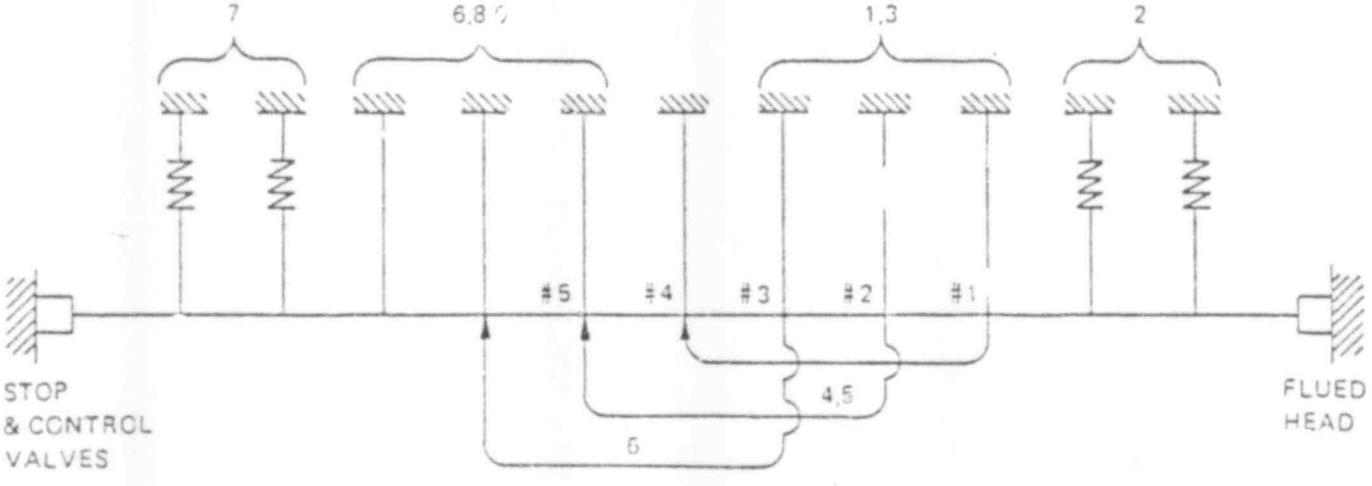
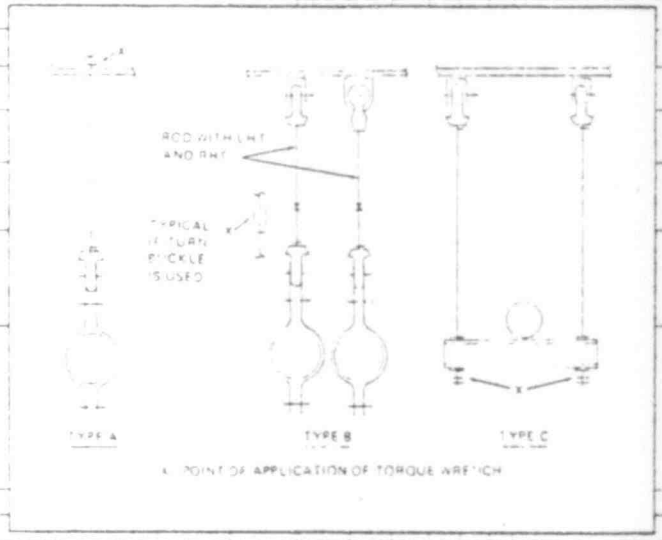


FIGURE 2 ADJUSTMENT SEQUENCE FOR PIPE SUPPORTS

RIGID PIPE HANGER ADJUSTMENT PROCEDURE [1]

Appendix D_2 = P114S_3
Specification 6600-M-2504

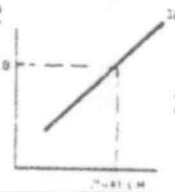


TORQUE IN LBS

ROD SIZE

2
1-3/4
1-1/2
1-1/4
1
7/8
3/4
5/8
1/2

NOTES:

1) THIS GRAPH APPLIES ONLY TO RIGID HANGERS ON HANGER CRITICAL SYSTEMS NOT SUBJECT TO DYNAMIC LOADING CONDITIONS
2) ALL THREADS ON HANGER RODS SHOULD BE WELL LUBRICATED AND LOCKNUTS LOOSENED PRIOR TO TORQUING PROCEDURE
3) TORQUE SETTING DETERMINED BY PIPE DEAD WEIGHT AS SHOWN ON HANGER SKETCH
4) FOR TYPE A HANGERS THE TORQUE VALUES AS SHOWN ON GRAPH SHOULD BE USED
5) FOR TYPE B HANGERS DOUBLE THE TORQUE VALUES AS SHOWN ON GRAPH SHOULD BE USED
6) FOR TYPE C HANGERS USE HALF THE PIPE DEAD WEIGHT PER ROD WHEN DETERMINING TORQUE VALUES
7) ACTUAL FIELD TORQUE SETTINGS TO BE WITHIN ± 10% OF COMPUTED VALUES FROM GRAPH
8) EXAMPLE:
GIVEN ROD SIZE 3/4"
PIPE WEIGHT 2500 LB
TYPE A HANGER
SOLUTION


1,000 10,000 20,000 30,000

PIPE DEAD WEIGHT-LBS

FIGURE 3

POOR ORIGINAL

DESIGN AND INSTALLATION REVIEW

2" AND UNDER PIPE SUPPORTS / RESTRAINTS

IDENTIFICATION				DESIGN REVIEW						INSTALLATION REVIEW			LINE OK	TOTAL NO. SUPT./RESTR	INSTALLED SUPT./RESTR	NO. INCOMPLETE	QC APPVL. INITIAL'S & DATE	REMARKS	STRESS GROUP APPVL INITIAL'S & DATE
ISOMETRIC NUMBER	REV.	LINE IDENT. NO.	LINE DESCRIPTION	DESIGN		SPAN		THERMAL		STRUCTURAL MEMBER	THERM MOVE	WELDS							
				① SPEM	COMP.	GRAV.	SEIS	TO 1st RESTR	LINE OK										

APPENDIX F

ACCEPTABLE WELD PROCEDURES FOR USE ON SUPPORTS, HANGERS AND RESTRAINTS

P1-A-Lh rev 1
P1-A rev 0
P1-A-C rev 0
P1-A-C Lh rev 0
P1-F-CO2 rev 2
P1-F-CO2 (structural) rev 1
P8-T-AG rev 0
P8-AT-AG rev 0
P8-A rev 0

Required NDE: none

Required inspection: Visual per F.I.M. W-1.

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Attachment C

TECHNICAL SPECIFICATION

FOR

ANSI B31.1

INSTALLATION, INSPECTION, AND DOCUMENTATION

OF

PIPE SUPPORTS, HANGERS, AND RESTRAINTS

FOR THE

ARKANSAS POWER & LIGHT COMPANY

ARKANSAS NUCLEAR ONE - UNIT 2

Bechtel Power Corporation

San Francisco, California

FOR INFORMATION ONLY

FOR ORIGINAL

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No.	DATE	REVISIONS	BY	CH'K	APPR
5					
4	2/21/78	Rev. para. 5.4, 6.2, 6.3, Deleted para 5.3 App. C	WRH		
3	9/30/77	Revised para 4.5.2,4.14,5.2,5.3,6.2,Added APP. F	WRH		
2	4/13/76	REVISED PARA. 4.1 & 6.1	WRH		
1	3/4/76	ISSUED FOR CONSTRUCTION	WRH		

ORIGIN

BECHTEL

ARKANSAS POWER & LIGHT CO.
ARKANSAS NUCLEAR ONE – UNIT TWO

JOB No. 6600-002

M-2505 REV. 3

SHEET OF

ED-21 (3-74)

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TECHNICAL SPECIFICATION

FOR

ANSI B31.1

INSTALLATION, INSPECTION, AND DOCUMENTATION

OF

PIPE SUPPORTS, HANGERS, AND RESTRAINTS

FOR THE

ARKANSAS POWER & LIGHT COMPANY

ARKANSAS NUCLEAR ONE - UNIT 2

Bechtel Power Corporation

San Francisco, California

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TECHNICAL SPECIFICATION

FOR

ANSI B31.1

INSTALLATION, INSPECTION, AND DOCUMENTATION

OF

PIPE SUPPORTS, HANGERS, AND RESTRAINTS

ARKANSAS NUCLEAR ONE - UNIT 2

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1.	SCOPE	4
2.	CODES AND STANDARDS	4
3.	REFERENCE DOCUMENTS	5
4.	INSTALLATION	5
5.	INSPECTION	12
6.	DOCUMENTATION	14

APPENDICES

A Adjustment Methods for Piping Systems

B Large Pipe Support Installation Review, Form P-129S3

C (Deleted)

D

Figure 1 Typical Dynamometer Installation at a Rigid Pipe Support, Form P-128S3

Figure 2 Adjustment Sequence for Pipe Supports, Form P-128S3

Figure 3 Torque Chart, Form P-114S3

E Small Pipe Support Installation Review, Form P-119S3

F Welding Procedures

ATTACHMENTS

1 Specification 6600-M-2084, Piping Materials and Standard Details

2 Specification 6600-M-2103A Field Fabrication and Installation of Piping for Nuclear Service

3 Specification 6600-M-2103B, Field Fabrication and Installation of Non-Nuclear Piping and Instrumentation in a Nuclear Power Plant

4 Pipe Support Design Drawings

5 Isometric Drawings

6 Specification 6600-M-2119, Technical Specifications for Design and Documentation of Pipe Supports, Hangers, and Restraints for Pipe 2-1/2 Inches and Larger for a Nuclear Power Plant

7 Specification 6600-M-2118, Technical Specifications for Fabrication and Installation of Pipe Supports, Hangers, and Restraints for Pipe 2 Inches and Smaller

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TECHNICAL SPECIFICATION

FOR

ANSI B31.1

INSTALLATION, INSPECTION, AND DOCUMENTATION

OF

PIPE SUPPORTS, HANGERS, AND RESTRAINTS

ARKANSAS NUCLEAR ONE - UNIT 2

1. SCOPE

This specification describes the procedures for the field installation, adjustment, inspection, and documentation of supports, hangers, and restraints for ANSI B31.1 process piping classified as Hanger Critical.

Even though the installation and adjustment of supports, hangers, and restraints for Hanger Noncritical and Hanger Critical piping systems shall be of the same quality, pipe supports, hangers, and restraints for Hanger Noncritical piping systems will not be subject to the inspection and documentation requirements of this specification.

2. CODES AND STANDARDS

2.1 Materials, fabrication, installation, and examination of pipe supports for non-nuclear piping shall be in accordance with ANSI B31.1 Power Piping Code, 1967 issue, with Addenda.

2.2 Field installation, adjustment, inspection, and documentation of supports, hangers, and restraints for ASME Section III process piping shall be performed in accordance with Specification 6600-M-2504.

2.3 The pipe support design drawings will indicate whether the supports are for Hanger Critical piping systems.

2.4 The designation of the applicable Code is indicated by the pipe support mark number as defined for the applicable line in Specification 6600-M-2083.

2.5 In the event of any conflict between the requirements of this Technical Specification and the Codes referenced in Paragraphs 2.1 and 2.2, the Project Field Engineer shall submit the matter to the Project Engineer for resolution. Adoption of any Code case interpretations and special rulings, or subsequent issues of Codes, shall be subject to the approval of the Project Engineer.

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3. REFERENCE DOCUMENTS

Applicable portions of the documents listed in the Table of Contents of this specification are incorporated in this specification by reference.

4. INSTALLATION

4.1 Compliance with Design Drawings

To the greatest extent possible, pipe supports shall be installed in strict compliance with the pipe support design drawings. It is recognized, however, that although the pipe support design drawings reflect the best information available at the time of their preparation, in some circumstances minor variations in local conditions may necessitate a modification in the location of a pipe support, or in its overall dimensions. Under such circumstances, and within the limitations prescribed in Paragraphs 4.2 and 4.3, the Field Mechanical Engineer may sanction the modification of pipe supports without filing a Field Change Request (FCR) or Field Change Notice (FCN). Such modifications, however, shall be documented in accordance with the requirements of Paragraph 6. Changes, other than the above, shall be submitted to Project Engineering for approval in accordance with the Field Inspection Manual (FIM). Field Change Notice (FCN) shall not be used for changes to ASME III Class I piping hangers.

4.2 Acceptable Deviations - Horizontal Piping

4.2.1 Horizontal Deviations of Piping Support Assembly

The horizontal location of a pipe support may deviate from its design location by an amount no greater than two (2) pipe diameters for pipes up through 12-inches diameter, and no greater than two (2) feet for pipes 14-inches diameter and over. This deviation is permitted only in a direction parallel to the pipe centerline. If the pipe support design drawing indicates that the support is to be installed with a stated amount of offset, the same amount of offset shall be incorporated at the modified location.

4.2.2 Vertical Deviations of Structural Attachments for Rigid Pipe Supports

Modification of the vertical elevation at which a rigid pipe support assembly is attached to the supporting structure is permitted provided that:

a. The pipe centerline elevation is maintained at its design location

b. The overall length of the hanger assembly, i.e., the distance measured vertically from the pipe centerline to the point of its attachment to the supporting structure, is not reduced by an amount greater than 20 percent of the

corresponding dimension shown on the pipe support design drawing. If it is necessary to reduce the overall length of the hanger assembly by more than 20 percent, a check shall be made to ensure that the angle through which the hanger rod will swing as the pipe expands from its cold position to its hot position will not exceed four (4) degrees. If the hanger rod swing angle will exceed two (2) degrees, the hanger shall be offset by two-thirds (2/3) of the calculated horizontal expansion. Project Engineering should be contacted for proper direction and magnitude of cold to hot movement.

4.2.3 Vertical Deviations of Structural Attachments for Variable and Constant Supports

Modification of the vertical elevation at which a variable or constant support assembly is attached to the supporting structure is permitted within the limitations prescribed for rigid supports in Paragraph 4.2.2, and provided also that the load setting of the spring is maintained.

4.3 Acceptable Deviations - Vertical Piping

4.3.1 Horizontal Deviations of Pipe Attachment

No deviation in the horizontal direction is permitted for supports attached to vertical piping.

4.3.2 Vertical Deviations of Pipe Attachment

The vertical location of a support, at the point of its attachment to the pipe, may deviate from its design location by an amount not exceeding the following:

For Variable or Constant Supports:

a. 20 percent of the length of the vertical pipe run.

For Rigid Supports:

a. Two (2) pipe diameters for pipes up through 12-inches diameter; or,

b Two (2) feet for pipes 14-inches diameter and over.

4.3.3 Horizontal Deviations of Structural Attachments - Rigid, Variable, or Spring Supports

If it is necessary to modify the horizontal location of the pipe support structural attachment, a check shall be made to ensure that the modified hanger rod angle will not exceed one degree, and that the total hanger rod angle will not exceed two degrees when the pipe moves from the cold to the hot position. Project Engineering should be contacted for the proper direction and magnitude of the cold to hot pipe movement.

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4.4 Acceptable Deviations of Piping Restraints Such As Shock Suppressors and Rigid Struts

4.4.1 Location Deviation of Piping Restraint Assemblies

The location of a pipe restraint assembly may deviate from its design location by an amount no greater than one (1) pipe diameter for pipes up through 12-inches diameter, and no greater than one (1) foot for pipes 14-inches diameter and over. This deviation is permitted only in a direction parallel to the pipe centerline.

4.4.2 Structural Attachment Deviation

The orientation of the axis of a restraint may deviate from its design orientation by an amount no greater than ±5°. This deviation is permitted only in a direction perpendicular to the plane of the pipe centerline with the restraint axis.

4.4.3 Axial Deviation

The pin-to-pin dimension for a restraint may deviate from its design dimension by no more than ±10 percent. For suppressors, this deviation is permitted provided that the cold setting is per Paragraph 4.14.f.

4.4.4 If the pipe restraint design drawing indicates that the restraint is to be installed with a stated amount of offset, the same amount of offset shall be incorporated at the modified installation.

4.5 Welding

4.5.1 Integral Attachments

Attachments which are to be welded to pressure boundary components shall fall under the jurisdiction of the component and be welded in accordance with the applicable component specification.

4.5.2 Other Welds

Welding of hangers and hanger attachments not covered by 4.5.1 shall be performed by welders and welding operators qualified in accordance with AWS requirements or with ASME Section IX, using welding procedures listed in Appendix F.

4.6 Variable Spring Support Installation Procedure

4.6.1 Steam or Gas Filled Piping

4.6.1.1 Before Hydrotesting

a. Ensure that all travel stops are securely installed.

b. Adjust variable or constant supports to their approximate cold load settings.

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4.6.1.2 After Hydrotesting

a. Ensure that piping system has been drained, and that insulation has been installed.

b. If used, remove and store all temporary supports, to be reinstalled prior to future hydrotesting.

c. Remove all travel stops, and securely attach these stops to the outside of or immediately adjacent to the spring supports for re-installation prior to future hydrotesting. (NOTE: Do not attach in any manner which obscures the spring load scales from view.)

d. Check variable or constant support cold load settings, and adjust as necessary. After such adjustment, ensure that the cold-to-hot movements of the piping, as indicated on the pipe support design drawings, are within the remaining travel ranges of the load scales of the springs. If the indicated range of travel is no longer available, refer to the Project Design Engineer for guidance.

4.6.2 Water Filled Piping

4.6.2.1 After System is Filled with Water

a. Adjust variable or constant supports to their approximate cold load settings.

b. Do not remove travel stops if piping is to be drained following hydrotest.

c. After hydrotest, and after piping system is filled with water prior to any startup, preoperational testing, or other mode of operation during which the service temperature will exceed 120F, remove all travel stops and attach them to the outside of or immediately adjacent to the spring supports for future use.

d. Check variable or constant support cold load settings as described in Paragraph 4.6.1.2.d.

e. Before normal system service, remove all remaining travel stops.

4.6.2.2 Before Piping System is Drained

At all times prior to draining the system, reinstall travel stops on the first three variable spring supports off rotating equipment.

4.7 Constant Spring Support Installation Procedure

In general, constant spring supports shall be installed following the procedures described for variable spring supports in Paragraph 4.6. Travel stop removal and load adjustments are to be carried out in strict compliance with the instructions for

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these operations furnished by the manufacturer. Particular care shall be taken to avoid the use of unnecessary force during the removal of travel stops.

4.8 Rigid Hanger Adjustment Procedures

The following procedure is applicable only to piping systems 2-1/2 inches in diameter and over. (NOTE: Where a piping system is supported by a combination of spring supports and rigid hangers, these procedures shall be conducted simultaneously with the installation and adjustment of the spring supports.)

Two procedures for the adjustment of rigid hangers are described below. These are: (1) dynamometer method; and, (2) torque wrench method. The dynamometer method is intended for use with piping systems whose function may be subject to severe dynamic loadings, e.g., main steam turbine trip. Piping systems in this category are listed in Appendix A of this specification, and the dynamometer method of rigid hanger adjustment is mandatory for these systems. The torque wrench method is acceptable for the adjustment of rigid hangers on piping systems defined in Appendix A, although the dynamometer method is recommended on other large diameter systems, at the discretion of the project field engineer.

4.8.1 Dynamometer Method

Appendix D, Figures 1 and 2 illustrate the method and typical sequence. While the precise sequence to be followed must be determined on a case-by-case basis, that determination should be based on the principles incorporated in the description which follows.

a. Procure three 20-kip* dynamometers with chains and come-alongs.

b. Verify that all rigid supports are carrying a load.

c. Verify that the piping system is fully insulated, and is at ambient temperature. Water systems must be filled with water.

* This capacity will be sufficient for most applications. Larger loads must be handled on a case-by-case basis.

d. Verify that all spring supports are at their cold load settings, with travel stops removed.

e. Install dynamometers at each of the first three consecutive rigid hangers, counting from one system terminal, e.g., #1, #2, and #3, Figure 2.

f. By means of the come-alongs, adjust tension on the dynamometers until each is just carrying the cold load as indicated on the corresponding pipe support drawing.

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g. Dynamometer readings should be within ±5 percent of the design cold loads. If any dynamometer reading is outside this range, adjust the tension of adjacent hangers (or dynamometers) so as to bring the divergent dynamometer reading within ±5 percent of the design cold load.

h. With all dynamometers in place, adjust the nearest adjacent spring supports to their design cold load settings as stated on the pipe support design drawings.

i. Recheck dynamometer load readings, and readjust to ±5 percent of the design cold load settings if necessary.

j. Tighten rigid pipe hanger nearest to the terminal from which the procedure was started, e.g., #1 on Figure 2, until rigid hanger just begins to carry the dynamometer load. Then completely unload and remove this dynamometer and install it at the fourth rigid hanger location, e.g., #4 on Figure 2.

k. Adjust tension on dynamometer at fourth rigid hanger until it is just carrying the load previously being carried by that hanger.

l. Repeat Step (i) for the second and third dynamometers.

m. Repeat Steps (j) through (l), and continue sequentially until all spring and rigid hangers have been adjusted. When the last three rigid hangers on the system have been adjusted and tightened in this manner, all three dynamometers may now be removed in turn. With branched systems, complete the adjustment of hangers one branch at a time, removing all three dynamometers on the branch before proceeding systematically along the header to the next branch in sequence.

4.8.2 Torque Wrench Method

Refer to Appendix D, Figure 3 which gives torque wrench settings versus load carried for a range of hanger rod sizes from 1/2-inch through 2-inch diameter. Its use is self-explanatory. The sequence to be followed is the same as that described for the dynamometer method in Paragraph 4.8.1.

Before adjusting rigid hangers by this method, ensure that all threaded parts are well lubricated, and that burrs and scale under the bearing surfaces of adjusting nuts have been removed.

4.9 Locking Devices

In order to prevent hanger assemblies from loosening during operation, all threaded connections should be secured by one of the following methods:

a. Jam nut with a hex nut

b. Two jam nuts (not in a tension member)

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c. Pin or cotter

d. Tack weld or stake per Dwg. 6600-M-2810

e. C-clip.

4.10 Spring Scale Visibility

All springs shall be installed so that the load scales will be clearly visible.

4.11 Support Assemblies of Greater Strength Than Required

Pipe support or restraint assemblies are acceptable if components having greater strength are substituted in place of those indicated on the support detail. The greater strength should be understood to mean as follows:

a. Larger structural beam (i.e. larger moment of inertia)

b. Thicker plates

c. Heavier hanger rods or hanger rod components

d. Larger or additional anchor bolts

e. Larger or longer welds.

4.12 Clearance Between Plates at Walls

The clearance between the concrete walls and the structural attachment plates should not exceed 1/16 inch over a maximum of 20 percent of the bearing area. If the gap exceeds 1/16 inch or if the clearance exists over more than 20 percent of the bearing area, grouting is required in order to ensure proper bearing.

4.13 Concrete Expansion Bolts

a. Concrete expansion bolts may be used only where specifically indicated on the appropriate pipe support detail.

b. Where allowed, expansion bolts shall be installed in strict accordance with the applicable project specifications and the expansion bolt manufacturer's guidelines.

c. All expansion bolts shall be visually inspected for correct installation and true alignment.

d. Expansion bolt installations shall be tested and repaired, and the results shall be documented in accordance with the applicable project specifications.

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4.14 Shock Suppressors

a. The acceptable suppressor installation deviation from the design location shall be as specified per Paragraph 4.4.

b. The cold settings of the suppressor may deviate from the design setting by an amount no greater than ±1/2 inch. This deviation is permitted only if at least 1 inch of travel remains between the modified cold and hot settings and the nearest adjacent ends of travel.

c. Shock suppressors are precision mechanical devices and consequently must receive careful treatment during and after installation.

d. After installation, the suppressor assembly shall be protected from physical damage due to normal construction activities by providing wooden or heavy cloth protective covers.

e. Under no circumstances shall the suppressor assembly provide hold down for scaffolding, hoists, or any other equipment.

5. INSPECTION

5.1 Initial Installation

Upon completion of installation and prior to hydrotest, and with piping at ambient temperature, the Mechanical Field Engineer shall inspect all supports on each piping system for completeness and correctness of the installation, excellence of workmanship, and the adequacy of the installation to perform its function during hydrotest, startup, and hot functional testing. To achieve this, the Mechanical Field Engineer shall look for deficiencies in installation including, but not necessarily limited to, the following:

a. Noncompliance with pipe support design drawings

b. Insufficient clearances for cold-to-hot expansion at guides, stops, and failure restraints

c. Insufficient travel availability on spring supports

d. Offset of hangers inadequate, or in wrong direction

e. Incomplete welding of attachments

f. Insufficient thread engagement of threaded parts

g. Travel stops on spring supports not removed, except on drained water lines.

h. Temporary supports and tack welding not removed following hydrotest

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i. Spring canisters dented or otherwise damaged

j. Lock nuts missing, or other means for preventing loosening of threaded parts not provided

k. Local interferences that could impair support function

l. Suppressor cold settings incorrect

m. Oil leaking from hydraulic suppressors

n. The overall configuration of the piping system should be inspected to assure proper slope, and to assure that no excessive sag exists.

o. A check should be made to assure sufficient clearance exists between pipe and adjacent structures to accommodate anticipated thermal expansion.

5.2 During Startup and Hot Functional Testing

The performance of all pipe supports and hangers shall be observed where accessible by the Startup Field Engineer during the startup and hot functional testing of all piping systems. He shall take such corrective action as may be necessary to prevent impairment of the piping system or its supports in a timely manner. Particular attention shall be given to the following:

a. Spring supports not moving within their prescribed travel range

b. Binding, jamming, or galling of springs within their containers

c. Interference at guides, stops, and restraints before maximum expansion has taken place

d. Excessive gaps at failure restraints when piping is at full temperature

e. Excessive swing of hanger rods

f. Sliding supports not moving freely.

5.3 (Deleted)

5.4 Project Stress Engineer

After the Mechanical Field Engineer has completed his inspection and acceptance of the installed piping and support system, the Project Stress Engineer shall inspect the installation to ensure that all supports are performing their intended engineering function. Deficiencies noted during this inspection shall be brought to the attention of the Mechanical Field Engineer for correction. Following correction of deficiencies, the installation shall be reinspected by the Project Stress Engineer for final acceptance.

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5.5 Inspection Documentation

The results of all inspections made in accordance with this section shall be recorded by means of the documentation requirements described in Section 6.

6. DOCUMENTATION

6.1 Pipe Support Design Drawings

The detailed design of all pipe supports covered by this specification is depicted on the pipe support design drawings prepared by Project Engineering, San Francisco. Field revisions to the pipe support design drawings are permitted as provided in Paragraphs 4.2 and 4.3 or by specific correspondence from the Project Engineer. These revisions shall be approved by the Mechanical Field Engineer and shall be recorded on "as built" pipe support design drawings. Changes, other than the above, shall be submitted to SFHO Engineering for approval in accordance with the Field Inspection Manual (FIM). Field Change Notice (FCN) shall not be used for changes to ASME III Class I piping hangers.

In course of the installation inspections required by Section 5, the pipe support design drawings shall be further revised to record "as-built" conditions, showing final spring hanger load settings and similar pertinent design data.

The "as-built" pipe support design drawings shall be transmitted to Project Engineering, San Francisco, for review, final approval, and incorporation in the permanent project records. If the "as-built" design is found to be unacceptable, Project Engineering, San Francisco, shall make appropriate revisions to the design, and reissue the pipe support design drawings to the Field for further action. All necessary rework shall be subject to the inspections and approvals described in Section 5.

6.2 Pipe Support Installation Review for Piping 2-1/2 Inches in Diameter and Over, Form P-129S3

Appendix B, Form P-129S3 is used to record all inspections and approvals as specified herein and to record all deficiencies noted and actions taken in the field. Its use is further described below.

a. Appendix B, Form P-129S3 is initiated by Project Engineering, San Francisco, by filling out Columns 1, 2, and 4. A separate form is used for each piping system. The forms are then transmitted to the field.

b. Upon receipt of Form P-129S3, the responsible Field Engineer completes Column 3. Upon completion of the support installations and the required inspections, and after all remedial action has been carried out satisfactorily, the Field Mechanical Engineer signifies

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his approval by initialing and dating Column 5 and 6. He then passes the form on to the SFHO Stress Engineer.

c. (Deleted)

d. In the course of his inspection the Stress Engineer enters a description of any noted deficiencies in Column 7, and returns the form to the Field Mechanical Engineer for corrective action. Upon satisfactory resolution of any noted deficiencies, the Stress Engineer signifies his final approval by dating Column 9. Form P-129 is then transmitted to Project Engineering, San Francisco, for retention in the permanent project records.

e. Legend For Filling Out Form P-129

Column 1 - Identification number of isometric marked-up sketch showing locations of supports and restraints

Column 2 - Identification and revision number of the current support restraint sketch to be reviewed

Column 3 - Check ( ) if support/restraint assembly is installed

Column 4 - SS - spring support
RS - rigid support
CS - constant support
RR - rigid restraint
MR - mechanical restraint
A - anchor

Column 5 - Field engineering will check installation against SFHO approved final support/restraint sketch. If no discrepancies exist field engineer will initial and date this column.

Column 6 - Field Engineer will initial and date this column at the same time he signs Column 5.

Column 7 - Identification of discrepancies and remarks recorded by SFHO stress engineers. Field engineering will insure these items are corrected.

Column 7A - Installation requires modifications or rework as noted.

Column 7B - Installation deviates from final support/restraint sketch as noted. Field shall take corrective action, if specified.

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Reinspection by Stress Engineer is not required. If installation is acceptable as is, so state.

Column 7C - Check ( ) if the acceptable support/restraint deviations as noted in column 7B are significiant and require an "as-built" sketch.

Column 8 - Check ( ) by:

a) Stress engineering after column 7A is completed and corrected

b) Field engineering after column 7B is completed (with initials and date)

c) Field Engineering after column 7C is completed (with initials and date).

Column 9 - a) If no installation deviations requiring modificiations or rework exist, SFHO stress engineering will initial and date this column.

b) If corrective action is specified in column 7B, Stress Engineering will initial and date this column after Field Engineering has initialed and dated column 8, signifying completion of the specified action.

6.3 Pipe Support Installation Review for Piping 2 Inches in Diameter and Under, Form P-119

Appendix E, Form P-119S3, is used to record all inspections and approvals as specified herein, and to record all deficiencies noted and actions taken in the field. Its use is further described below.

a. Project Engineering, San Francisco, will define scope of review effort and assemble review packages consisting of the appropriate small piping drawings and review data sheets and fill out Columns 1 through 5, Appendix E, Form P-119.

b. Upon completion of the support installations and the required inspections, and after all remedial action has been carried out satisfactorily, the Field Mechanical Engineer signifies his approval by initialing and dating Column 11, 13, 14, 15, 16, 17 & 18. He then passes the form on to the SFHO Stress Engineer.

c. (Deleted)

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d. The Stress Engineer enters the description of any noted deficiencies on the small piping isometric and returns the form with the isometric to the Field Engineer for corrective action. Upon satisfactory resolution of any noted deficiencies, the Stress Engineer fills out Columns 6 through 13, and 19, and signifies his final approval by dating Column 20. Form P-119 is then transmitted to Project Engineering, San Francisco, for retention in the permanent project records.

e. Legend for Filling Out Form P-119

Columns 1 through 4 Line identification number and description.

Column 5 Design is per Small Pipe Engineering Manual.

Column 6 Design is by computer analysis.

Column 7 Gravity span between supports is appropriate.

Column 8 Seismic span between restraints is appropriate.

Column 9 Piping flexibility between first restraint and moving terminal points is sufficient.

Column 10 Remainder of pipe is sufficient for thermal flexibility.

Column 11 Structural attachment is adequate and conforms with Small Pipe Engineering Manual.

Column 12 Thermal flexibility in as-built configuration is sufficient.

Column 13 Welds are sufficient and conform with Small Pipe Engineering Manual.

Column 14 Field Engineer's signature and date of acceptance of installation.

Column 15 Total number of supports/restraints required per isometric drawing.

Column 16 Total number of supports/restraints actually installed.

Column 17 Total number of incomplete installations (deficiencies) per isometric.

Column 18 Field Engineer will initial and date this column when he signs Column 14.

Column 19 Remarks, notes, discrepancies, etc.

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Column 20 Piping Stress Analysis Group Engineer's signature and date of acceptance of design and installation.

Note: A check mark ( ) in a column indicates item is approved.

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APPENDIX A

ADJUSTMENT METHODS FOR PIPING SYSTEMS

I. Rigid hangers in the following listed systems shall be adjusted using a dynamometer in accordance with Section 4.8.1.

Main steam, feedwater, steam dump to condenser.

II. Rigid hangers in the following listed systems shall be adjusted using a dynamometer as outlined, or by using a torque wrench in accordance with Section 4.8.2.

All Seismic Category I systems 2-1/2 inches in diameter and over not listed above.

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APPENDICES B, D, AND E

To be complete this specification must have the following three appendices (consisting of four sheets) which may be obtained from the Document Control Center.

Appendix B	Large Pipe Support Installation Review, Form P-129S3
Appendix D	
Figure 1	Typical Dynamometer Installation At a Rigid Pipe Support, Form P-128S3
Figure 2	Adjustment Sequence for Pipe Supports, Form P-128S3
Figure 3	Torque Chart, Form P-114S3
Appendix E	Small Pipe Support Installation Review, Form P-119S3

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INSTALLATION REVIEW

PIPE SUPPORTS/RESTRAINTS - 2½" AND OVER

(1) IDENT NO	(2) SUPPORT OR RESTRAINT MARK NO	(2) REV	(3) O INSTAL	(4) SPPT OR RESTR TYPE	(5) INSTALLED CORRECT	(6) QC APPROVAL INITIAL & DATE	(7) CORRECTIVE ACTION BY FIELD (7A) MODIFY INSTALLATION	(7B) INSTALLATION DEVIATES FROM FINAL SKETCH	(7C) AS BLT DWG. REQ'D	(8) COMPLETE	(9) STRESS GROUP APPROVAL INITIAL & DATE

LEGEND OF COMMON DEFICIENCIES

a) Cold setting not per hanger sketch
b) Remove travel stops
c) Provide full thread engagements
d) Tack or burn threads, or use double nuts at closure fits and stops
e) Welding of structural attachments not per hanger sketch
f) Welding of pipe attachments not per hanger sketch
g) Structural attachment not per hanger sketch
h) Spring/hydraulic restraint type, size and mark no. not per sketch
i) Off set of structural attachment not per hanger sketch
j) Insufficient clearance for thermal expansion near support/restraint
k) Number or size of concrete anchor bolts not per sketch
l) Concrete anchor bolts installed incorrectly or excessive clearance between plate and wall

SAN FRANCISCO POWER DIVISION

SYSTEM:

BY | DATE

PIPE SUPPORT/RESTRAINT INSTALLATION REVIEW

JOB NO	DRAWING NO	REV

P 1295 3/75 CVS

DOCUMENT CONTROL
509 08

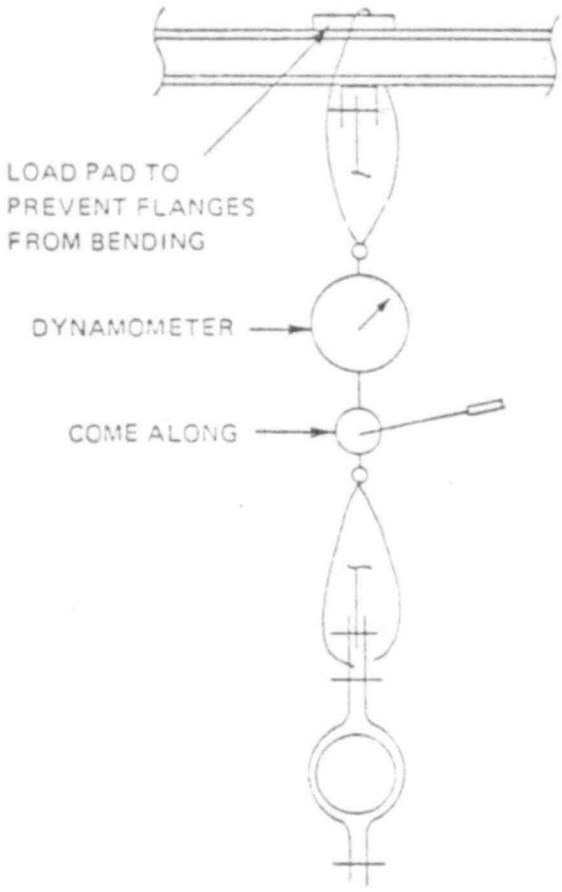

FIG. 1 TYPICAL DYNAMOMETER INSTALLATION
AT A RIGID PIPE SUPPORT

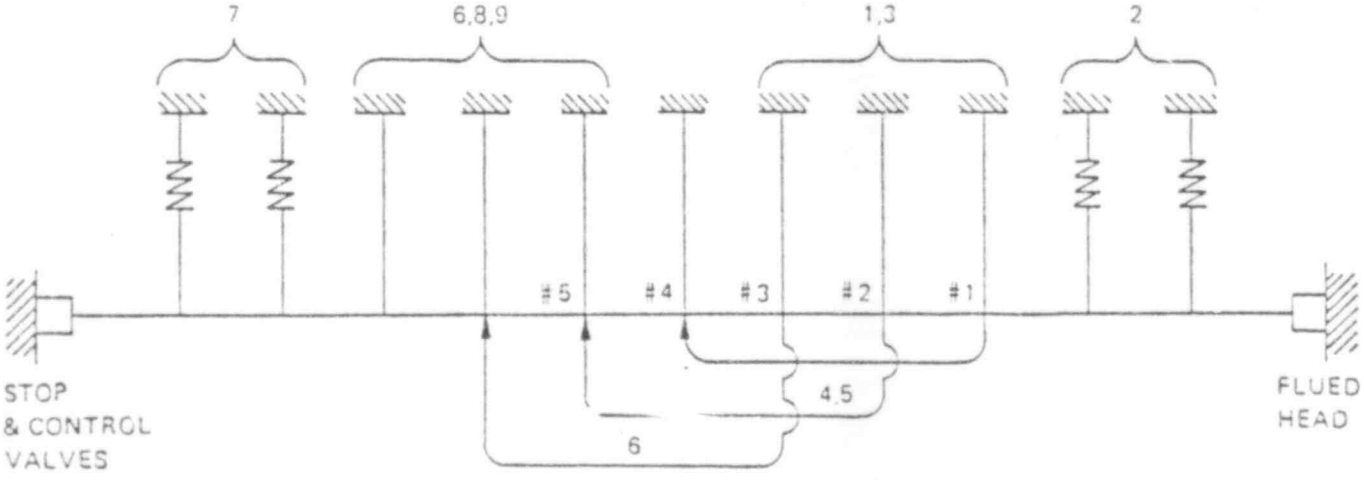

FIG. 2 ADJUSTMENT SEQUENCE FOR PIPE SUPPORTS

RIGID PIPE HANGER ADJUSTMENT PROCEDURE

Appendix D_2 = P114S_3
Specification 6600-M-2505

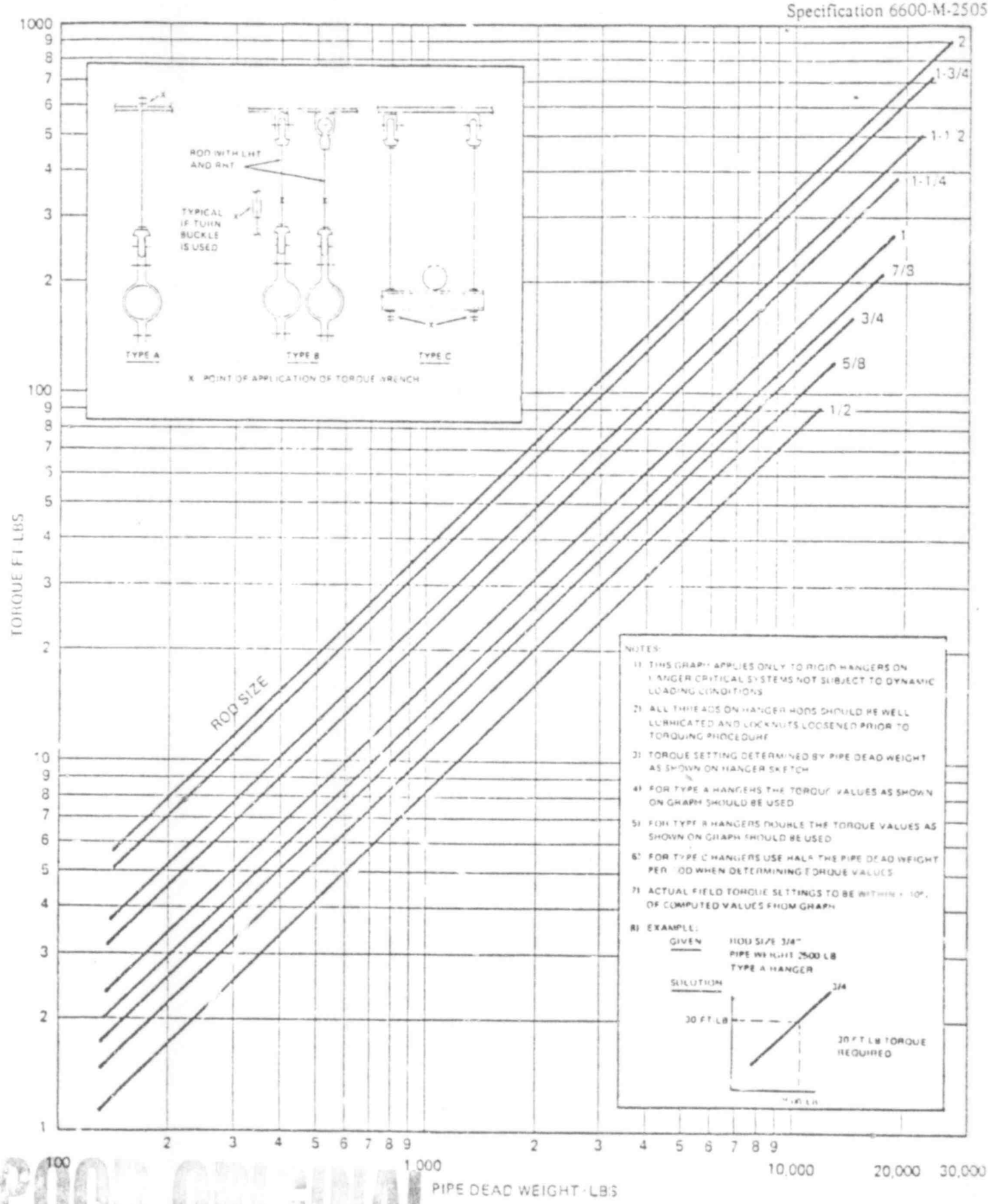

FIG. 3

POOR ORIGINAL

DESIGN AND INSTALLATION REVIEW

2" AND UNDER PIPE SUPPORTS / RESTRAINTS

Appendix E [illegible]
Specification [illegible]

IDENTIFICATION				DESIGN REVIEW						INSTALLATION REVIEW			LINE OK	TOTAL NO. SUPT./RESTR.	INSTALLED SUPT./RESTR. NO.	INCOMPLETE	QC APPVL. INITIAL'S & DATE	REMARKS	STRESS GRP. APPVL. INITIAL'S & DATE
ISOMETRIC NUMBER	REV.	LINE IDENT. NO.	LINE DESCRIPTION	DESIGN SPEM	DESIGN COMP.	SPAN GRAV.	SPAN SEIS.	THERMAL TO be RESTR.	THERMAL LINE OK	STRUCTURAL MEMBER	THERM MOVE.	WELDS							

APPENDIX F

ACCEPTABLE WELD PROCEDURES FOR USE ON SUPPORTS, HANGERS AND RESTRAINTS

P1-A-Lh rev 1
P1-A rev 0
P1-A-C rev 0
P1-A-C Lh rev 0
P1-F-CO2 rev 2
P1-F-CO2 (structural) rev 1
P8-I-AG rev 0
P8-AT-AG rev 0
P8-A rev 0

Required NDE: none

Required inspection: Visual per F.I.M. W-1.

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